Organized by

SAB, IITG

In association with

IIT Guwahati

Research Conclave'17

An amalgamation of Academia, Industry & Startups

Powered By

प्रति दिन TIME

SPONSORED BY

Zwick Roell

NRL

ओएनजीसी ONGC

सेन्ट्रल बैंक ऑफ़ इंडिया Central Bank of India

ZALONI THE DATA LAKE COMPANY

PRIZE PARTNERS

Springer

ThermoFisher SCIENTIFIC

AUREA BIOLABS

melbiogen

CONTENTS

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

Prof. Gautam Biswas
FNA, FASc, FNAE, FNASc, F-ASME, FIE
Director and J. C. Bose National Fellow

गुवाहाटी–781 039, भारत
Guwahati–781 039, India

MESSAGE FROM THE DIRECTOR

It gives me immense pleasure to know that the third Research Conclave of the Institute will commence from March 16, 2017. This is an annual event celebrated by the MTech and PhD students across the Institute. As part of the programme, the students showcase their research work through posters and presentations to the peers, invited guests and fellow attendees from other Institutes. The event forms the building-block for collaboration, and helps in earning recognition. The PhD program is a long journey. Sustained effort and confidence building are the vehicles for this journey. Such events help you in confidence building. I want to personally congratulate you for taking up this initiative and making the pledge for a journey towards excellence.

This event was originally planned by our Associate Dean (Academic) with the ambition that the event will help you to know your colleagues and encourage you to exchange the ideas in a free and efficient manner. The idea has been supported overwhelmingly by the Dean (Academic), the Academic Section and finally all the faculty members of the Institute. This year, a large number of enthusiastic faculty members are participating in the event with a great passion. We do hope that the event will provide you with the opportunity to come closer to each other as the fellow scientists. I believe that you will enjoy your interactions with the amazingly talented faculty members and students at IIT Guwahati and understand what makes this institution such a magical place.

The responsibility for completing a PhD within a reasonable period of time is a very important issue for maintaining the supply of steady stream of students to the Institute. At the same time the quality of PhD is adjudicated by the number of cutting edge publications at the top-tier journals in the field. Meeting up the challenge of the above two seeming bivalent requirements, is a great responsibility. The responsibility has to be shouldered by the students and their advisors jointly.

One noteworthy feature regarding governance of the students at IIT Guwahati is the periodic reports to the advisors and participation in progress seminars. However, at every stage, sincere attempts must be made to convert the reports in to publications in the top-tier journals.

We at IIT Guwahati are a diverse group of students, representing many states of India and some countries abroad. Amidst all our differences, we are united in our passion for higher level of scientific achievements. We feel delighted and privileged to be a part of the great tradition of education and research at this Institute.

The doctoral programme may be termed as "training in research". Improved training for research contributes in generation of high quality human resources. Today we need a huge repository of such highly qualified human resources in order to serve a large number of Institutes/ Universities created by the Government. The quality manpower is the only means to achieve excellence in "Knowledge Economy". Knowledge age seeks and rewards ideas, irrespective of where they originate and reside. The large source of human capital of India has to be tapped and converted into value.

Once again, I congratulate all the members of the organizing teams and all the participants for making this event a great success.

Gautam Biswas

Gautam Biswas, FNA
JC Bose National Fellow and Director
Indian Institute of Technology
Guwahati

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

MESSAGE FROM THE CHAIRPERSON, SAB

It is indeed a great pleasure for me to congratulate all the members of the Students' Academic Board (SAB), IIT Guwahati on the eve of the Research Conclave 2017. The Research Conclave is organized by the SAB primarily as an annual celebration of the research activities undertaken at IIT Guwahati. Research Conclave was first held in 2015, but in this third edition it has been planned on a much larger scale with participation by students from several other institutes and colleges. I am very much impressed by the dedication, sincerity and hard-work of the organizing team. The team has been admirably led by Mr. Arup Jyoti Bora, General Secretary of SAB and the Student Convener of Research Conclave 2017. The whole team has benefitted immensely from the guidance and active involvement of Dr. A. Kunnumakkara, Faculty Convener and Dr. P. Khanikar, Faculty Co-convener for Research Conclave 2017. It is heartening to note that students from all the academic disciplines have joined hands together and whole-heartedly participated in the organization of the event, which itself can be considered a success. After all, one of the primary objectives of the Research Conclave is to facilitate interaction amongst researchers across various disciplines and contribute to the growth of an ambiance of interdisciplinary research. We hope that the various workshops organized during the conclave will help the students to gain exposure and acquire new skills essential for higher academic pursuit. The Research Conclave also aspires to reach out to the younger students from colleges of the region so that they can get an opportunity to experience the academic facilities and ambiance of the institute. The Research Conclave also aims to bring together the scholars of various institutes of the region by proving a platform for scientific exchanges through poster & model presentations, discussions, workshops and technical sessions.

The institute has been very supportive in organizing this event. I take this opportunity to thank all the students, faculty and staff members for extending their help. I must especially thank Prof. Gautam Biswas for his wholehearted support and encouragement. I have to mention that the faculty coordinators from the departments and the academic centres have played a key role. I must thank Prof. Saurabh Basu, Dean of the Outreach Education Programme for extending the help of his office in making arrangements for the visit of the students from nearby colleges. I hope that Research Conclave will be embraced not only by the whole community of IIT Guwahati, but also the nearby institutes of higher learning. I conclude with the hope that the Research Conclave will continue to grow into a more meaningful event with each passing year.

Anupam Saikia

Anupam Saikia
Professor, Department of
Mathematics &
Associate Dean, Academic Affairs
IIT Guwahati,Guwahati 781039

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

MESSAGE FROM THE ORGANIZING COMMITTEE

Dear Colleagues and Friends,

It is our great pleasure to welcome you to the Research Conclave 2017, organized by Student's Academic Board (SAB) of Indian Institute of Technology Guwahati (IITG), Assam, India.

Research Conclave is a staunch platform to nurture the young minds towards research, innovation and entrepreneurship, which intends to bring the integrity of the students towards both industries and academia to redress the academic research challenges, concerns of the entire student community and upcoming entrepreneurs around the globe. It is a forum to harness innovative mind to level-up the economic strata of current society from research to industries. Research Conclave work as catalyst for building leaders through holistic, transformable and innovative ideas. It has started in 2015 with great rhythm and passion, and this year with the same enthusiasm we are conducting this event in a broader spectrum.

This year we have planned many events in Research Conclave to provide a better platform to students to understand current research scenario and to motivate them such as lectures by eminent personalities, poster presentation and model exhibition by students, workshops on different areas of science and technology, panel discussion in the thrust areas of modern science and technology etc. We do hope that all the participants would be highly benefitted by these events.

We would like to acknowledge the efforts from everyone such as faculties, staffs and students of IITG and other participating institutes, who made this event possible. We thank and congratulate all the participants for their contribution. We also thank the sponsors for their enormous support to this event.

We wish you memorable and enjoyable days and hope to see you in the coming years with greater energy and enthusiasm.

With all the best regards
On behalf of the organizing committee

Dr. Ajaikumar B Kunnumakkara
Convener
IIT Guwahati

Dr. Prasenjit Khaniker
Co- Convener
IIT Guwahati

Arup Jyoti Borah

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

MESSAGE FROM THE EVENT CONVENER

It gives me an immense pride to witness Research Conclave, 3rd edition with every step gathering its momentum encompassing broader prospects and values towards integrity and cooperation. The first day of this event from this time has been declared as Open Day of the Institute. Research Conclave came into existence in 2015, with a motive to promote an interdisciplinary research. We feel proud with the association of Dean Outreach Section and Alumni affair Section that this event would take such a massive turn around. A constant support from Student Gymkhana Council in smoothness of the event will be always appreciable. In the first edition we tried to showcase all departments' research endeavors and milestones achieved in the form of posters, lecture series. In the second edition we move a step ahead seeking a possible amalgamation of Academia, Industry and Startups. The aim of this edition was to introduce people involved in research towards other possible dimensions of research. We have invited resource persons and participants from different Universities, governmental organizations and Company delegates along with the academician from both within and outside Institute. The 3rd edition Research Conclave we thrive to bring a flavor of research carnival with both National and International participation with over one thousand registrations in various events. This year we will be having a footfall from more than fifty universities, colleges and schools. We have floated RC-2017 with various workshops, exposure to all the laboratories, quizzes and career counseling through panel discussion with a hope to motivate upcoming students towards cutting edge research and also provide the researchers a platform to witness the scope and possible collaboration to add a value to the system and its fruit to the society. As the proverb goes, "nothing stays forever and every good thing has an end," so is the Research Conclave. It has been a wonderful journey supervising this event for three consecutive times, right from its inception to a height where it needs no introduction. This has been a wonderful experience for me and my whole team, by learning from mistakes, experimenting new areas, gaining expertise, confidence and exposure to face the world. Hope this event also brings happiness to all the other people participating in Research Conclave in the form of knowledge, achievements, awards and accolades. I wish this RC will contribute a wide responsibility in motivating researchers to adopt a need based problem in bringing a visible change towards the society and also rest in the hands of those stakeholders with broader vision for upcoming RC who would take it to a new height.

Arup Jyoti Borah

Mr. Arup Jyoti Borah
Student's Convener
IIT Guwahati

SCHEDULE FOR THE EVENT

Research Conclave'17
16th March 2017 (Thursday)

Time	Event	Venue
5:30 pm - 8:00 pm	**Inauguration Ceremony**	Institute Auditorium

17th March 2017 (Friday)

Time	Event and Speakers	Venue
09:00 AM onwards	Poster Display	Academic Complex Corridors (IITG participants) / Lecture Hall Premises (External participants)
	Model Displays	Lecture Hall Premises
10:00 AM – 04:00 PM	Lab Visits	
10:00 AM- 5:00 PM	Workshop-I **R Language (Amit Goyal)**	Conference Hall-2
09:00 am – 5:00 pm	Workshop-II **Matlab (MESA, IITG)**	Conference Hall-4
12:15 pm –1:00 pm	Science Museum Show	Lecture Hall-4
2:00 pm-3:00 pm	Workshop - III **How to make a race car?** ***(Mayank Agrawal, IITG)***	Lecture Hall-4
3:30 pm – 5:00 pm	Panel Discussion **Career Counseling** ***(Dr. Biman Mandal, Dr. Pankaj Kalita, Dr. Amit Sethi, Dr. Ankit Garg, Dr. Debapriya Basu, Prof. Sourabh Basu & Dr. Nanki Nath***	Venue: Conference Hall-3
5:15 pm- 6:15 pm	Lecture-I Dr. Aryabhatta Sahu ***Topic: Message Passing Interface (Parallel Computing)***	Conference Hall-3
06:20 PM – 07:15 PM	Lecture-II Prof. Amitabh Chattopadhyay ***Topic: How to Write a Scientific Manuscript: Excitements, Challenges and Reality***	Venue: Conference Hall-3
7:15pm- 8:00 pm	Science Puzzle	Venue: Conference Hall Foyer

Schedule
Research Conclave'17
18th March 2017 (Saturday)

Time	Speakers	Venue
10:00 AM– 1:00 PAM	**Science Quiz** ***Quiz master: Mr. Ashutosh Das***	Venue: Lecture Hall-4
09:00 AM -6:00 PM	Workshop-IV ***Aeromodelling***	Conference Hall-1
09:30 AM -12:00AM	Workshop- V ***LaTeX*** By IITG Scholars	Conference Hall-2
4:00 pm – 5:00 pm	Lecture- III Prof. Ganesh Bagler ***Topic: Leveraging food for better health through data-driven approaches***	
5:15 pm –6:15 pm	Lecture- IV Mr. S.P. Dhal ***Life Cycle of a Currency***	Conference Hall
6:30 pm – 8:15pm	Lecture- V The Dabbawalas of Mumbai ***Lunchbox Legends***	Auditorium

SCHEDULE FOR THE EVENT

Schedule
Research Conclave'17
19th March 2017 (Saturday)

Time	Speakers	Venue
10:00 am – 12:00 noon	Lecture-VI Prof. M.S. Ananth ***Introduction to Research***	Conference Hall-2
09:00 AM -6:00 PM	Workshop-IV ***Aeromodelling*** ***(Continued)***	Conference Hall-1
10:00 am – 1:00 pm	**General Quiz** **Quiz Master: Mr. Wonkyo Weingken**	Lecture Hall-4
1:00 pm – 5:00 pm	Workshop-VI P. Ganguly ***Topic: How to write a Patent***	Conference Hall-2
5:15 pm – 6:30 pm	**Valedictory Session**	Institute Auditorium

INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Indian Institute of Technology Guwahati, the sixth member of the IIT fraternity, was established in 1994. The academic programme of IIT Guwahati commenced in 1995. At present the Institute has eleven departments and three inter-disciplinary academic centres covering all the major engineering, science and humanities disciplines, offering BTech, BDes, MA, MDes, MTech, MSc and PhD programmes. Within a short period of time, IIT Guwahati has been able to build up world class infrastructure for carrying out advanced research and has been equipped with state-of-the-art scientific and engineering instruments. Indian Institute of Technology Guwahati's campus is on a sprawling 285 hectares plot of land on the north bank of the river Brahmaputra around 20 kms. from the heart of the city. With the majestic Brahmaputra on one side, and with hills and vast open spaces on others, the campus provides an ideal setting for learning.

Indian Institute of Technology Guwahati, the sixth member of the IIT fraternity, was established in 1994. IIT Guwahati was established in 1994 by an act of parliament and its academic programme commenced in 1995. Indian Institute of Technology Guwahati's campus is on a sprawling 285 hectares plot of land on the north bank of the river Brahmaputra. With the majestic Brahmaputra on one side, and with hills and vast open spaces on others, the campus provides an ideal setting for learning.

IIT Guwahati has been symbolised as one of most effervescent Institutes across the world by several major ranking associations. The hardship of students, devotion of quality research, contributions of renowned alumni, dedication and untold effort of the teachers and staff (teaching and non-teaching), and the vision of the administration wasinfluential in these achievements.

Worldwide, the ranking of IIT Guwahati was 451–460 in the QS World University Ranking of 2015 and 89 in the QS Asian University Rankings of 2012. In India, among engineering academies, it was ranked 10 by India Today in 2012, 8 by Outlook India in 2012 and 7 by Dataquest in 2011. In the Mint Government Colleges survey of 2009 it was ranked 6. In 2014, IIT Guwahati has been ranked 87 in 100 Top Global Universities under 50 Years by the Times Higher Education World University Rankings, bringing India into the list for the very first time. In 2015, IIT Guwahati has been ranked 50 by BRICS ranking. In 2016, IIT-Guwahati ranked 14th among 20 institutions classed as the World's Best Small Universities in the latest Times Higher Education (THE) rankings of 2016.

According to recent statistics, IIT Guwahati has around 6000 students, 425 staff and 375 faculty. IIT Guwahati is now 17 Convocations old, has over 7000 alumni, and has graduated over 475 Ph.D. students. Over the years, more than 250 companies/organisations have participated in the student placements.

ABOUT STUDENTS' ACADEMIC BOARD

Students' Academic Board (SAB)
IIT Guwahati

The SAB is intended as a student forum which strives to redress the academic problems and concerns of the entire student community of IIT Guwahati. It is a bridge between the students and the academic administration and is responsible to redirect the academic issues of the students to the appropriate administrative authority.

Together we strive to achieve the following:
To make you cognizant of the Academic protocols and procedures. For any system to function efficaciously there is a set of rules and ordinances which needs to be followed to achieve maximum organization. Often the students are unaware regarding these and end up wasting a lot of their time.

SAB, through its workings, organizes various Departmental and Inter-Departmental Activities through-out the semester. Such a synergistic system is often necessary to inculcate the spirit of Academic Excellence and innovation. Last but not the least, the SAB conducts periodic sessions to interact with the Student Community and undertake timely dissemination of important information.

Issues such as Internships, Exchange Programs, Fellowship/Scholarship Schemes etc. remains the underlying topics on which we try to bolster the student community so as to achieve positive results in a methodical way and thus succeed in bringing laurels to our Alma mater. SAB Ph.D. Council includes the Ph.D. student members of the DPPC of all the department in IIT Guwahati along with the elected Ph.D. representatives of different centres (Centre for Energy, Nanotechnology, and Environment) within the Institute.Apart from such activities the Ph.D. council conducts Research Conclave

ABOUT RESEARCH CONCLAVE

Research Conclave'17

An amalgamation of Academia, Industry & Startups

Research Conclave is organized under the banner of Students' Academic Board (SAB) of Indian Institute of Technology Guwahati (IITG). It is a staunch platform to nurture the young minds towards research, innovation and entrepreneurship, which intends to bring the integrity of the students towards both industries and academia to redress the academic research challenges, concerns of the entire student community and upcoming entrepreneurs of all over India. It is a forum to harness innovative mind to level-up the economic strata of current society from research to industries. The Research Conclave work as catalyst for building leaders through holistic, transformable and innovative ideas. It has started in 2015 with great rhythm and passion, and this year with the same enthusiasm we are conducting this event in a broader spectrum.

Objectives:

- Showcase of ongoing research activities at IITG as well as other research institutes nearby through posters
- Model exhibition by research groups from IITG and other institutes from various parts of India
- Industry-academia interaction with industrial delegates highlighting their technological requirement, expectations from research institutes
- Interactive sessions with entrepreneurs to identify the avenues through which IITG can contribute to local firms, businesses and other intermediaries through innovation and research
- A prestigious platform to start-ups for exhibiting their products and ideas to industries and academia
- Technological implementation towards sustainable development
- Mapping of real-time industrial problems to mitigate them through panel discussion and laboratory visits

Research Conclave Features:

'CONNAISSANCE '
(Lecture Series: Academicians and Industrialists)

'SCIENTIFICIA'
(Posters, Model presentation and Laboratories visit)

'INNOVATEUR PLATE-FORME'
(Startups incubation)

'ACAD-INDUSTRIE SYNERGY'
(Interaction with industry delegates, startups and academicians)

QUIZZES

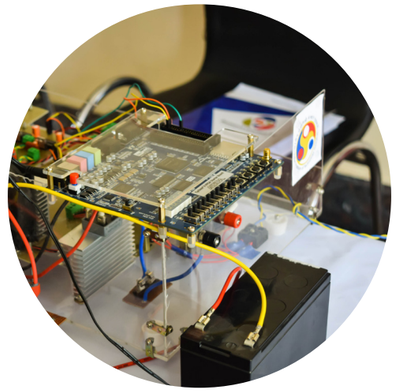
WORKSHOPS

DEBATE & BRAINSTORMING SESSIONS

RESEARCH CONCLAVE 2016: A GLIMPSE

A Glimpse

- Showcased various research activities undergoing in different departments within IIT Guwahati through posters, lectures, presentations and lab visits.
- Active participation from institutes all across North-East India.
- Overwhelming response and positive feedback from academic community and industries.



21 दिसंबर 1911 को मुम्बई में भारत के प्रथम पूर्णतः स्वदेशी व्यवसायिक बैंक, सेन्ट्रल बैंक आफ इंडिया की स्थापना हुई थी. बैंक के संस्थापक सर सोराबजी पोचखानावाला एक विलक्षण एवं दूरदर्शी बैंकर थे. उनकी दूरदर्शिता, विद्वता एवं परिश्रम के परिणामस्वरूप सेन्ट्रल बैंक आफ इंडिया शीघ्र ही देश के अग्रणी व्यवसायिक बैंक के रूप में स्थापित हो गया.

सेन्ट्रल बैंक आफ इंडिया ने बचत खाता, आवर्ती खाता, सेफ डिपाजिट लाकर जैसे कई जन उपयोगी प्रोडक्ट प्रस्तुत किये जो न केवल लोकप्रिय सिद्ध हुये अपितु बैंकिंग में मील का पत्थर भी बने.

देश सेवा में वर्ष 2011 में एक शताब्दी पूर्ण कर चुके और निरंतर 106वें वर्ष में सेवारत सेन्ट्रल बैंक आफ इंडिया के आज समस्त भारत में लगभग 5000 कार्यालय हैं. जिनमें 13 आंचलिक कार्यालय, 59 क्षेत्रीय कार्यालय, 3 प्रशिक्षण महाविद्यालय एवं 16 प्रशिक्षण केन्द्र सम्मिलित हैं. इंटरनेट बैंकिंग, मोबाइल बैंकिंग सहित आधुनिक तकनीक युक्त सेन्ट्रल बैंक आफ इंडिया देश के कोने -कोने में अपनी शाखाओं के माध्यम से समाज के प्रत्येक वर्ग के लाभार्थ प्रोडक्टों के द्वारा देश के आर्थिक विकास में अपना योगदान दे रहा है.

सेन्ट्रल बैंक आफ इंडिया के पास आज हर वर्ग की वित्तीय आवश्यकताओं को पूरा करने वाले प्रोडक्ट हैं. जिनमें आवास ऋण, शिक्षा ऋण भी सम्मिलित हैं. शिक्षा ऋण में महिलाओं, पिछड़े वर्गों एवं प्रतिभाशाली छात्रों को ब्याजदर में छूट भी दी जाती है.

सेन्ट्रल बैंक आफ इंडिया प्रतिभाशाली उद्यमियों को अपना उद्योग स्थापित करने हेतु भी ऋण प्रदान करता है.

सेन्ट्रल बैंक आफ इंडिया अपने कर्मचारियों के साथ - साथ सम्माननीय ग्राहकों भी अपने परिवार का सदस्य मानता है. इसलिये कर्मचारियों की तरह सम्माननीय ग्राहकों को भी सेन्ट्रलाइट कहा जाता है. इसी परम्परा में सम्माननीय ग्राहकों की संतुष्टि को सर्वोच्च प्राथमिकता दी जाती है. इसलिये इससे जुड़े सम्माननीय ग्राहकगण

सेन्ट्रल बैंक आफ इंडिया को अपना बैंक मानते हैं.

EMINENT SPEAKERS FOR RESEARCH CONCLAVE ’17

S P DHAL
"LIFE CYCLE OF CURRENCY"
Zonal manager, Central bank of India

DR. ARYABHATT SAHU
***"MESSAGE PASSING INTERFACE"* (PARALLEL COMPUTING)**
ASSOCIATE PROFESSOR
(DEPARTMENT OF COMPUTER SC. & ENGG.) IIT GUWAHATI

PROF. M S ANANTH
"INTRODUCTION TO RESEARCH"
DISTINGUISHED VISITING PROFESSOR, IIT BOMBAY

DR.PRABUDDHA GANGULI
"HOW TO WRITE A PATENT-MINISTRY OF HUMAN RESOURCES DEVELOPMENT (MHRD)"
IPR CHAIR PROFESSORSHIP, TEZPUR UNIVERSITY, ASSAM, INDIA

DR. GANESH BAGLER
"LEVERAGING FOOD FOR BETTER HEALTH THROUGH DATA DRIVEN APPROACHES"
CENTER FOR COMPUTATIONAL BIOLOGY AT IIIT-DELHI

PROF. AMITABHA CHATTOPADHYAY (J.C. BOSE FELLOW)
"HOW TO WRITE A SCIENTIFIC MANUSCRIPT: EXCITEMENTS, CHALLENGES AND REALITY"
J.C. BOSE FELLOW CSIR-CENTRE FOR CELLULAR & MOLECULAR BIOLOGY

RESEARCH CONCLAVE TEAMS

RESEARCH CONCLAVE TEAMS

Convener And Doctoral Representative: ARUPJYOTI BORAH, CENTRE FOR ENERGY

CREATIVE TEAM	DEPARTMENT / CENTRE
Dipti Yadav	Energy
Umesh Chaudhary	Electrical and Electronics Engineering
Saurav Khuttiya Deori	Design
Indresh	Design
Shubhangi Bhardwaj	Energy
Mihir	Design
Dipleena Saikia	HSS
Shubha	HSS
Ravishankar Nair	HSS
Toni	Energy
Rahul Tiwari	Energy

SPONSORS TEAM	DEPARTMENT / CENTRE
Mum Taggu	Civil Engineering
Gagan Deep Singh	EEE
Avinash Pandey	Mechanical
Shazee Rahmani	Mechanical
Bikash Sah	EEE
Krishan Kumar	BSBE

PUBLIC RELATION TEAM	DEPARTMENT / CENTRE
Nitesh Singh	HSS
Ayush Jain	Biotech
Shubham Chaudhari	Biotech
Anna Elias	HSS
Ayush Oksia	Physics
Abhinav Sharma	HSS
Dudul Das	Energy
Siddharth Kumar	HSS

PHOTOGRAPHY TEAM	DEPARTMENT / CENTRE
Prashik Bhogle	Energy

FINANCE TEAM	DEPARTMENT / CENTRE
Vignesh Babu R	Mechanical Engineering

HOSPITALITY TEAM	DEPARTMENT / CENTRE
Tushar	Energy
Adil	Energy
Torsha	BSBE
Mriganka	Energy
Kaleemuddin	Energy

BRANDING & VENUE MANAGEMENT	DEPARTMENT / CENTRE
Deep Bora	Energy
Nilkamal Kalita	Mechanical

SPONSORS

POWERED BY:

EVENT SPONSORS:

PRIZE PARTNERS:

Research Conclave'17

An amalgamation of Academia, Industry & Startups

Abstracts

Insecticidal activity of Phlogocanthus thyrsiflorus Nees (Acanthaceae) against Pulse beetle Callosobruchus chinensis (L.) (Coleoptera: Bruchidae) in stored green gram seed (Vigna radiata L.)

C. Murasing[1], P. Das[2] , P. Saikia[3] and P. Borbaruah[4]
[1]SRF, [2]Assistant Professor, [3]M.Sc. Student, [4] M.Sc. Student, Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam, India

ABSTRACT

Petroleum ether, ethanol and water extracts of Phlogocanthus thyrsiflorus Nees were evaluated to find out their effect on biological parameters against Pulse beetle (Callosobruchus chinensis L.) in green gram seeds. It was observed that the botanical was superior over control to suppress some biological parameters such as adult mortality, oviposition deterrence and adult emergence. Among the solvent extracts petroleum ether was found to be significantly superior over rest of the solvent extracts, registered the highest percent of mortality (100%) at 5% conc. after 96 hour of treatment followed by ethanol (80%) and water extract (78%) respectively. The LC_{50} value of petroleum ether extract of P. thyrsiflorus at 72 HAT recorded the lowest LC_{50} (2.278%).After 7 days of seed treatment at 5 % conc.highest oviposition deterrence was found in petroleum ether extract (66.62%), followed by ethanol (57.16%) and water extract (52.38%) respectively. In terms of inhibition rate of insect, petroleum ether extract at 5% conc. was found to be most effective (82.45%), followed by ethanol (79.77%) and water extract (78.11%) respectively from 1st day to 10th days of adult emergence. The present review focused on botanicals for controlling pulse beetle.

KEYWORDS: Phologocanthus thyrsiflorus, Callosobruchus chinensis, Adult mortality, Oviposition deterrence, Adult inhibition rate, $LC_{50.}$

Status of Oil Palm cultivation in Mizoram

C. Lalkroschhuangi, Nibir Pratim Choudhury, C. Zonunpuia
MBA in Agribusiness Management
Department of Agricultural Economics
Assam Agricultural University, Jorhat, Assam, India
krosofficial1@gmail.com

ABSTRACT

Palm oil is one of the most important vegetable oils in the world and each year million tonnes of palm oil has been traded globally to be consumed by million people around the world. Oil Palm stands as an ideal crop capable of achieving conservation of soil and moisture, repair of degraded land, provide ecological balance, food and security of rural and urban poor. Mizoram Government aims to implement and action programme with an objective of placing Oil Palm as a key component in the plan to generate employment and mitigate environmental degradation and to strengthen the process of Oil Palm Development. In Mizoram 5,000 Nos. and 7,000 Nos. of seedlings of Oil Palm were planted at Rotlang area of Lunglei District and Thingdawl area of Kolasib District during 1999-2000, respectively, with promising results. The total potential area identified in 7 Districts of Mizoram is 1,01,000 Ha. Potential area for Oil Palm cultivation in Mizoram is identified as 1,01,000 Ha. Total area covered under Oil Palm till 2013-14 is 17588 Ha and 10800 farmers are involved in oil palm programme in 7 districts in a total of 225 villages. The Government of India has provided support in the form of subsidy to private entrepreneurs for setting up of Oil Palm processing unit @ Rs.250.00 lakh per processing unit for 3 Mills totaling Rs.750.00 lakhs under Oil Palm Area Expansion (RKVY) during 2011 – 2012. Which were allotted to each partner Company at the rate of Rs.2.5 crore per Mill. Operational Guidelines have been worked out and circulated to each partner company for setting up of Oil Palm Mill in their respective areas. Godrej Agrovet Limited has completed establishment of Oil Palm Mill at Bukvannei, Kolasib District and started processing Fresh Fruit Bunch (FFB) at the plant since 14th April, 2014.

Bringing Green Revolution to Eastern India (BGREI): A programme for farmers welfare in Assam

Pinky Pathok*, N. Deka ,***P. B. Gogoi***
*Ph.D. Student, *** Professor
Department of Agricultural Economics and Farm Management,
Assam Agricultural University, Jorhat-785013
E-mail: pinkymunu93@gmail.com

ABSTRACT

The Bringing Green Revolution to Eastern India (BGREI) programme is one of the sub schemes under RKVY. The programme was initiated in 2010-11 targeting improvement in the rice based cropping systems of Assam, West Bengal, Orissa, Bihar, Jharkhand, Eastern Uttar Pradesh and Chhattisgarh because of having excellent potential for increasing food grain production and productivity. Under BGREI program, adoption of new seed varieties, farm machines and implements, nutrients, pesticides and knowledge based interventions are being promoted in different agro-climatic zones of eastern states. In this paper, an attempt was made to examine farmers welfare through BGREI programme with the objective of the studying the impact of the programme on cropped area, cropping intensity, yield and economics of rice production system. A sample of 120 farmers (80 beneficiaries and 40 non beneficiaries) was selected using multistage stratified random sampling technique from two different A.D.O. circles namely, Baghchung and Allengmora. From the analysis, it was observed that there was positive change in the net cropped area, gross cropped area and cropping intensity in 2015-16 over 2013-14 in case of beneficiary and negative change in case of non beneficiary which may be due to the fact that the beneficiary farmers started growing more rice under the scheme with provision of free inputs. The yield and economics were also found to be higher in case of beneficiaries as compared to non beneficiaries. The Benefit Cost ratio of beneficiaries was marginally higher than non beneficiaries showing the direct impact of BGREI on the farmer's income that led to farmers welfare.

Hydrological characteristics of the soils of Jorhat district under rice monoculture

Mridupawan Saikia[1] and Dilip K. Patgiri[2 1,2] Department of Soil cienc
Assam Agricultural University, Jorhat-785013
Email: mridupaban007@gmail.com

ABSTRACT

The study on "Hydrological characteristics of the soils of Jorhat district under rice monoculture" was carried out with the objective to generate information on hydrological parameters of the soils under rice cultivation. For this study soil samples were collected from different locations which includes Mariani, representing High lands (HL), Titabor, representing Humid Alluvial Flood Free Zone (HAFFZ), Baghchung, representing Humid Alluvial Flood Prone zone (HAFPZ) and Nimatighat, representing Char areas (CA) of Jorhat district. From each agro-ecological zones representative composite and core samples were collected from two locations containing two land situations viz. lowland and medium land and from three depths viz. 0-30cm, 30-60cm and 60-90cm. Soil samples were analyzed for determination of soil moisture characteristics parameters following standard procedures as outlined by Baruah and Barthakur (1997). Available water content of HL, HAFFZ, HAFPZ and CA are 20.32 and 20.02 per cent, 20.98 and 22.12 per cent, 20.85 and 22.72 per cent and 22.96 and 21.11 per cent for both lowland and medium-land situations, respectively while the air entry suction (Ψ_e) ranged from 10.21 to 10.67 cm, 11.05 to 12.13 cm, 10.88 to 11.59 cm and 12.01 to 11.47 cm for both lowland and medium-land situations, respectively. The Profile Water Storage capacity (PWSC) of HL and HAFFZ for both lowland and medium land situation ranged from 19.33 to 20.11 cm m-0.90 which remained almost similar but for CA and HAFPZ the storage capacity ranged from 19.13 to 22.95 cm m-0.90 which showed much variation as compared to HL and HAFFZ. In Pedotransfer functions the exponent for Ψ-θ relationship decreased and exponent for K-θ increased with the increased depth from 0-90 cm for all the agroecological zones. In this study the findings leads to the conclusion that irrespective of land situations a second crop can be cultivated in these soils without irrigation immediately after harvesting of rice as the water storage capacity of the rice soils of Jorhat district was considered high. The functional relationships of soil water suction (Ψ) and hydraulic conductivity (k) with soil water content (θ) developed for the paddy soils of Jorhat district can be utilized for large scale planning of efficient use of available water resources of the area.

Organic cultivation vis-à-vis CLIMATE CHANGE WITH SPECIAL REFERENCE TO Tea

Priyanka Behera*,Shyamal Kumar Phukan** and Supriya Sonowal**
*M.Sc Student, ** Ph.D Student
Department Of Tea Husbandry And Technology, AAU, Jorhat-13

ABSTRACT

Organic Farming has been a trend in the modern agricultural practice which is largely practiced all over the world. Organic farming aims at human welfare without harming the environment and follows the principles of health, ecology, fairness and care for all, including soil. The modern concept of organic farming combines the tradition, innovation and science. Tea (Camellia sinensis) is the most widely consumed beverage in the world. It is one of the oldest beverages in the world (FAO, Intergovernmental Group on Tea, 2015). Public concerns over environmental health, food quality and safety have led to organic tea expanding rapidly in India during the past decade. Presently over 15,726 ha of tea plantation is under organic management with a percentage growth of over 50 percent during 2007-2015. The quantity of production is 11 million kg recording a percentage growth of 45.15 percent (FAO 2014). Only 1 percent of the total tea produced in India is organic tea due to the resulting decline in yield trend observed in plantations. Correspondingly, the world-wide price for organic tea is higher as compared to the price of conventionally produced tea. In the 2015-2016, about 2 percent organic tea was exported due to the increasing demand, worldwide, for organic tea. It has been observed that organic agriculture has helped in mitigating climate change to an extent. Climate change is a major reason for environmental degradation and depletion of nature but organic agriculture has been acting as a boon to save nature from the wrath of the climatic changes. Such practice, if adopted in a proper manner, may help mitigate climatic change and be converted to climate smart agriculture.

Key Words- Organic Farming, Organic Tea, Climate Change, Climate Smart Agriculture

References-

Pathak H, Aggarwal PK and Singh SD (Editors). 2012. Climate Change Impact, Adaptation and Mitigation in Agriculture: Methodology for Assessment and Applications. Indian Agricultural Research Institute, New Delhi. pp xix + 302.
FAO, (2014). "Working group on organic tea" Intersessional Meeting of the Intergovernmental Group on Tea, Rome
FAO, (2015)." World tea production and trade Current and future development" the Intergovernmental Group on Tea, Rome
www.icar.org.in/files/**Base-Paper-Organic-Farming**-%20**Base**-16-03-2015.pdf

Tea Seed Oil and Its Prospects

AlijaBurhagohain*, ParamitaBharadwaj*, MandiraBorborah*
*M.Sc Student
Tea Husbandry & Technology,AAU, Jorhat-13

ABSTRACT

Tea seed oil is an edible oil which has a pale amber green colour with sweet odour. Tea seed oil is extracted from seeds of different Camellia spp which contain 30-32% oil (**Sahari & Amooi, 2013**) which is more than soybean oil (20-21 %) or cotton seed (18-21%) (**Scott et al. 1997**). Tea seed oil is very rich in antioxidant compound like vitamin A, C, & E and it has high iodine value (88-90%), high smoke point (252◦C) as compared to other vegetable oil like sunflower oil sesame oil etc. (**George et al., 2013**). Moreover it contain high saturated fatty acid and low poly unsaturated content which indicates its quality.(http://oilhealthbenefits.com/camellia-oil-tea-seed-oil/)

Tea seed oil is extracted from tea seeds by different methods. But two main methods are supercritical CO2 method and soxhlet extraction method. Among this two method it has been seen that oil extracted by soxhlet method has high quality as compared to the other method. But both these method has some disadvantages so that Jiang et.al. (2013) has found out an another method which is known as fermentation method. It has many advantages and produce high quality oil. (**Jiang et. al., 2013**)

Tea seed is use in many purposes. It has high anti-oxidant, anti-aging, anti-mutation, anti-microbial capacity and also can use as emollient, pesticide. Tea seed oil is used extensively for cooking purpose in China, Japan. (http://oilhealthbenefits.com/camellia-oil-tea-seed-oil/). Though oil content is 30-32% and from one plant we can harvest 5 kg seeds / annum. So we can extract up to 1600 ml oil from per plant per annum and also we can go for research prospect for further development.

Key words- Tea seed oil, Quality, Extraction method, Prospects

References-

George K. O.; Thomas K.; John W.; Kelvin M. O.; and Wachira F.(2013). Extraction and analysis of tea (*Camellia sinensis*) seed oil from different clones in Kenya.*African Journal of Biotechnology*,12(8),841-846
JiangJ.;RenC.;WangZ.;QianC.;ShenY.; and YangY. (2013)New Process for Extracting Oil and Starch from Tea Seeds.*Journal of Food Science and Engineering*,3,699-703
http://oilhealthbenefits.com/camellia-oil-tea-seed-oil/
Scott L.; Taylo F. J.; Eller & Jerry W. K. (1997). A comparison of oil and fat content in oilseeds and ground beef-using supercritical fluid extraction and related analytical techniques. *Food Research International,*30(5),365-310
Sahari A.M. and AmooiM. (2013). Tea seed oil: Extraction, compositions, applications, functional and antioxidant properties. *Academia Journal of Medicinal Plants* 1(4),68-79

Sensory Attributes And Chemical Composition Of Green And Black Tea

ParamitaBharadwaj*, PriyankaBehera* and AlijaBurhagohain*
*M.Sc. Student
Assam Agricultural University, Jorhat-785013

ABSTRACT

Tea, derived from Camellia sinensis L., is one of the most widely consumed beverages in the world. Tea can be categorized into three types, depending on the level of oxidation, as green, oolong and black tea (Senanayake, 2013).The quality of tea is normally assessed through organo-leptic method by a tea taster withfocus on leaf appearance, both before and after infusion; flavour and colour of the infusion. Colour of infusion is a key attribute that is affected by chemical compounds in different kinds of tea. Flavour in tea is defined by its roots of origin: Carotenoid, Lipid, Glycosides, Maillard Reaction and Strecker Degradation.The quality, both sensory and chemical, is influenced bycultivar, harvest season, age of plant, climate, environmentand processing condition (Theppakon, 2015).In addition to polyphenols which are the prime constituents, a wide variety of other components exists, including flavones, phenolic acids, carbohydrates, alkaloids, minerals, vitamins and enzymes (Ahmed et al., 2014). Catechins (Green Tea - 10-30%; Black Tea - 10-20%), Flavonols (Green Tea - 2%; Black Tea – 1%) and other polyphenols (Green Tea -3-6%;Black Tea - 3-10%) are among the most important compounds in tea (Yashinet al., 2015).Tea from different jats and clones differ considerably. The clones TV1, TV2, TV3, TV5, etc., are categorized as having strong Assam character. Individual clones do not produce a self-drinking tea. Thus blending according to market demand with tea, herbs, spices, etc. is practiced (Gogoi, 2014).The bio-active components in tea (EGCG, EGC, ECG and EC) possess antioxidant, anti-mutagenic, anti-diabetic, anti-inflammatory, anti-bacterial, and above all, cancer-preventive properties. It can be concluded that due to these extensive health benefits of tea, its' consumption and applications have increased to a large extent (Prakash, 2011).

Keywords: Oxidation, Tea Taster, Infusion, Polyphenols, jats, EGCG, EGC, ECG, EC.

REFERENCE

Ahmad, M.; Baba, W.N.; Shah, U.; Gani, A.; Gani, A. and Masoodi F.A. (2014).Nutraceutical Properties of the Green Tea Polyphenols.*J. Food Process Technol.***5**(11).
Chaturvedula, V.S.P. and Prakash, I. (2011).The aroma, taste, color and bioactive constituents of Tea.*J. Med. Plants Res.* **5**(11): 2110-2124.
Gogoi, R.C. (2014). Blending of tea – the development.*Two and a Bud.***61**(1&2): 53-56.
Senanayake, S.P.J.N. (2013). Green tea extract: Chemistry, antioxidant properties and food applications – A review. *J. func. foods*.
Theppakorn, T. (2015). Chemical constituents of Oolong tea produced in Thailand and their correlation with infusion colour. *Maejo Int. J. Sci. and Technol.* **9**(03): 344-354.
Yashin, A.Y.; Nemzer, B.V.; Combet, E.; and Yashin, Y.I. (2015). Determination of the Chemical Composition of Tea by Chromatographic Methods: A Review. *J. Food Res*. **4**(3).

Mechanical Rice Transplanter: A profitable business model in Assam

Nibedita Taye* and Nivedita Deka**
*MBA Student, **Professor
Department of Agricultural Economics
Assam Agricultural University, Jorhat, Assam, India
nibeditatayedhon007@gmail.com

ABSTRACT

Mechanical Transplanting of rice (MTR), can be defined as the process of transplanting raised seedlings of rice from a mat type nursery using a transplanter at an accurate spacing between the plants and the rows. It is an efficient model because it requires less number of labourers and other resources compared to manual rice transplanting. This study attempts to recommend a business model for MTR and its possible application in Assam based on research experience gathered on use of MTR Model at Bihar. The results of study in Bihar revealed that MTR model was able to provide employment opportunity to the rural youth and women farmer. Further, MTR helped to reduce the drudgery of the women in rice cultivation. A SWOT analysis of the MTR revealed its strength that it provided entrepreneurship opportunity while its weakness was that its comparatively expensive. The opportunity is that farmers demand for mat nursery raised seedlings and transplanter has increased. The threat comes in the form of social belief related to its seedlings. The study strongly recommends use of MTR as a feasible model for Assam which can attract rural youth to agriculture.

KEYWORDS- MTR, Business model, Rural youth, Assam.

Morphological and biochemical characterization of tea (Camellia sinensis (L.) O. Kuntze) shoots of few industry clones of Upper Assam

Aditi Smith Gogoi[1], P.K. Borua[2]
Assistant Professor, Department of Tea Husbandry & Technology, Assam Agricultural University, Jorhat, Assam
Professor, Department of Life Sciences, Dibrugarh University, Dibrugarh, Assam
Email- aditi.smith@yahoo.com

ABSTRACT

Tea is receiving increased interest for its antioxidant properties and nutraceutical values in a well brewed tea. Along with various planting materials, more than 100 numbers of industry tea clones are under commercial cultivation which is yet to be explored and are verse of extinction leading to the narrowing down of the genetic base of the crop (Konwar, 1999).
Fourteen industry tea clones of Upper Assam were profiled based on morphological and biochemical characters by field survey and laboratory investigation using physical methods, dimensional methods and morphological descriptor. Post hoc analysis was used to test the significance level and correlation similarity co-efficient matrix to analyze the genetic relationship among clones. Significant variation was observed in shoot and biochemical characters. Clone S3A3 showed highest shoot dry weight and plucking point density while clone P126 exhibited maximum shoot pubescence. The phenolic compounds present in tea shoots plays important role in determining the made tea quality (Hara et. al., 1995).The highest total polyphenol and caffeine was found in clone S3A3 (25.79 %) and L807 (2.49%) respectively. Chlorophyll gives blackness to tea liquor which is an important factors in commercial evaluation of tea (Liyanage et al., 1993). Total chlorophyll was highest in clone P126 (1.20mg/g) and lowest in clone S3A3 (1.01mg/g). Pigment profiles can be applied for fingerprinting of clones for selection of breeding material (Bajaj, 1975). Correlation similarity coefficient matrix ranged from 0.000 to 1.000 indicating a high degree of variation amongst the clones. Dendogram based clusters indicated that clones S3A3, P126, Keyhang and N325 formed a discriminated cluster and may be selected in future breeding programmes. Clones with low polyphenol and caffeine with high chlorophyll may be selected to produce quality green teas whereas clones with high polyphenol, high caffeine and low carotinoid may be preferred for quality black tea production.

Key words: Tea, Industry clone, Descriptors, Total polyphenol, Caffeine

Reference

Bajaj, K.L. (1975). Medicinal and nutritional aspects of tea, *Two & a Bud,* **22**:13-15.
Hara, Y., Luo, S.J., Wickremasinghe, R.L. and Yamanishi, T. (1995). Special issue on tea. *Food Rev. Int* **11**: 371–545.
Konwar, B. K.. (1999). Biodiversity of Tea in NE India and their conservation at Tocklai. *Two and a Bud*. **46**:7-12.
Liyanagc, A.C, and Punyasiri, P.A.N. (1993). High performance linquid chromatography (HPLC) of chlorophylls in tea (*Camellia sinesis*). *Tea Sci*. **62**:32-70.

Prospects Of Organized Agri Retail Business Of Brahmaputra Valley Fertilizer Corporation Limited (BVFCL) in Assam

Raktim Ranjan Lahan* and Nivedita Deka**
*MBA student**Professor
Department of Agricultural Economics,
Assam Agricultural University
raktimranjan04@gmail.com

ABSTRACT

Agriculture is the key sector of Indian economy to provide foundation for sustainability of farmers. In Assam, Brahmaputra Valley Fertilizer Corporation Limited (BVFCL), Namrup is the only public sector undertaking company. It has three operating Ammonia units namely Namrup-I, Namrup-II and Namrup-III situated at Namrup, Assam. BVFCL bears responsibility of supplying timely urea to farmers across the region. BVFCL produces neem coated urea, bio fertilizer and vermi-compost manure. Company also trade products like M.O.P. D.A.P, S.S.P, Crop Seeds (Paddy, Wheat, Gram, Mustard, Lentil), vegetable seeds, pesticides from different companies. It is the first factory in India to use natural gas as basic raw material for producing nitrogenous fertilizer. At present they sales their products through retailers and dealers. But BVFCL wants to make organized retail centres to make available the agricultural products and services for the farmers. In Assam farmers use more than 60% urea than other fertilizers, which is the main product BVFCL. A study on performance of BVFCL was conducted with the specific objective of prospect and SWOT analysis of BVFCL retail marketing. Primary data from farmers and dealers and secondary data from various sources were collected for the study. Growth and percentage analysis were done to achieve the objective. It was found that organized retail marketing will reduce the dependency of the company on intermediaries; it will become one stop solution for the farmers to get agri inputs such as fertilizers, pesticides, crop nutrients, high yielding seeds and agriculture equipments such as sprayers, micro irrigation systems, tools through the retail centers. BVFCL Retail center can help to make a strong relationship between the customers and company.

KEYWORD- BVFCL, fertilizer, retail trade, SWOT.

Urban Agriculture: The Future Of Food Security

KotaRakesh, TolesworiWangkheimayum,Sandeep
MBA (Agri-Business Management)
Assam Agricultural University, Jorhat

ABSTRACT

Urban agriculture can be defined as the growing of plants and raising of animals within and around cities (FAO). The concept of UA should possess a distinctive architecture of its own, both on contents and forms, and evolve through its interactions with the development of related concepts. According to a survey by UN, the World population reports that by 2030, 40.76% of countries population is expected to reside in urban areas. To met the fruits and vegetables demand of this growing population, UA may be one of the many options. UA is experiencing burgeoning popularity with gardens springing up in many cities in developed countries. In India there is practice of UA in cities like Delhi, Hyderabad, Mumbai and Guwahati. UA is an economically viable industry that is constrained by a variety of obstacles. Some of these are long-standing philosophies narrowly focused on fighting famine and hunger rather than building food-security, non recognition of the benefits, inappropriate policies, etc. if these constraints can be removed, UA will become more competitive and efficient, and participation by new practitioners in additional locations become possible that will ensure nutritional security to the urban dwellers.

KEYWORD- *Urban agriculture, potentiality, constraints and food security.*

Mission Double Cropping in Assam

Sonowal, A[1].; Hazarika, J.P[2] and Gogoi, J.K[3]
Department of Agricultural Economics and Farm Management
Assam Agricultural University
email: aakankshasonowal01@gmail.com

ABSTRACT

Assam introduced Mission Double Cropping for increasing the production and productivity of the farms in the state by increasing the cropping intensity. The present study was conducted to examine the improvement of farm income by using linear programming technique, from the existing production plan (P0) under the conditions of without hiring and borrowing activities (P1) and with hiring and borrowing activities (P2) across different size groups of farms. The study was also aimed to test the constraints faced by the farmers in adopting the scheme. The study revealed that less remunerative crops did not appear in the optimal plans. In most of the optimal plans there had been considerable increase in the cropping intensity, human labour employment, bullock labour employment and farm net income over the existing plans. It was found that marginal, small and medium farmers could generate more profit from the optimal plans without hiring and borrowing while in case of semi medium farms with inclusion of hiring and borrowing gave higher profit. The cropping intensity was increased in both the improved optimal plans over the existing plans which was highest in case of marginal size group with 177 per cent in P1 and 239.31 per cent in case of semi medium size group in P2. It was observed that non-availability of water supply was the highest ranked problem among all others constraints.

Table 5. Socio Economic Constraints
N=120

Sl.no	Constraints	Frequency	(%) share	Rank
1.	Non availability of labour	92	8.53	VI
2.	Shortage of labour	113	10.48	II
3.	High wage rates	84	7.79	VIII
4.	Non availability of water supply	114	10.57	I
5.	Shortage of water supply	101	9.38	IV
6.	High fuel cost	94	8.71	V
7.	Non availability of credit	103	9.55	III
8.	Shortage of credit	94	8.71	V
9.	Stray cattle	113	10.48	II
10.	Non adequate demand in the nearby area	86	7.97	VII
11.	Transportation cost	84	7.79	VIII
Total		1078	100	

References

Economic survey of Assam, Directorate of Economics and Statistics, Assam Planning and Development Department, Govt. of Assam, 2014-2015.
Singh, A.K.; Chakraborti, M. and Dutta, M. (2014). Improving Rice- Based Cropping Pattern through soil moisture and integrated nutrient management in mid tropical plan zone of Tripura in India. *Rice Science* 21(5): 299-304.

Status of Vegetable Production in Assam in the New Millennium

P. Baishya, J. P. Hazarika and J. K. Gogoi
Department of Agricultural Economics & Farm Management
Assam Agricultural University
e-mail: pratiksha.baishya@gmail.com

ABSTRACT

The agrarian economy of Assam has always focused on increasing production of the agricultural crops and commodities, as it has a significant impact on the economy of the state. This has resulted in attainment of self-sufficiency in case of food grains, especially rice production in the state, where it is even looking for export. The protective food sector has lately become the area of prime emphasis resulting in a boost in overall horticultural production. This paper aims at comparing the status in the initial and final years under study and analyzing the trends in growth witnessed in the vegetable sector of the state at both zonal and state levels in the new millennium. All the zones show positive and significant growth rates for area, production and yield of Kharif, Rabi and total vegetables; except for Central Brahmaputra Valley Zone. Relatively higher growth was seen for Hill Zone as compared to the other zones for the concerned parameters. Determining the instability indices for the same to indicate the consistency in growth have shown that none of the zones have high growth accompanied by low instability, which is the most favorable condition. Decomposition analysis further shows that increase in production of Kharif vegetables was mainly due to area expansion whereas that of Rabi vegetables was due to increase in yield.**Table:** Decomposition analysis for Kharif and Rabi vegetables in Assam (all figures in per cent)

Agro-climatic Zone	Kharif Vegetables				Rabi Vegetables			
	Area Effect ($Y_0\Delta A$)	Yield Effect ($A_0\Delta Y$)	Interaction Effect ($\Delta A\Delta Y$)	Change in Production (in MT) (100%)	Area Effect ($Y_0\Delta A$)	Yield Effect ($A_0\Delta Y$)	Interaction Effect ($\Delta A\Delta Y$)	Change in Production (in MT) (100%)
NBPZ	23.59	58.77	17.64	205664	68.66	21.84	9.50	309573
UBVZ	42.99	39.95	17.06	153199	66.54	22.91	10.55	251693
CBVZ	-31.51	137.79	-6.28	14320	39.72	48.40	11.89	142208
LBVZ	12.91	66.65	20.44	419864	45.67	38.95	15.38	679728
BVZ	37.99	46.07	15.94	72067	43.17	45.24	11.58	122358
HZ	33.48	40.78	25.74	52806	6.12	89.06	4.82	55792
All Assam	23.49	58.47	18.04	917920	50.81	35.87	13.31	1561352

Reference:

1. Borgohain, A., 2013. An Analysis of Growth Trends in Area, Production and Productivity of Vegetables in Assam. *ZENITH International Journal of Multidisciplinary Research*. 3(7): 307-16.
2. Choudhary, K., Kundal, R., 2015. A Study on Area, Production and Yield of Tomatoes in India from 2002 to 2011. *International Journal of Advance Research in Computer Science and Management Studies*. 3(7): 90-4.
3. Dhakre, D. S., Bhattacharya, D., 2013. Growth and Instability Analysis of Vegetables in West Bengal, India. *International Journal of Bio-resource and Stress Management*. 4(3):456-59
4. Dhakre, D.S., Sharma, A., 2009. Growth and instability analysis of Ginger production in North-East Region., *Agricultural Situation in India*. LXVI: 463-66.
5. Kondal, K., 2014. Growth Rate of Area, Production and Productivity of Onion Crop in Andhra Pradesh. *Indian Journal of Applied Research*. 4(3): 4-6

Effect of Sugarcane grassy shoot disease (SCGS) on growth and juice quality of sugarcane

Trishna Mipun, M.K.Kalita[1], P.D.Nath and R. Kandali
College of Agriculture, Assam Agricultural University, Jorhat-785013
[1]Biswanath College of Agriculture, Assam Agricultural University, B. Chariali-784176
Email: *trishnamipun93@gmail.com*

ABSTRACT

Sugarcane is one of the important cash crops grown in India and Sugar industry is the 2nd largest agro-based industry in India supporting 50 million farmers. India is world's 2nd largest producer producing nearly 15 and 25% of global sugar and sugarcane respectively. It is also an important cash crop in Assam and cultivated in an area of 28404 Hectares. Sugarcane grassy shoot disease (SCGSD) caused by Sugarcane Grassy Shoot Phytoplasma, is becoming a serious problem in many sugarcane growing states in India and has been spreading rapidly to newer locations. Effect of SCGS disease on Cane weight, number of internodes per cane, length of internodes, cane height, Cane diameter and Briks (%) of both infected and healthy plants was recorded on 10 months old canes of two varieties of sugarcane viz. Nambor and Khagori during 2015 and 2016 growing season in Assam. It was recorded that SCGS infection reduced all the growth characters under study and also juice the quality of sugarcane. The cane height and cane weight was reduced markedly due to SCGS infection as compared to healthy plants which varied from (52.36- 59.41%) and (50.91-51.03%) in variety Nambor and Khagori respectively. The sugarcane grassy shoot infection also showed a marked reduction in the no of internodes (25 - 35.71%) and length of the internodes.(55.63-65.68%) as compared to their healthy control. Sugarcane grassy shoot infection resulted in the reduction of quality of juice and the Brix (%) was reduced to 31.00 to 31.75 over control in variety Nambor and Khagori respectively.

Purification of Potato virus Y and production of polyclonal antisera for serodiagnostic assay

Ranima Mishra[1], Baswaraj Raigond[2] and P. D. Nath[1]
[1]Department of Plant Pathology, Assam Agricultural University, Jorhat-785013, Assam, India.
[2]Central Potato Research Institute, Shimla, Himachal Pradesh, India
E-mail: ranima.mishra@gmail.com

ABSTRACT

Obtaining pure virus suspensions is an essential step in many applications, such as vaccine production, antibody production or other in vitro characterizations of virus. Potato virus Y (PVY) pure culture was maintained on its indicator hosts Tobacco (Nicotiana xanthi and N. glutinosa) as well as on Potato (Solanum tuberosum). Extracted leaves from pure cultured host plant were homogenized in phosphate and sodium buffer 0.1 M pH-7.0 with 0.1% of 2- mercaptoethanol, 0.1% DEECA and 0.015M of EDTA with 1:2 ratio and after homogenization was added 1% of triton-100. Final purification was done by centrifugation on sucrose cushion 30% (w/v) in 0.01m Na and K Phosphate buffer ph 7.0 at 25000 rpm for 150 minutes to obtain the viral protein as pellet. Purified viral protein was used for raising rabbit polyclonal antibodies. Three injections with the purified virus (antigen) surplus Freund's adjuvant at alternate weeks followed by a booster dose at 6 weeks interval in rabbit was done. Batches of antisera were produced using 3 boosters at 6 weeks interval. The IgG fraction was separated from the respective antisera through ammonium sulphate purification method. DAS-ELISA assay of all the IgG fractions from the booster doses showed high specificity with the known PVY infected and healthy potato samples.

Incidence and distribution of potato viruses in Jorhat district of Assam

Jutimala Phookan[1], Ashapriya Bora[2], Bornali Bora[2], Rashmi Bora[2], Ranima Mishra[1], P. D. Nath[1]
[1] – Deptt. Of Plant Pathology, AAU, Jorhat-13, Assam.
[2] – Central College, Jorhat, Assam.
E-mail: *jutiphookan@gmail.com*

ABSTRACT

Potato (Solanum tuberosum) is a starchy, tuberous crop belongs to the family Solanaceae. It is a major cool season crop which is cultivated in different agro- climatic zones of India. In India the area, production, productivity is 20.85 lakh ha, 480.96 lakh mt and 23.07 tonnes/ha, respectively for the year 2015-16 and in Assam the area, production, productivity is 105 th ha, 784 th tones and 7499 kg/ha, respectively for the year 2014-15. This crop is infected by different viruses which reduces the yield as well as deteriorate the tuber quality. The incidence and distribution percentage of some of the important potato viruses viz. PLRV, PVY, PVM and PVA were surveyed and detected through serological assay (DAS-ELISA) in Jorhat district of Assam. The survey was conducted in six different potato growing areas of Jorhat district viz. Chenijan, Nimati, Hazarigaon, ICR Farm (AAU), Dhekiajuli and Gorumora. Both healthy and infected leaves were collected and detected by DAS-ELISA. The incidence percentage of PVY was found to be highest and in case of PVA the incidence was nil. According to the serological assay, the distribution percentage of the three viruses are- PVY was found highest in Chenijan and Nimati and lowest in ICR Farm (AAU), PLRV was found highest in Nimati and lowest in Gorumora and Chenijan and the virus PVM was found highest in Hazarigaon and lowest in Nimati.

Expression of CTV suppressor genes in CTV vector *Toxoptera citricida*

Urmil Barthakur and P. D. Nath
Department of Plant Pathology, Assam Agricultural University, Jorhat 785013, India,
E-mail: ubarthakur@gmail.com

ABSTRACT

Citrus tristeza virus (CTV) is one of the most important causal agents of citrus diseases and exists in numerous strains. CTV is replicated in phloem cells of plants within the Rutaceae family and is transmitted by few aphid species most notable being Toxoptera citricida. CTV infection shows three prominent symptoms, namely quick-decline, stem-pitting and seedling yellows. CTV uses three silencing suppressor genes, p20, p23 and p25, to resist the attacks from its Citrus hosts. Inactivating these genes is therefore obviously a potential defensive option in addition to the current control strategies. The gene p20 inhibits intra and inter-cellular silencing; p23 is a multi-functional protein and inducer of CTV like symptoms and p25 gene is intercellular suppressor and major coat protein. For our study, we collected aphids from both mild as well as severe strain affected CTV plants and extracted RNA from the collected aphids sample using the TRIzol method. We designed specific primers for the p20, p23 and p25 CTV suppressor genes using bio-informatics tool. After extraction of RNA from the collected aphids, we standardised one-step RT-PCR protocol for each of the specific primers by manipulating the annealing temperature for each primers. The RT-PCR product for each primers were run in an agarose gel electrophoresis system using a 100bp ladder and bands were observed at expected lengths which is 368bp, 420bp and 422bp for p20, p23 and p25 primers, respectively. Thus an expression of the three suppressor genes could be confirmed from this study in aphids collected from CTV infected plants. These RT-PCR products could further be cloned and used for making a gene construct against CTV infection for its management.

Incidence, detection and vector population pattern of Sesamum Phyllody disease in five Sesamum growing districts of Assam

Shankar Hemanta Gogoi[1*], M. K. Kalita[2] and P. D Nath[1]
[1] Department of Plant Pathology, College of Agriculture, Assam Agricultural University, Jorhat, Assam -785013, India; [2] Department of Plant Pathology, Biswanath College of Agriculture,Assam Agricultural University, Jorhat, Assam- 784176, India
Mobile no and Email ID of presenter: 09706882948, Email ID: *shankarhemanta@gmail.com*

ABSTRACT

Sesamum (*Sesamum indicum L.*) is one of the ancient oilseed crops grown in Assam. Sesamum phyllody is a very serious and destructive disease and it is associated with phytoplasmas that are unculturable wall-less bacteria (class Mollicutes) which live inside the phloem of host plant and in the hemolimph of insect vectors. Roving survey was conducted to know per cent disease incidence of sesamum phyllody in some of sesamum growing areas of Assam under five districts viz. Jorhat, Biswanath Chariali, Karbi Anglong, Nagaon and Sonitpur district during kharif season, 2015. During the survey different disease symptoms such as floral virescence, phyllody, floral proliferation, flattened stem, splitting of capsules and shattering of seeds, witches broom and stunted growth were observed. In each field five plots of 5 m2 area were selected and percent disease incidence was recorded by counting the diseased and healthy plants. The percent disease incidence was recorded as Karbi Anglong (23.22%) followed by Biswanath (20.23%), Sonitpur (19.91%), Jorhat (18.38%) and Nagaon (17.46%) district respectively. PCR analysis using phytoplasma specific primer and electron microscopy confirmed the presence of sesamum phyllody in all the five districts of Assam. Five different types of leafhoppers viz., *Cofana unimaculata* (Dist.), *Exitianus indicus* (Dist.), Hishimonus phycitis (Dist.), Nephotettix nigropictus (Stal) and Orosius albicinctus (Dist.) were collected during the survey with average population of 3.4, 3.2, 6.2, 3 and 5.6 no./ five net sweep respectively. In the farmer's field, the loss of no of pod/plant and seed yield due to the disease was ranged from 58.54-100 and 57.20-100 percent respectively. The sesamum phyllody disease was successfully transmitted by graft transmission (80%) and dodder (90%) but it was not transmitted by seed and sap inoculation. There was no effect in germination of seeds collected from infected sesamum plants.

Urban Agriculture - Feeding a fast growing population

Gargee Baruah* Rabi Sankar Saikia**
*M.Sc. (Agri) Student **Associate Professor
Department of Agricultural Economics
Assam Agricultural University, Jorhat-13
gargeebaruah07@gmail.com

ABSTRACT

In the twenty-first century, people are becoming city dwellers at an alarming rate. The UN estimates that by 2050, 6.5 billion people will be living in cities, especially in places across Asia and Africa and we will need to produce 50% more food to feed nine billion of people. Worldwide, around three billion hectares of agricultural land are lost each year due to degradation, erosion and additional four million hectares are lost due to urbanization. Urban agriculture is practiced by 800 million people worldwide, representing 15-20% of the world's food sources and an area of just one square meter can provide 20 kg of food annually. With increasing population, the potency of a simple vegetable garden in every household will hold greater implications. A single community garden of 9 raised beds and 10 round planters can produce 250 pounds of food in one year (King County, 2010). Rooftop gardening can be practiced by every household with less effort and minimum investment. In vertical farming, crops can be grown in lesser space using 50% less fertilizers and zero insecticides. It also reduces crop duration which enhances rapid production process. Hydroponics is ideal for crowded city spaces and found to be very effective. Urban agriculture will help in reducing carbon footprint, which may be the solution to maximize inner city crops in developing economies. Urban farming can not only feed future generations, but also can create employment for the people across the world in coming years.

KEYWORDS- urban agriculture, vertical farming, hydroponics

Reference

Q. Nick. (2016). Solving World Hunger: The Key To Thinking Big Is In Thinking Small. *The Huffington Post*. 22 December

Hybrid Rice in Assam- A Way Forward For Food Security

Jeemoni Gogoi* Nivedita Deka**
*M.Sc.(Agri) Student **Professor
Department of Agricultural Economics
Assam Agricultural University, Jorhat-13
jeemoni55555@gmail.com

ABSTRACT

In Assam, rice occupies about two-third of the total cropped area in the state. Being the single major source of agricultural GDP, it plays a significant role in the state economy. The rice farmers of the state have been growing traditional rice varieties along with high yielding improved varieties. However, hybrid rice in Boro season is getting momentum in the state because of the reason that season is free from flood. In India area covered by hybrid rice is 3 million ha whereas in Assam it is 4.11 lakh hectare. It is reported that additional net profit by cultivation of hybrid rice over the inbred checks ranged from Rs. 2781 to Rs. 6291 per hectare. (Vikramnath).Hence, production of hybrid rice by farmers at micro level, will boost farmers' income, generate marketable surplus and meet their food and nutritional security, while at macro level it will make the State self-sustainable in rice production and help it export rice. (Assam Tribune, 2012). There are various govt. schemes like National Food Security Mission (NFSM), Rashtriya Krishi Vikas Yojana (RKVY), Bringing Green Revolution to Eastern India (BGREI), Mission Double cropping for promotion of hybrid rice in Assam. Assam agricultural University has recommended some of the hybrid varieties such as Arize 6444, DRRH 1, KRH 2 etc. With proper implementation and timely supply of hybrid seeds, rice production may be increased to many fold which ultimately will help in achieving food security. .

KEYWORDS- Hybrid rice, income, Food security, Assam

Reference:

Assam Tribune (2012). An English daily, 12 April.
Vikramnath, B.C. Hybrid Rice in India- current Status and Future Prospects in Rice Knowledge Management Portal

Potential linking of India's NE agriculture with South East Asia: An exploration

Rinumoni Buragohain[1] and Nivedita Deka[2]
[1]Junior Research Fellow and [2] Professor
Department of Agricultural Economics
Assam Agricultural University, Jorhat-13, Assam, India
bgohain5rinu@gmail.com

ABSTRACT

India's northeast region is a reservoir of rich natural resources and is blessed with biodiversity, huge hydro-energy potential, oil and gas, coal, limestone, forest wealth, fruits and vegetables, flowers, herbs and aromatic plants, rare and rich flora and fauna having all the potential to transform itself into a commercial hub and tourist paradise. There is a huge untapped, emerging market, which should prove to be of interest to large domestic and international investors. Individually, all the North-Eastern Indian States have distinct advantages, and provide immense economic and trade opportunities to domestic and international corporate. It is being hoped that developing multifaceted engagement of India's northeast with the economically vibrant Southeast Asia through closer transport links will yield substantial economic benefits to the region. Therefore, the present study attempted to explore the potential linking of India's north east agriculture with South East Asia that will create vast economic opportunities and benefits including deepening of social and cultural ties between the people of North-Eastern states of India and its neighbouring areas.The present paper discussed about some of identified crops of India having export potential which are extensively grown in NE region of India such as - ginger, turmeric, pineapple, tea, bhut jalakia, orchids, Assam lemon etc. The paper also compared the scenario of those crops of NE India with ASEAN countries. Besides, the paper also discussed in brief about some other crops such as citrus, banana, potato, turmeric, jackfruits, passion fruits, black pepper, arecanut, dry chilli etc having considerable marketable surplus which are extensively grown in NE region and found that they can offer immense opportunity towards export promotion from the region. A SWOT Analysis of NE agriculture for potential linking with ASEAN countries done in this paper reveled that there are ample strength and opportunities such as abundant natural resources, organic agriculture along with some challenges like lack of proper research and development, deforestation, low connectivity with the rest of India. However, by tapping the opportunities with proper planning, the hurdles could be overcome to have a meaningful linkage.

KEYWORDS- North East India , South east Asia, Potential link, agriculture.

Pioglitazone attenuates lipopolysaccharide (LPS) induced neuro-inflammation and depressive-like behaviour via suppressing the NF-κB/Nrf-2 and MAPK signalling pathways

Sahabuddin Ahmed[1], Mohit Kwatra[1] Babul Bezbaruah[1, 2]
[1]Laboratory of Neuroscience, Department of Pharmacology and Toxicology, National Institute of Pharmaceutical Education and Research Guwahati, Guwahati 781032, Assam, India
[2]Department of Pharmacology, Gauhati Medical College, Guwahati, Assam, India
E-mail: sahabuddinpharma@gmail.com

ABSTRACT

Depression is a stern neuro-psychiatric hitch with a lifetime prevalence exceeding 15% and has become the fourth leading cause of disability worldwide1. According to a report by WHO mental illness affects around 450 million people globally of which 10-20 million commits suicide every year. Despite having several medications the disease is still a challenging with approximately a large number of populations do not respond to their first line medication2. Hence there exists a necessity to explore new targeted drugs. Microglia's are resident immune defence cells of the brain and comprises approximately 12% of the total neurons. Upon activation microglia cell undergo proliferation, chemotaxis and morphological alteration to engender plethora mediators including cytokines, chemokines, reactive oxygen species (ROS) and nitrogen species which may alter the serotoninergic and glutamatergic neurotransmission3. NF-κB(Nuclear factor kappa beta) is an important transcription factor is activated by LPS(lipopolysaccharide) causing transcription of many pro-inflammatory cytokine genes and thus microglia acts as a sensor for pathological events that occurs in the brain4. Furthermore, LPS evoked brain alternation through hyper activation of the hypothalamic–pituitary–adrenal axis (HPA axis) axis results in rise of circulating serum corticosterone level5. Endoplasmic reticulum(ER) is an important organelle of protein post translational modification. LPS evokes generation of free radicals causing ER stress and up-regulation of unfolded-protein response (UPR). Hippocampus region also reveals a decrease in the level of brain derived neutropic factor. Pioglitazone belongs to peroxisome proliferator-activated receptor gamma (PPAR-γ) agonist class regulates lipid metabolism, exerts potent central and peripheral anti neuroinflammatory action and possesses neuroprotective effect6. Several studies have also reported the protective role of Pioglitazone at a dose of 30mg/kg body weight for 14 days inhibits the oxidative-nitrosative stress and other inflammatory cytokine markers. Thus, this has pushed us to explore the neuroprotective nature of Pioglitazone especially with psychiatric disorders associated with inflammation and oxidative stress.

References:

1. Maes M, Fišar Z, Medina M, et al. (2012) New drug targets in depression: inflammatory, cell-mediated immune, oxidative and nitrosative stress, mitochondrial, antioxidant, and neuroprogressive pathways. And new drug candidates--Nrf2 activators and GSK-3 inhibitors. Inflammopharmacology 20:127–150. doi: 10.1007/s10787-011-0111-7.
2. Perviz S, Khan H, Pervaiz A (2016) Plant Alkaloids as an Emerging Therapeutic Alternative for the Treatment of Depression. Frontiers in pharmacology 7:28. doi: 10.3389/fphar.2016.00028.
3. Liu B, Wang K, Gao HM, et al. (2001) Molecular consequences of activated microglia in the brain: overactivation induces apoptosis. J Neurochem 77:182–189.
4. Leonard BE, Myint A (2009) The psychoneuroimmunology of depression. Hum Psychopharmacol 24:165–175. doi: 10.1002/hup.1011.
5. Janssen DGA, Caniato RN, Verster JC, Baune BT (2010) A psychoneuroimmunological review on cytokines involved in antidepressant treatment response. Hum Psychopharmacol 25:201–215. doi: 10.1002/hup.1103.
6. Randy LH, Guoying B (2007) Agonism of Peroxisome Proliferator Receptor-Gamma may have Therapeutic Potential for Neuroinflammation and Parkinson's Disease. Curr Neuropharmacol 5:35–46.

Monitoring and Diagnosis of fish viral diseases of Assam

Abhishek Mazumder[1]and Dr. DandadharSarma*[2]
Research scholar, department of zoology, Gauhati University.
Associate professor , department of zoology, Gauhati University.
E-mail id*: sarma_dandadhar@yahoo.com

ABSTRACT

Viral disease is now considered to be the most limiting factor in the aquaculture production worldwide. In Assam aquaculture system, a number of diseases like epizootic ulcerative syndrome, skin erosion, gill damage, tail and fin rot have been frequently reported and these diseases are responsible for huge economic loss to Assam fish farmers.A survey was being conducted for monitor the health status of fish and also disease occurrence in the fish farms located at different parts of Assam especially the area where the fish culture is being carried out intensively. External appearance and behaviour of fish were observed carefully and clinical signs of disease was noted. The suspected virus infected fish samples were frozen and transported to laboratory on ice. Some samples are being fixed in recommended fixatives for histopathological investigation. For the diagnosis purpose virus isolation was done by cell lines in tissue culture flask containing Leibovitz' L-15 medium with a supplement of 10% foetal bovine serum and antibiotics in standard concentrations.Characterization and identification of fish viruses were carried out based on standard procedures through PCR and RT-PCR using virus specific primers.

KEYWORDS- Aquaculture,Virus, Cell line, PCR.

Efficacy of essential oil from Citrus grandis (Sapindales: Rutaceae) against Aedes aegypti (Say)(Diptera: Culicidae)

[1] Riju Sarma, [2] BulbuliKhanikor
[1] Research scholar, Department of Zoology, Gauhati University, Guwahati-781014
sarmariju64@gmail.com
[2]Assistant Professor, Department of Zoology, Gauhati University, Guwahati-781014
khanikorbulbuli@yahoo.co.in

ABSTRACT

Study on the usage of essential oil for the control of vector borne diseases against mosquitoes has been receiving renewed interest for last two decades as they are target specific and environmentally safe as compared to the synthetic products. In the present investigation, an attempt was made to evaluate the efficacy of essential oil from the leaves and peel of Citrus grandis against different developmental stages of Aedes aegypti. Result revealed that the oils from the leaves was the most effective as ovicides having LC50 value 6.2ppm than the peel (LC50 value 37.07ppm) at 72 hour followed by larvicidal activity with LC50 value 126.45ppm in oil from leaves and 61.71ppm in oil from peel at 72 hour respectively. But there was not much adulticidal affect recorded in oil from leaves but the oil of peel showed adulticidal activity with LC50 value 174.96ppm at 72h. The oil from leaves gave good protection time (1 hour) than the oil of peel(30 minutes) against Ae. aeypti at 1000ppm concentration. From the result of GC-MS analysis, nootkatone and citronellol was found as probable major compounds of the essential oil of the plant extracted from the peel and leaves respectively which might be the major contributor for their activities against Ae. aegypti.

KEYWORDS- *Citrus grandis*, *Aedes aegypti*, Essential oil.

Status of Vegetable Production in Assam in the New Millennium

Pratiksha Baishya, Dr. J. P. Hazarika and Dr. J. K. Gogoi
Assam Agricultural University

ABSTRACT

The agrarian economy of Assam has always focused on increasing production of the agricultural crops and commodities, as it has a significant impact on the economy of the state. This has resulted in attainment of self-sufficiency in case of food grains, especially rice production in the state, where it is even looking for export. The protective food sector has lately become the area of prime emphasis resulting in a boost in overall horticultural production. This paper aims at comparing the status in the initial and final years under study and analyzing the trends in growth witnessed in the vegetable sector of the state at both zonal and state levels in the new millennium. All the zones show positive and significant growth rates for area, production and yield of Kharif, Rabi and total vegetables; except for Central Brahmaputra Valley Zone. Relatively higher growth was seen for Hill Zone as compared to the other zones for the concerned parameters. Determining the instability indices for the same to indicate the consistency in growth have shown that none of the zones have high growth accompanied by low instability, which is the most favorable condition. Decomposition analysis further shows that increase in production of Kharif vegetables was mainly due to area expansion whereas that of Rabi vegetables was due to increase in yield.

Fish Production in Assam: A Statistical Outlook

Pompi Dutta * and R.A Halim**
*M.Sc. Student and **Professor
Department of Agricultural Economics, AAU, Jorhat

ABSTRACT

Assam abounds in aquatic resources necessary for development of fisheries. With an estimated coverage of 3.74 lakh hectares of water-spread areas, Assam is one of the most resourceful state of North-east part of the country. It accounts for about 77% of the total fish production of the North-East region. However various changes in fish production have occurred in Assam. In the present study, an attempt is made to examine the dynamics of fish production in Assam. The study used secondary data. Compound growth rate and co-efficient of variation (C.V) were used to estimate the growth and variation in fish production. The secondary data on fish production were divided into 2 periods viz. period I (1995-2005) and period II (2005-2015). It was found that growth in period I was 1.95 % with C.V of 7.07 % whereas the growth rate in period II was 5.071% with C.V 15.43 %. The growth rate from 1995-2005 was 3.25% with C.V 20.82%. The positive growth in both the period is encouraging for the fishery sector. Government has taken several measures for the fishery development in the state. Various schemes/programmes such as Fish and Fish Seed Farming, Construction of new ponds through women SHG (Mukhya Mantri Mahila Samriddhi Asoni- Lakhimi), Reclamation/development of Derelict water bodies (Mukhya Mantrir Saniyojan Asoni), District administration, Fishery Extension Service, Rural Infrastructural Development Fund, Fresh water aquaculture under fish farmer's development agencies, Development of after-logged areas into aquaculture estate, National welfare fund for fishermen, Externally aided project (EAP).With proper implementation of this scheme it is expected that fish production can meet the demand in the state of Assam.

KEYWORDS- Fishery, CGR, Development scheme, Assam.

Inter-relationship between nitrogen use efficiency, yield and the attributing traits in Assam rice accessions

Shantanu Das, Debojit Sarma and Prakash Borah
Department of Plant Breeding and Genetics, Assam Agricultural University Jorhat
E-mail: *shanubrdr.oryza@gmail.com*

ABSTRACT

Among various factors that significantly reduce rice productivity, low nitrogen use efficiency (NUE) comprises a major problem for rice production. Efficient use of N in agricultural practice can increase yield, decrease production costs and reduce the risk of environmental pollution. Thus, developing varieties with high NUE is one of the major objectives of crop breeding programmes and as a basis of selection, identification of important traits that are associated with high grain yield and high NUE is also important. In order to achieve these objectives, 26 winter rice accessions were evaluated during Kharif 2014 and Kharif 2015 under 3 N levels. Observations recorded on 14 different characters across the environments were pooled and used for correlation and path analysis. The result revealed that grain yield/plant had moderate to strong positive correlation with panicle length, 1000-grain weight, biological yield, harvest index, grain N, physiological N use efficiency, N utilization efficiency and N harvest index at both genotypic and phenotypic level, respectively. Grain yield/plant was also moderately correlated with spikelet fertility, days to maturity, stem starch content, chlorophyll a, chlorophyll b, total chlorophyll and root length at genotypic level. Thus, these associations assume importance toward achieving higher yield, and could be used as selection criteria in breeding N efficient rice varieties. The path coefficient analyses at genotypic and phenotypic level revealed high positive direct effects of biological yield and NUtE on grain yield/plant. Thus, indirect selection for the traits having moderate to high heritability would be effective to bring yield improvement in rice along with high NUE.

Production and Export Performance, Instability and Input Price Transmission in Tea in India

Udeshna Talukdar, Department of Agricultural Economics

ABSTRACT

The study is an attempt to examine the structural changes of production and export of value added tea, to examine the instability of export and factors affecting export earnings during 1971 to 2014. Attempt was also made to examine the transmission of factor prices affecting the output prices of green leaf in small tea sector. It was observed that the production of tea marginally declined from 1991 to 2014 with an annual growth of 2.39 per cent. The production of tea was highly influenced by area and productivity and rainfall had an adverse effect on tea. The production of CTC tea was found to increase from 55 to 89 per cent while the share of other grades like Darjeeling and Green tea declined in the country. About 97 per cent of total production of tea was shared by CTC and Orthodox. The application of linear regressions to examine the factors affecting export earnings in the country indicated that export of tea was adversely affected by self-sufficiency in India as well as consuming countries of the world. Export of Indian tea was adversely affected by low consumption demand in the world. Other factors like world per capita consumption of tea, international export price, production of tea in India and world coffee consumption could not affect the tea in India. Export instability indicated that export of bulk tea was more stable and consistent while the export of value added tea like tea bags and packet tea was unstable. Export earnings were more stable for value added tea than bulk tea mainly due to variation in export prices. The export of value added tea was more erratic with high C-D-V index. The application of marketed surplus model is based on elasticities and auction prices. The other input prices like labour wages, price of NPK, agrochemicals, green leaf price and interest rate indicated that the growth of prices of these factors during the last 5 years could push the green leaf price by 4.85 per cent.

Export instability

Instability measures	Bulk tea	Packet tea	Tea bags	Instant tea	Total value added tea
Quantity					
Coefficient of variation					
Mean positive deviation	24.71	64.04	78.61	33.68	46.45
Mean negative deviation	7.12	18.09	25.18	6.70	1.01
	7.84	13.30	5.78	20.81	11.95
Export earnings					
Coefficient of variation					
Mean positive deviation	59.00	46.15	103.12	54.61	29.20
Mean negative deviation	147.25	21.01	32.71	27.22	16.20
	----	13.65	6.84	7.62	8.35
Variation of export earnings					
Attributable to quantity variation	16	256	24.8	15	3.7
Price variation	101	-199	95	107	125.10
Relative production	-8.3	8.88	-4.3	-4.6	-7.70
Interaction	-18.4	3.3	-15	-18	-20.80

References:
Sharma, H. R. and Sharma, R.K. (2003) Production and export performance of Indian tea- A temporal and cross sectional analysis, *Agricultural Economics Research Review,***16**(2): 152-170.
Talukdar, K.C. and Sahewalla, I. P. (2010) Temporal growth, instability and trade opportunity of Indian tea in context of global competition, *Finance India*, **24**(2): 481-492.
Tea statistics: Various Issues, Tea Board of India, Kolkata.

Acute Energy Cool Chamber

K.Das,A.Deka,S.Nath,
A.Gogoi and T.Chakraborty
[1]Department of Chemistry+Department of Physics, School of Basic Sciences, The Assam Kaziranga University, Jorhat, Assam
E-mail: *trinac921@gmail.com*

ABSTRACT

A low temperature maintenance is a great problem in a tropical country like India. In India, horticultural products like fruits/vegetables damage immediately after harvest due to lack of cool storage space. Refrigeration is neither easy to install in remote areas nor always environmentally friendly Considering acute energy crisis and lack of cool storage facility efforts to develop low cost and low energy cool chambers. AECC works on the principle of "Evaporative Cooling", as water evaporates it has considerable cooling effects and faster the rate of evaporation greater the cooling. Water evaporates into air raising the humidity and at the same time cooling the bed. Efficiency of evaporative cooler depends on humidity of the surrounding air. The advantages of AECC are it uses no mechanical or electrical energy, it can be used for mushroom cultivation, raising silk worm, storage of bio fertilisers. Small and marginal farmers can store a few days' harvest to avoid middlemen. It allows small farmers to store produce for a few days and thus avoid costly rush selling. It is ideal for household and can be constructed by an unskilled person. It reduces losses and pays for itself in a short time. This can be easily installed in farmers field, packing stations, railway stations, defence, hostels, processing factories, super markets, wholesale markets etc. Low cost environment friendly commercial size cool chamber can be developed utilizing the principle of evaporative cooling.

Biofortification In Food Crops

Rupak Jena[1] , Shriram Ratan Pradhan[2] and Satyabrata Mangaraj2
1Assam Agriculture University, Jorhat, Assam
[2]Orissa University of Agriculture and Trechnology, Bhubaneswar, Odisha
E-mail: rupu.jena27@gmail.com

ABSTRACT

Biofortification is the process by which the nutritional quality of food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology. Biofortification differs from conventional fortification in that biofortification aims to increase nutrient levels in crops during plant growth rather than through manual means during processing of the crops. Biofortification may therefore present a way to reach populations where supplementation and conventional fortification activities may be difficult to implement and/or limited. Some of the important examples of successful biofortification projects include:

Table 1. List of successfully released biofortified food crops of world

Crop	Nutrient	Countries of first release	Agronomic trait	Release year
Sweet potato	Provitamin A	Uganda, Mozambique	Disease resistance, Drought tolerance	2007
Cassava	Provitamin A	Nigeria, Democratic Republic of Congo	Disease resistance	2011
Bean	Zinc, Iron	Rwanda, Democratic Republic of Congo	Virus resistance, Heat and drought tolerance	2012
Maize	Provitamin A	Zambia	Disease resistance, Drought tolerance	2012
Pearl millet	Zinc, Iron	India	Mildew resistance, Drought tolerance	2012
Maize	Provitamin A	Zambia	Disease resistance, Drought tolerance	2012
Rice	Zinc, Iron	Bangladesh, India	Disease and pest resistance, cold and submergence tolerance	2013
Wheat	Zinc, Iron	India, Pakistan	Disease and lodging resistance	2013

The biofortification strategy seeks to take advantage of the consistent daily consumption of large amounts of food staples by all family members, including women and children who are most at risk for micronutrient malnutrition. As a consequence

of the predominance of food staples in the diets of the poor, this strategy implicitly targets low-income households. Once in place, the biofortified crop system is highly sustainable. Nutritionally improved varieties will continue to be grown and consumed year after year, even if government attention and international funding for micronutrient issues fades. Thus biofortification provides a truly feasible means of reaching malnourished populations in relatively remote rural areas, delivering naturally fortified foods to people with limited access commercially-marketed fortified foods, which are more readily available in urban areas.

References

Bouis, H. E., Hotz, C., MvClafferty, B., Meenakshi, J. V. and Pfeifer, W. H., 2014, Biofertification: A New Tool to Reduce micronutrient

Malnutrition in Thompson, B. and Amoroso, L. (eds) *Improving Diets and Nutrition: Food-based Approaches*. The Food and Agriculture Organisation of the United Nations and CABI, Rome, pp. 203-216.

Nestel, P., Bouis, H.E., Meenakshi, J.V. and Pfeiffer, W., 2006, Biofortification of staple food crops. *Journal of Nutrition.* 136, 1064–1067.

Combating multiple biotic stresses with a single gene expressed product, ChTI

Mishra, U. N., Bhattacharjee, C., Manushree, V., Prasad, D. T.

ABSTRACT

Protease inhibitors (PIs), class of plant defense proteins usually present in seeds, tubers, leaves, become one of the most abundant defensive classes of proteins in plants. They act by attenuating enzyme function necessary for metabolic processes viz. protein turnover or nutrient assimilation. Serine protease (SPs) are inevitable component in all microbes for metabolic food processing, host tissue penetration, reproduction, evasion of the host immune system and developmental processes thus revealing the potency of Serine protease inhibitors (SPIs) to attenuate SPs thereby controlling microbes from invasion into host. Our present investigation for a SPI of plant origin i.e. Cocculus hirsutus Trypsin Inhibitor (ChTI) from Cocculus hirsutus leaves, a climber of Menispermeaceae family showed stability up to 70°C with a narrow pH range 7.0 to 9.0. It has an ORF of 366 bp encoding for 121 amino acids accounting for about 18KDa. ChTI had been proven to have insecticidal activity against coleopteran and lepidopteran insect pests as well as antifungal activity against various fungal strains. ChTI binding pattern had also been detected by ChTI-FITC fluorescent binding assay.

We found bactericidal activity of ChTI against Gram negative plant bacterial pathogens viz. X. axonopodis pv. punicae, R. solanacearum, P. stewartii, E. coli and Gram positive strains viz. B. cereus, B. thuringiensis at a concentration range from 2.0 to 40 ug/ml of ChTI. The IC50 value of ChTI for Trypsin Like Activity (TLA) of these organisms range from 1.4 to 1.9 ug/ml which brought inhibition in the TLA significantly. Percent mortality of bacterial cells were calculated by evan's blue assay. Further ChTI showed nematicidal activity against M. incognita with an IC50 of 1.75 ug/ml. The results put together suggest that a single gene, ChTI can combat multiple biotic stresses thus proving a potential for developing transgenic plant for multiple biotic stress tolerance.

Metabolic cooperation in between Liver and Skeletal Muscle following sub-acute lead toxicity in mice

Pritha Das and Sudipta Pal*
Nutritional Biochemistry and Toxicology Laboratory
Department of Human Physiology
Tripura University
Suryamaninagar
West Tripura 799022
* corresponding author
Email: *sudiptapal@tripurauniv.in*

ABSTRACT

Lead (pb), the finest and the commonest heavy metalloid accounting for 13mg/kg of earth crust and introduced as the first metal for its kind toxicity. The soft, bluish-gray, low melted (327°C) lead is now paid a great concern in metabolism in humans as well as animals. The current experiment reveals the metabolic changes and cooperation in lead elated liver and muscular tissue of Swiss albino male mice. The sub-acute (5mg/kg body) dose of lead for 30 days by oral ingestion reflects the hypoglycaemic, glycosuria and glycogenolytic condition in blood and liver tissue of mice. The elevation of muscle glycogen is played an important supportive role to relief the blood and liver tissue that struggle for energy supplementation after lead intoxication. On the other hand the pyruvic acid content was decreased in muscular tissue while increased in liver tissue which demonstrated a strong correlation in between liver and muscle tissue of mice because all the gluconeogenic substrates were engaged to enrich the glucose content and fight against lead toxicity. The inhibitory action of PDH and LDH were noted in liver whereas the PDH activity was decreased only in muscle. On the other hand the enhanced activity of LDH in muscle emphasizes organ cooperation during lead toxicity to provide lactate supplementation to liver tissue via blood circulation.

KEYWORDS- glycogenolytic activity, glycosuria, glucose, lead toxicity.

ABSTRACT FOR POSTER PRESENTATION

Bhabani Sankar Satapathy [1*] and Biswajit Mukherjee [2]
[1] NSHM College of Pharmaceutical Technology, NSHM Knowledge Campus, Kolkata-700053
[2] Department of Pharmaceutical Technology, Jadavpur University, Kolkata-700032
*Presenting Author

Effective management of brain related ailments continues to be the challenging area in neuroscience research. Lipid based nanosize carriers owing to their structural uniqueness possess the ability to cross blood-brain barrier (BBB); the major hurdle for the successful transport of therapeutic agents into brain. The present study aimed for the development of a lipid based nanosize carrier encapsulating an established anticancer agent and investigation of its BBB crossing potential in vivo. The optimized formulation had a size range between 20-50 nm with smooth surface morphology. The optimized formulation showed a narrow size distribution pattern with 7.8% drug loading. Cryo-transmission electron microscopy study revealed stable formation without any perforation on the outer surface. A sustained drug release profile was observed for the experimental formulation up to 24 h study period. Pharmacokinetic and biodistribution data showed an enhanced residence time of the drug loaded nanocarrier in blood as compared to free drug. Gamma scintigraphy studies clearly evidenced an efficient permeation of the drug loaded nanocarrier through the BBB, as compared to the free drug. The experimental formulation may provide a promising platform for the treatment of brain cancer.

Rapid Detection of Septicemia and Antibiotic Sensitivity

Shashi Bhushan[1], Sourav Ghosh[1], Manjila Gupta[2], Shabana Bano[2] Arindan Roy[2], Shaon Ray Chudhuri1
[1]Department of Microbiology, Tripura University, India
[2]Centre of Excellence in Environmental Technology and Management, Maulana Abul Kalam Azad University of Technology, (Formerly known as West Bengal University of Technology) India
E-mail: *shaonraychaudhuri@tripurauniv.in*

ABSTRACT

Bacterial septicemia is a potentially life-threatening complication with the high rate of incidence. The patient develops symptoms due to the presence of bacteria or their toxin in blood. Sepsis occurs when chemicals released into the bloodstream to fight the infection trigger inflammatory responses (SIRS) throughout the body. This becomes more severe in the aged population, immune compromised or suppressed subject and the presence of drug-resistant bacteria. Early diagnosis is the key to successful treatment. The available techniques which are routinely followed in the diagnostic lab are culture dependent and Image scan. Culture-dependent method requires 48-72 hours to report. Food and Drug Administration (FDA or USFDA) has approved four advanced technologies of antibiotic detection till date. Mostly these technologies use liquid based detection system which is coupled with the high-end instruments (sequencer, real-time PCR). In our lab, we have developed a rapid (within 1hrs of infection), cost effective, and independent of the high-end instrument detection system. The approach was to understand the shrinkage pattern of WBC in the prognosis of infection under the light microscope. 205 healthy individual irrespective of sex and age were used to develop the database against which the suspected sample would be compared for detection of Septicemia. Significant change ($p<0.005$) in WBC dimension was observed when the healthy blood was infected with bacterial strains from clinical origins. This was validated in vivo in the mouse model. The significant part of the study was that this shrinkage was reversible and hence within 3 hours the sensitivity of the antibiotic could be detected in vivo. This could drastically reduce the 48 to 72 hours gold standard to 3 hours antibiotic sensitivity detection. The finding has been filed as an Indian Patent (No. 201631003917, dt 3rd Feb 2016).

Microbial system for environmental sustenance and plant productivity

Srimoyee Banerjee[1] and Shaon Ray Chaudhuri[1]
[1]Department of Microbiology, Tripura University, India
E-mail: *srimoyee.microbiology@tripurauniv.in*

The past ten years has seen massive progress in industrialisation in India along with eleven fold rise in the urban population in between 1991 to 2001 only. Thus huge volumes of wastes are generated. About 22,900 million litres per day (MLD) of domestic wastewater and 13,500 MLD of industrial wastewater are generated in opposition to a treatment capacity of 5900 MLD and 8,000 MLD respectively. This is alarming as the untreated wastewater is discharged into rivers thereby polluting them and also contaminating the groundwater. Of the major pollutants, nitrates and phosphates are two of the most highly soluble pollutants which cause various human health and environmental risks.

Thus it is extremely important to remediate the wastewaters. Chemical methods such as Electro coagulation, chemical precipitation, ion exchange are available for the remediation of nitrate and phosphates but they are expensive, require complex actions and also produce large sludge volumes. Thus biological alternatives for remediation or bioremediation are sought for. Here we present a microbial formulation for removal of nitrates and phosphate from wastewaters in strikingly short duration of time at affordable costs.

The tested bacterial consortium has been developed from highly efficient strains having ability to sequester nitrate and phosphate. The consortium formed biofilm on the matrix of the bioreactor and hence required only a single initial charging. At an initial nitrate and phosphate concentration of 350 ppm and 40 ppm respectively the system removed above 90% nitrate and 55.27% phosphate in a 220 Litres bioreactor within 120 minutes from synthetic wastewater using only 0.05% Citric acid as carbon source. Such a system would not only remediate the waste water but also help in recovery of the agriculturally important macronutrients. The treated waste water from the bioreactor having minimal levels of ammonia when tested for plant growth resulted in healthier plants and maintained fish survivability when used for aquaculture. This can minimise the wastage of potable water for non potable purposes.

Thus in order to appreciate the industrialisation and urbanisation, the environment must also be protected and resources should be preserved. Such a technology of waste water bioremediation at high rate in an economical way can prove to be the best approach for a clean and green environment.

Utilization of Microbially Treated Dairy Effluent in Agriculture

Mandakini Gogoi[1], Basant Kumar Agarwala[2] and Shaon Ray Chaudhuri[1, 3*]
[1]Department of Microbiology, Tripura University, Suryamaninagar, Tripura West, India
[2]Department of Zoology, Tripura University, Suryamaninagar, Tripura West, India
[3]Centre of Excellence in Environmental Technology and Management, Maulana Abul Kalam Azad University of Technology, Kolkata, India
*Email: *shaonraychaudhuri@tripurauniv.in*

ABSTRACT

India is among the major producers (~0.4 million L/day) of milk and dairy products in the world. On the other hand dairy industry is one of the most polluting industries and the effluents (3m3/KL) generated by this industry needs to be treated to achieve the discharged standards prescribed by the Environment (Protection) Rules, 1986 before they can be released into the environment. The effluent treatment process adopted by the dairy industry to achieve the standard is an expensive preposition. A tailor made consortium for dairy effluent treatment is developed leading to production of a by-product (ammonia) with economic value. The ammonia though produced at a rate higher than that of modified Haber's Process, is too low in concentration to be volatilized (for recovery) in an economically viable process. Moreover the precipitation option does not work as the salts of ammonia are all soluble in water. Even post treatment the effluent is not suitable for discharged into the environment owing to the high concentration of ammonia. Hence, an alternative option was sought for reuse of the treated effluent.

Since ammonia, nitrate and phosphate are all necessary for plant growth, the treated effluent with and without further processing for dissimilatory and assimilatory nitrate reduction was used for cultivation of Mung bean [(Vigna radiata var. MEHA) mb] and Sorghum-Sudan grass(sg). The microbially treated effluent could reduce the time required for maturation of the plants with associated significant yield (2.6 folds mb) and biomass [(1.7 folds mb) and (3.5 folds sg)] enhancement. The protein (1.9 folds) and carbohydrate (3.1 folds) content of mb seeds were significantly increased while root nodulation was decreased [(48.8 folds mb) and (31.1 folds sg)] emphasizing the mode of action of the biofertilizer formulation. The infestation by aphid insect (Aphis craccivora Koch) was less in microbially treated effluent administered plants of mb indicating protection from aphid infestation.

In this study, the treated bioformulation functions as liquid biofertilizer as revealed through the pot trials conducted at Suryamaninagar, Tripura, Agartala.

Dairy waste water treatment using microbial formulation associated with production of valuable industrial product like ammonia.

Nabanita Halder[1] and B. Dr. Shaon Ray Chaudhuri[2]
Department of Microbiology, Tripura University, India
Email: nabanitahalder282@gmail.com

ABSTRACT

Dairy industry is one of the largest sources of industrial effluents in many countries like India, China, USA, Pakistan etc. It generates between 3.7 -11.2 million m3 of waste water per year. Large amount of water is used to clean dairy processing plants. Hence, the resulting waste water contains detergent, sanitizers, base, salts and organic matter (Tikariha et al., 2014). Dairy effluent affect the soil quality, soil structure and part of waste water can also leach into underlying groundwater and affect its quality (Pachpute et al., 2014). A dairy factory generates waste water daily with considerable concentration of organic matter (fat, protein and carbohydrates) and pollutants like Nitrogen and phosphorous (Pachpute et al., 2014). Disposal of waste water into rivers and other aquatic bodies, without or with partial treatment offers a serious problem to human and environmental health (Akpor et al., 2011). The annual cost of treatment and disposal for the typical plant appears to be very expensive. So, disposal of untreated water is becoming a major economic and societal problem faced by the dairy processing industry in many aspects. Here we proposed microbial conversion of un-ammended dairy effluent into a by-product (ammonia) of commercial value through an energy inexpensive process at room temperature. The by-product in soluble form can be utilized as bio-fertilizer could make the process of bioremediation of dairy effluent self sustainable for the dairy industry. Here 23-26folds higher concentration of ammonia was produced under ambient temperature and pressure as compared to the modified Heber's process (at 570oC and atmospheric pressure). This by product would be of economically important since the price of ammonia is 582$ per metric tons. This opens up a new dimension of self-sustained bioremediation of dairy effluent were the revenue generation can take care of the expenditure for waste treatment.

Efficacy of different sources of organic nutrients on growth parameters of banana cv. Jahaji at different stage

Purabi Tamuli Phukan[1] and Kartik Baruah[1]
1. Department of Horticulture, Assam Agricultural University, Jorhat, Assam, India
Email: *tamuliphukanpurabi@gmail.com*

ABSTRACT

Banana requires heavy manuring for its optimum growth and development, which mostly comes from inorganic chemical sources. The increased use of chemical fertilizers increased the production of food but decreased the "nutritional quality" and "soil fertility" over the years. Keeping this in view, a field experiment was conducted to gain information on the efficacy of different sources of organic nutrients on growth parameters of banana at different stage. The experiment was laid out in Randomized Block Design (RBD) with four replications. The treatments combinations were- T1- FYM 10 kg + Neem cake 1.25 kg + Vermicompost 5 kg + Wood ash 1.75 kg/pl, T2- FYM 10 kg + Neem cake 1.25 kg + Vermicompost 5 kg + Wood ash 3.75 kg/pl, T3- FYM 15 kg + Neem cake 1.875 kg + Vermicompost 7.5 kg + Wood ash 0.625 kg/pl, T4- FYM 15 kg + Neem cake 1.875 kg + Vermicompost 7.5 kg + Wood ash 2.625 kg/pl, T5- Control, T6- Triple green manuring with dhaincha + Cowpea + Cowpea as intercrop, T7- AM (25g) + Azospirillum (50g) +PSB (50g) +T. harzianum (50g)/pl, T8- T1 + T6, T9- T1 +T7, T10- T1 + T6 + T7, T11- 300 g N + 100 g P + 300 g K per plant as inorganic. The results revealed that among all the treatments, T11 recorded significantly highest pseudostem height, pseudostem girth and number of functional leaves at 3rd month(45.50 cm, 23.90 cm, 6.65), large stage (73.63 cm, 39.13 cm, 10.68) and shooting stage(120.51 cm, 52.38 cm, 9.68) respectively which was statistically at par with treatment T10. The same treatment also showed maximum leaf area index at large stage (2.50), shooting stage (3.80) and harvesting stage (2.57) and shortest phyllochron (4.45) over control. The treatment T10 recorded leaf area index at large stage (2.43), shooting stage (3.63) and at harvesting stage (2.49) and phyllochron (4.53) and it was at par with treatment T11. Hence, considering the positive effects of organic treatments on conservation of soil health and quality production on a long-term basis, treatment T10 would be the most effective and economic practices in banana plantation under the prevailing condition of Jorhat.

Poisonous Mushrooms and Their Detection Using Gold nanoparticle-based Dipstick

Assma Parveen, Dibya Jyoti Hazarika, Madhumita Barooah, Robin Chandra Boro*
Department of Agricultural Biotechnology, Assam Agricultural University, Jorhat-785013, India
*Corresponding author's email: *robinboro@gmail.com*
Author's E-mail: *assma@aau.ac.in*

ABSTRACT

Cases of mycetismus or mushroom poisoning have been on the rise during the recent years. In light of this, development of diagnostic kits to detect toxins present in wild mushrooms in situ or rapid detection of the toxin in affected patients for early diagnostics and treatment is important. In this study, we report the generation of antibodies against the Phallacidin (PCN) toxin present in poisonous mushrooms. Phallacidin, a bicyclic heptapeptide that belongs to the phallotoxin family of toxins is highly hepatotoxic. Phallacidin-BSA conjugate was synthesized and 500 µg injected into New Zealand white rabbit. Sensitivity and cross-reactivity of purified anti-PCN antibodies were evaluated using competitive inhibition assay which showed high sensitivity and selectivity towards the cyclopeptides group of toxins such as Amatoxins and Phallotoxins. The detection limit of Phallacidin was 13.01 ng/ml whereas for α-Amanitin, it was 7.64 ng/ml using ELISA format. The cross reactivity towards other group of toxins such as muscimol (IC50 40.12 ng/ml) and ibotenic acid (IC50: 45.23 ng/ml), respectively was also assessed. A lateral-flow-based dipstick immunoassay format using a antibody-gold conjugate for the rapid screening of phallacidin in mushroom samples. The immunoassay is based on the competitive inhibition, in which antibody-gold conjugate competes with the free antigen present in the sample, for the limited antibody binding sites available at test zone on dipstick membrane. The developed conjugate showed a high level of stability as it did not show any significant loss of activity even after 12 weeks of storage at ambient conditions. The color developed due to CG-Ab conjugate, based on competitive inhibition approach, is correlated with the concentration of phallacidin sample. The kit could serve as a rapid screening methodology for visual screening of phallacidin contamination of mushroom samples within 10 min of analysis time, as an inexpensive semi-quantitative assay.

Methane Emission from Paddy Fields and its Mitigation Strategies- A review

A. N. Islam, R. L. Deka and B. J. Gharphalia
Department of Agrometeorology, Assam Agricultural University, Jorhat-13, Assam

ABSTRACT

Increasing levels of methane (CH4) concentration by 150% from 722 ppb in 1750 to 1803 ppb in 2011 has become a matter of utmost concern, as it has significant effect on the heat balance causing an elevation of the global temperature. Anthropogenic sources (paddy cultivation, sewage and waste, fossil fuel extraction etc.) are responsible for approximately 50% - 65% of global atmospheric inputs of CH_4 wherein, the rice paddies have been identified as one of its major sources and its contribution to the global CH_4 budget have been set at approximately 10% of the total emission. Methane in paddy fields are produced through methanogenesis, which is a biogenic process, involving metabolic activities of a small and highly specific bacterial group called methanogens. Using authentic guide lines and country specific data, it was revealed that global paddy fields would emit between 33 to 40 Tg (CH_4) yr–1 and 90% of these emissions come from tropical Asia, with more than 50% from China and India. Data from FAO reveals that areas having high rice production are also the areas of high CH_4 emission. Further, with the increase in the production of rice, CH_4 emission is also showing an increasing trend. It has been strongly established that through proper selection of cultivar, intermittent flooding and fertilizer management, CH4 emissions can be substantially reduced. Other approaches such as application of amendments like silicate in combination with urea and silicate in combination with sulphate of ammonia decreased total seasonal CH_4 flux. Thus, by adopting comprehensive approaches and providing feasible and sustainable adaptive packages to the farming community, sound mitigation of CH_4 emissions from paddy cultivation can be achieved, which were critically reviewed in this study.

KEYWORDS- Methane, paddy, methanogenesis, mitigation.

Recent trend of extreme rainfall events in the Guwahati city of Assam during 1986-2015

Bikash. J. Gharphalia , R. L. Deka and A. N. Islam
Department of Agrometeorology
Assam Agricultural University, Jorhat

ABSTRACT

Extreme rainfall events are among the natural hazardswith catastrophic impacts on socio-economic sectors such as agriculture, hydrology and water resources. Changes in extreme rainfall events have received enormous attention during the past few decades. A proper estimation and assessment of the trends is important to understand the effects of climate change and variability on extreme rainfall. In this study, a thorough investigation of extreme rainfall events on annual basis has been conducted over the Guwahati city of North-East India using daily rainfall data for a period of 30 years (1986-2015). Sen's slope method was used to detect the trends and statistical significance of the trends was tested using Mann-Kendall rank statistics. Analysis revealed that the mean annual rainfall in Guwahati was 1732 mm, and it exhibited significant decreasing trend of 107.2 mm/decade. This was accompanied by the significant decrease in rainy days (4.4 days/decade). Extreme wet days, moderate wet days and very wet days and their corresponding rainfall fractions also exhibited non-significant decreasing trends. Moreover, the significant increase in the consecutive dry days by 9.2 days/decade also contributed to the decreasing trend of annual rainfall. On the other hand, maximum 1-day rainfall was found to exhibit a positive trend of 6 mm/decade. From this study, it can be inferred that increase in consecutive dry days coupled with decrease in rainfall fractions due to extreme wet days, moderate wet days and very wet days lead to the decrease in the annual rainfall.

KEYWORDS- Extreme rainfall, trend, Mann-Kendall rank statistics, Sen's slope estimator.

Future Prospects Of Aerobic Rice: Water Saving Technique

Divyashree Saikia*, Munmi Boruah* and Paramita Bharadwaj*
*M.Sc. Student
Assam Agricultural University, Jorhat, Assam

ABSTRACT

Rice is the staple food of more than 3 billion people in the world, mostly Asia. India is second largest producer of rice next to china producing 104.3 million tons of rice from area of 44.0 million ha with a productivity of 2780 kg/ha in 2011-12(GOI, 2013). Rice production consumes about 30% of all fresh water used worldwide. In Asia flood-irrigated rice consumes more than 45% of total fresh water (Barker et al. 1999). By 2025, 15 out of 75 million ha of Asia's flood-irrigated rice will experience water shortage (Tuong and Bouman, 2002). Traditionally, for growing 1kg of rice requires approximately 4000-5000 lit of water (Shen et al., 2001). There is a need to develop alternative system that requires less water for rice crop production. Aerobic rice reduces water input in the field by cutting down the unproductive water losses caused due to seepage and percolation. Water inputs were more than 50% lesser and water productivities were 64-88% higher than the lowland rice, but required improved breed specifically for aerobic condition. China started aerobic rice research from 1980 onwards and developed varieties like "Han Dao" (such as HD 297, HD 277 and HD 502). In tropical Asia, IRRI has initiated its work on tropical aerobic rice systems in 2001 and identified that a lowland variety "Magat" and some genotypes like APO and CT 6510-24-1-2 perform well under aerobic condition. Rice is considered as a drought sensitive crop species, however, aerobic rice withstands water stress. In present investigation, different agronomical and morphological traits were studied in aerobic (MAS 25, MAS 26) and lowland (HKR 47, PAU201, HBC 19, AND PUSA1121) indica rice genotypes grown under submerged and aerobic condition. Root length, root-shoot ratio, yield and yield attributes declined in all lowland rice genotypes.

KEYWORD- Flood – irrigated, Percolation, Han Dao.

Genetic variability, Heritability and Genetic advance for agro-morphological traits in faba bean (*Vicia faba* L.) genotypes of different origin

Praveen Kumar, Shantanu Das and Prashant Koushik
Department Of Genetics and Plant Breeding
Ccs Haryana Agricultural University Hisar - 125 004 (Haryana)

ABSTRACT

The present investigation was carried out in sixty five faba bean genotypes in 2014/015 cropping season in a randomized block design with three replications. Analysis of variance indicated that genotypes differed significantly for all of the studied traits. Broad sense heritability (h2) estimates were generally high to moderate for all of the studied traits. Theseresults suggested that the environmental factors had a small effect on the inheritance of traits with high heritability.High estimates of heritability indicated that selection based on mean would be successful in improving of these traits. High heritability indicate an additive gene action for the traits, and hence, possible trait improvement through selection. The results of analysis indicated that the traits seed yield, 100-seed weight, number of cluster per plant, number of pods per plant, number of branches per plant and days to flowering should be given due consideration while performing selection for seed yield in segregating generations of faba bean.

Improved "packaging design" for long distance transportation of high value horticultural crops

Nikunj Abhay Rathod, Nanki Nath and Pritom Borathakur

ABSTRACT

Long Distance transportation of high value horticultural crops is an area of extensive research and practice. In context of North-East this area requires more in-depth investigations in context of risk-free, cost-effective, innovative and sustainable structural packaging designs of the existing Corrugated Fiber Boards (CFBs) that carry these horticultural crops over a minimum distance of a 1000 km. within India and also across Indo-Myanmar border. Within these variables of study as part of our project, the project also aims to design and implement an a "improved packaging" (Design and Mechanical aspects) for long distance transportation of high value crops. We are also in the process of find the economics of using the developed packaging material(s) along with finding alternative material options (equivalent to eco-friendly materials in existing designs made of CFB- different grades and make). Treatments inside the structural package would be explored and new recommendations would be proposed accordingly.

KEYWORDS- *Material Science Of CFBs, Structural Packaging Principles, Sustainable Packaging, Contextual Inquiry, Packaging Graphics, Innovative Packaging Design, Large-scale Field testing, Colour and Type, Active Packaging Concepts*

Effectiveness of Arbuscular Mycorrhizae in paddy rhizosphere as influenced by different doses of Phosphorus

Ipsita Ojah* and Dhruba Jyoti Nath
Department of Soil Science, Assam Agricultural University, Jorhat-13, Assam 785 013
Corresponding Address: ipsita20ojah@gmail.com*

ABSTRACT

Arbuscular Mycorrhyzal (AMF) Fungi spores obtained through mass multiplication in maize (in a previous experiment) used as a host and roots were tested for their effectiveness in a pot experiment in rice with three levels of P2O5 (0, 20 and 40 kg/ha) under submerged condition. By reducing levels of P2O5 (20kg/ha) comparable plant biomasses were recorded ($P<0.05$) under AMF inoculation with that of highest level of P2O5 (40kg/ha) with or without AMF inoculation. By reducing the P supply (20kg/ha), the measurable effect of AMF ($P<0.05$) was obtained for P and N concentration (1.27 and 7.88mg/g respectively) and their uptake (20.63 and 127.50 mg/plant respectively) in rice plants which were comparable with uninoculated plants at 40kg P2O5/ha. AMF spores and root colonization were found at all levels of P supply, although overall the numbers of AMF spores and per cent root colonization decreased with increasing P under AMF inoculation which implies that saturation or inundation does not necessarily prevent the development of AMF association.

KEYWORDS- Arbuscular Mycorrhyzal Fungi, Phosphorus, Spore abundance, Root colonization

Protected Cultivation Of Off Season Vegetables in North East Region

Jangmir Rongpharpi_M.Sc. (Agri.)
Gouri Sankar Bordoloi_M.Sc. (Agri.)
Department of Horticulture, Assam Agricultural University, Jorhat-13

The North Eastern Hill (NEH) region lies between 21050' and 29034'N latitude and 85034' and 97050'E longitude. In NEH region, about 35% area is in the plains and the remaining 65% area is under hills. Out of the total geographical area 28.3% has an elevation more than 1200 m, 17.9% between 600 and 1200 m and about 10.8% between 300 m and 600 m above mean sea level. The varied physiological features and altitudinal differences give rise to varied types of climate ranging from near tropical to temperate and alpine. The annual rainfall in the region is received mainly from south-west monsoon from middle of May and continues till October. On an average, the NE region receives about 2450 mm of rainfall. The region shows great variation in temperature regime too. The temperature varies from 150C to 320C in summer and 0 to 260C in winter. Due to these varied climatic conditions, a wide range of vegetables can be grown but due to inhospitable weathers, off season cultivation shows problems.

Protected cultivation of vegetables offers distinct advantages of quality, productivity and favorable market price to the growers. Vegetable growers can substantially increase their income by protected cultivation of vegetables in off-season as the vegetables produced during their normal season generally do not fetch good returns due to markets glut. To cater the needs of the growing population as well as to cultivate fresh vegetables, greenhouse cultivation serves a good purpose. Protected cultivation of high value and exotic vegetables has been on the increase, targeting high end domestic and export markets. Of late, population pressure, fragmentation of land holdings and urbanization has led to the decline in cultivable area, more so in urban and peri-urban areas of the North East India regions. Production of vegetables under protected cultivation system results in effective use of the land resources, besides being able to increase the production of quality vegetables both for the export and domestic markets by offsetting biotic and abiotic stresses to a great extent that otherwise is prevalent in open cultivation.

Type of Greenhouse	Cost involved
1. Less expensive greenhouse without fan and pad	Rs.300 to Rs.500/m^2
2. Medium cost greenhouse with fan and pad system without automation	Rs.800 to Rs.1100/m^2
3. Expensive greenhouses with fully automatic control system	Rs.2000 to Rs.3500/m^2

During winters, the temperature and solar radiations are sub optimal for growing off season vegetables namely tomato, capsicum and cucumber. In tomato, low temperature and radiation cause puffiness and blotchy ripening. When cultivated in medium cost greenhouse during the winter season, the yields of tomato and capsicum are 98.6 tonnes/ha and 87.2 tonnes/ha respectively. By increasing temperature inside the polyhouse, the germination can be hastened and seedlings can be raised.

Performance of tomato varieties under polyhouse and open field conditions in NEH region (Barapani)

Varieties	Polyhouse yield (q/ha)	Open cultivation yield (q/ha)
Arka Alok	260.00	57.90
Arka Abha	193.50	70.33
Selection-1	2000.98	84.03
Selection-2	233.00	73.83

Protected vegetable production reduces the amount of water and chemicals used in production of high value vegetables compared to open field conditions, and can be produced year round. The crops are protected against harsh winter conditions and against the harsh sunlight as well. It is feasible for farmers

Protected Cultivation Of Off Season Vegetables In North East Region

Jangmir Rongpharpi_M.Sc. (Agri.)
Gouri Sankar Bordoloi_M.Sc. (Agri.)
Anmol Kachari_M.Sc. (Agri)
Department of Horticulture, Assam Agricultural University, Jorhat-13

The North Eastern Hill (NEH) region lies between $21^0$50' and $29^0$34'N latitude and $85^0$34' and $97^0$50'E longitude. In NEH region, about 35% area is in the plains and the remaining 65% area is under hills. Out of the total geographical area 28.3% has an elevation more than 1200 m, 17.9% between 600 and 1200 m and about 10.8% between 300 m and 600 m above mean sea level. The varied physiological features and altitudinal differences give rise to varied types of climate ranging from near tropical to temperate and alpine. The annual rainfall in the region is received mainly from south-west monsoon from middle of May and continues till October. On an average, the NE region receives about 2450 mm of rainfall. The region shows great variation in temperature regime too. The temperature varies from 15^0C to 320C in summer and 0 to 26^0C in winter. Due to these varied climatic conditions, a wide range of vegetables can be grown but due to inhospitable weathers, off season cultivation shows problems.

Protected cultivation of vegetables offers distinct advantages of quality, productivity and favorable market price to the growers. Vegetable growers can substantially increase their income by protected cultivation of vegetables in off-season as the vegetables produced during their normal season generally do not fetch good returns due to markets glut. To cater the needs of the growing population as well as to cultivate fresh vegetables, greenhouse cultivation serves a good purpose. Protected cultivation of high value and exotic vegetables has been on the increase, targeting high end domestic and export markets. Of late, population pressure, fragmentation of land holdings and urbanization has led to the decline in cultivable area, more so in urban and peri-urban areas of the North East India regions. Production of vegetables under protected cultivation system results in effective use of the land resources, besides being able to increase the production of quality vegetables both for the export and domestic markets by offsetting biotic and abiotic stresses to a great extent that otherwise is prevalent in open cultivation.

Type of Greenhouse	Cost involved
1. Less expensive greenhouse without fan and pad	Rs.300 to Rs.500/m^2
2. Medium cost greenhouse with fan and pad system without automation	Rs.800 to Rs.1100/m^2
3. Expensive greenhouses with fully automatic control system	Rs.2000 to Rs.3500/m^2

During winters, the temperature and solar radiations are sub optimal for growing off season vegetables namely tomato, capsicum and cucumber. In tomato, low temperature and radiation cause puffiness and blotchy ripening. When cultivated in medium cost greenhouse during the winter season, the yields of tomato and capsicum are 98.6 tonnes/ha and 87.2 tonnes/ha respectively. By increasing temperature inside the polyhouse, the germination can be hastened and seedlings can be raised.

Performance of tomato varieties under polyhouse and open field conditions in NEH region (Barapani)

Varieties	Polyhouse yield (q/ha)	Open cultivation yield (q/ha)
Arka Alok	260.00	57.90
Arka Abha	193.50	70.33
Selection-1	2000.98	84.03
Selection-2	233.00	73.83

Protected vegetable production reduces the amount of water and chemicals used in production of high value vegetables compared to open field conditions, and can be produced year round. The crops are protected against harsh winter conditions and against the harsh sunlight as well. It is feasible for farmers as they get better returns.

Exploring microbial bioagents for suppression of *Ralstonia solanacearum* associated with micropropagated banana

plantlets

Dutta J. and Bora L.C.
Department of Plant Pathology
Assam Agricultural University, Jorhat-785013, Assam
duttajoli@gmail.com

ABSTRACT

Generally, micropropagated plantlets are free from any pests and diseases. But after hardening, when it is transferred from controlled environment to a new environment, then some pathogens are associated with these micropropagated plantlets. To overcome this problem, bioprospective microbial antagonists are incorporated with these plantlets. To have a sustainable agricultural system with minimum contamination and risks to the environment, a consortial formulation of microbial antagonists should be applied to manage disease problems. Four antagonistic microorganisms Trichoderma viride, Metarhizium anisopliae, Pseudomonas fluorescens and Bacillus thuringiensis and their consortia were used to suppress Ralstonia solanacearum, the causal agent of bacterial wilt disease of micropropagated banana during 2014-16. The compatibility tests conducted in vitro among these bioagents showed that all the bioagents were compatible amongst themselves. The consortia of different antagonists were tested to assay their ability to inhibit the growth of R. solanacearum in vitro. Combination of B. thuringiensis, T. viride, M. anisopliaeand P. fluorescens showed maximum inhibition (97.06%) followed by combination of T. viride,P. fluorescens and M. anisopliae(93.40%) and combination of T. viride, B. thuringiensisand M. anisopliae(86.67%). The efficacy of the microbe based consortial formulations was also tested for their ability to suppress diseases caused by R. solanacearum in vivo in pot grown micropopagated banana plantlets. There was a significant reduction of bacterial wilt disease incidence (19.08%) accompanied by enhancement of yield attributing characters in banana due to application of consortial formulation of bioagents applied as root treatment and soil treatment.

KEYWORDS- Micropropagated banana, *Ralstonia solanacearum*, antagonistic microorganisms

Towards standardization of "*Xaj*"; a cereal based alcoholic beverage of Assam through biotechnological approach

Authors: Jyotshna Keot, Sudipta Sankar Bora, Madhumita Barooah*
Organization: Department of Agricultural Biotechnology, Assam Agricultural University, Jorhat-13, Assam, India
***Corresponding author:** Madhumita Barooah
Email:m17barooah@yahoo.co.in

ABSTRACT

Xaj is one of the cereal based alcoholic beverages produced by the Ahom community of Assam, India using fermentation starter "*Xaj-Pitha*". Though the methodology of *Xaj* preparation is similar among the Ahom people residing at different localities of Assam; however; fermentation starters and the substrates differ resulting in variance in the quality and acceptability of the final product. Fermentation starters are mixed cultures of molds, yeasts and bacteria that are maintained on substrates like rice powder, supplemented with various herbs. Both molds and yeasts from starter cultures are reported to be involved in rice beer fermentation. Fungi are primarily involved in the initial liquefaction and saccharification process that breaks down the rice starch to fermentable sugars which is subsequently converted into alcohol by the yeasts. The aim of this work is to standardize production of alcoholic beverages by using efficient microbes from starter cultures to provide safety associated with the use of microorganisms in fermented beverages and also related to organoleptic characters for acceptability of the consumers.

KEYWORDS- *Xaj- pitha,* mold, yeast, fermentation.

Traditional agricultural practices and its prospects in the modern era

Kollol Pratim Baruah * and Gaurav Phookan*
*M.Sc. Students
Department of Plant Pathology, AAU, Jorhat

ABSTRACT

Assam is a land occupied by thousands of villages in which more than 70 % of the population are more or less engaged in agriculture. Among the various crops grown, rice is one of the major crops occupying most of the areas. The farmers, as most of them are small and marginal, cannot afford the scientific methods of crop protection. Thus, from time immemorial, they have developed their own methods of management of pests and diseases, commonly referred to as Indigenous Technical Knowledge (ITK). As the ITK's have been in use for hundreds of years, they are mostly of biological origin and are free from side effects to human health such as Pomelo (Citrus grandis), Neem (Azadirachta indica) , ferns, bamboos, cow dung, etc. A few components, such as kerosene and tires are derived from non-biological sources as well.Thus, in the age where the government is giving more emphasis on Organic Farming, ITK's if developed properly with a scientific outlook, can very well suit into this new era of science and technology and go a long way in pest and disease management, maintaining the balance in the ecosystem.

Indigenous technical knowledge (ITK), Biological Origin, Organic farming, Assam, Small & marginal.

Carbon sequestration: A way towards mitigating climate change related to crop production

Lekhika Borgohain[1] and Danish Tamuly[2]
[1]M. Sc. (Agri.) student and [2] Assistant Professor
Department of Soil Science, Assam Agricultural University

ABSTRACT

The global standpoint depicts 2015 as important vis-à-vis climate change (CC) as three global treaties viz., Paris agreement (2015-30), sustainable development goal (2015-30) and Sendai Framework (2015-30) for disaster risk reduction was agreed upon by the world leaders. Anthropogenic drivers viz., over dependence on fossil fuels, deforestation, imbalance fertilizer application etc have caused substantial increase in carbon dioxide (CO_2) concentration leading to global warming induced CC. Over the past two and a half century (1750-2014), CO_2 concentration has increased from 280 parts per million (ppm) in 1750 to 400 ppm with a CAGR of 3 ppm. Potential adverse impacts include extreme weather events, depleted biodiversity as well as agrarian distress. Scientific land husbandry practices including soil and agronomic strategies such as use of balanced fertilizers, nutrient management, less soil disturbance, better irrigation, cover crops, crop rotation, intensive farming operation, conservation tillage has proved to mitigate the consequences of increased atmospheric CO_2. It restores degraded soils, enhances the land productivity, improves the diversity, protects the environment and reduces the enrichment of atmospheric CO_2, hence shifts emission of GHGs and mitigates climate change. Globally, soils are estimated to contain approximately 2400 Pg of carbon twice more than the amount in vegetation (approximately 1750 Pg) and thrice that in the atmosphere (750 Pg). Carbon sequestration is a growing research topic that addresses one important aspect of an overall strategy for carbon management to help mitigate the increasing emissions of CO_2, into the atmosphere. The present review attempts to congregate carbon sequestration work carried out in the country in general and north east in particular.

Keywords: Carbon sequestration, climate change, GHGs.

Status Of Corporate Social Responsibility (Csr) In North Eastern Region Of India

LH Changde Catherine[1] and Panthoi Chongtham[2]*
[1,2]M.Sc. (MBA) scholar, Department of Agricultural Economics & FM (MBA- Agri Business), FA, Assam Agricultural University, Jorhat-13, Assam
Email id of corresponding author: changwar@rediffmail.com

ABSTRACT

India has a long tradition in the field of Corporate Social Responsibility (CSR) and Industrial Welfare and it has been put to practice since late 1850s. Business practices, in the 1900s, that could be termed socially responsible took different forms: philanthropic donations to charity, service to the community, enhancing employee welfare and promoting religious conduct. Going by the new norms, the two per cent spending on CSR is not mandatory, but reporting about it is mandatory. Proper disclosure of the CSR policy by the corporate, reasons for not meeting the required expenditure and various activities that may be included in the CSR agenda of the companies are on the rising trend in the new CSR provisions. Thousands of companies are expected to fall under the CSR obligations which may lead to estimate CSR spending amounting to thousands of crores of rupees. The concept of CSR has evolved from being regarded as detrimental to a company's profitability, to being considered as somehow benefiting the company as a whole, at least in the long run. Corporate Social Responsibility gives benefits to the community, general public, environment and the companies. In North Eastern Region, oil companies like Indian oil, ONGC etc. have been involving themselves in societal responsibilities through the provisions of CSR. Companies have started to realize the importance of CSR and initiate the steps towards it.

KEYWORDS- Corporate social responsibility, Oil companies, North eastern region.

Role of remote sensing & gis in land use planing

Danswrang Basumatary , Dr. Marami Dutta.
Deptt. Of Soil Science, Assam Agricultural University, Jorhat-13
Email Id:- dans.basumataryb410@gmail.com

ABSTRACT

The application of Remote Sensing, GIS and precision farming techniques in the management of agricultural resources are increasing rapidly due to improvements in space science supported by computer and communication technologies. Remote Sensing technology has the potential of revolutionizing the detection and characterization of agricultural productivity based on biophysical attributes of crops and/or soils (Liaghat et al., 2010). Plant spectral properties reflect crop nutrient status and soil nutrient availability and they can be useful for directing in season variable N application (Scharf et al., 2002). Multispectral airborne satellite data & hand held radiometer have potential to map areas of soil textural calss with reasonable accuracy (Barnes et al., 2000). Multi-temporal remote sensing data-based crop inventory, NDVI and crop evapotranspiration estimation could rank the performance of the distributaries and also identify those having problems in water allocation and utilization (Ray et al., 2002). Bobade et al.,(2009) compiledsoil based GIS data and interpreted for agricultural land use suitability and fertility assessment and found 44% was non aerable and 56% of land was arable. Maurya & Rao (2014) used Advanced Microwave Scanning Radiometer 2s to estimate the surface soil moisture using brightness temperature data and found positive correlation with in situ soil moisture measurement.

Effect of *Meloidogyne incognita* infestation on plant growth parameter of Ivy gourd

Binita Basumatary[1], Rimi Deori[1], B. Mahanta[1]
[1] Department of Nematology, Assam Agricultural University, Jorhat-785013, Assam, India
E-mail- *basumatarybinita3@gmail.com*

ABSTRACT

The experiments was conducted to study the Effect of Meloidogyne incognita infestation on plant growth parameter of Ivy gourd (local variety) in nematode infested field (374 J2/200 cc soil) in the field of Department of Nematology located at Instructional-cum-Research (ICR) Farm, AAU, Jorhat during the rabi season of 2015.The experiment was laid out in Paired plot technique with ten replications. Required quantity of carbofuran granules @ 3 kg a.i./ha was applied at the spot two days before planting. Ten plots each of 3.0m x 3.5m size were treated and another ten plots were kept untreated control (without carbofuran application).Data indicated that mean fresh and dry weight of shoot and root of ivy gourd were reduced in untreatedplots of ivy gourd by 32.86, 14.62, 34.71 and 10.31 per cent respectively. And number of fruits were also reduced in untreated plots by 27.58 per cent over treated control plots.

KEYWORDS- *Meloidogyne incognita*, Ivy gourd, plant growth parameter, carbofuran.

ABSTRACT

Many plants and animals possess symbiotic microorganisms inside their body wherein intimate interaction occur between the partners. The class insecta is often rated as the most diverse animal group show various types of endosymbiotic associations, ranging from obligate mutualism to facultative parasitism. Symbiotic associations are widespread in nature and represent a driving force in evolution. They are known to impact fitness and thereby shape the host phenotype. Insects subsisting on nutritionally poor substrates have evolved mutualistic relationship with intracellular symbiotic bacteria (endosymbionts) that supply them with metabolic components lacking in their diets. In many species endosymbionts are hosted within specialized host cell, called the bacteriocytes and transmitted vertically along the host generation. The most developed nutritional associations are found in the obligatory symbionts (which are also referred to as primary endosymbionts) that provide essential amino acid and certain vitamins to insects with specialized feeding behaviours such as sap feeding aphids and blood feeding tsetse flies. Microbial symbionts, however, may also compensate for the nutrient deficiencies of less specialized herbivorous insects. For example, the intracellular endosymbionts Blochmannia in carpenter ants can provide essential amino acids that are deficient in the ant diet and that thereby sustain colony fitness. Similarly, cockroaches harbor intracellular bacteria (Blattabacterium sp.), which apparently recycle uric acid reserves, providing the insect with usable nitrogenous compounds during times of nitrogen famine. Thus endosymbionts play a vital role in providing nutrients to the insects for their successful growth and development.

KEYWORDS- Insecta, Endosymbionts, Bacteriocytes, Nutrients.

Performance of Sericulture Industry In Manipur

Panthoi Chongtham[1] and LH Changde Catherine[2]*
[1,2]M.Sc. (MBA) scholar, Department of Agricultural Economics & FM (MBA- Agri Business), FA, Assam Agricultural University, Jorhat-13, Assam
Email id of corresponding author: *chpanthoi@gmail.com*

ABSTRACT

Silk is a highly priced agricultural commodity which accounts for about 0.2% of the total world production of textile fiber. India is the only country in the world which produces all varieties of silk namely tasar, muga, eri and mulberry. India occupies a predominant position in the world and it is the second largest producer of silk after China. In India Manipur is ranked among top ten silk producing states with a contribution of nearly 2%. A huge section of people is dependent on sericulture for their livelihood generation in the state. Area covered under mulberry plantation is highest in Imphal East district followed by Thoubal district. The processed silk is used to prepare different traditional dressed such as Manipuri saree, enaphi, phanek, phige phanek, lengyan phi, waist coat etc. and the producers can sell these products in the range of Rs. 1,000-12,000. All the silk products have a very good demand in all the districts of Manipur and limited fine finished products are popular throughout the country. Presently government is trying to popularize sericulture industry among the farmers and initiated a few farmer-oriented policies which may attract more farmers towards this lucrative industry in future.

KEYWORDS- Silk, Manipur, Cocoon, Mean silk weight.

Carbon sequestration: A way towards mitigating climate change related to crop production

Lekhika Borgohain and Danish Tamuly
danishaau@aau.ac.in
M. Sc. (Agri.) student and Assistant Professor
Department of Soil Science
Assam Agricultural University

ABSTRACT

The global standpoint depicts 2015 as important vis-à-vis climate change (CC) as three global treaties viz., Paris agreement (2015-30), sustainable development goal (2015-30) and Sendai Framework (2015-30) for disaster risk reduction was agreed upon by the world leaders. Anthropogenic drivers viz., over dependence on fossil fuels, deforestation, imbalance fertilizer application etc have caused substantial increase in carbon dioxide (CO2) concentration leading to global warming induced CC. Over the past two and a half century (1750-2014), CO2 concentration has increased from 280 parts per million (ppm) in 1750 to 400 ppm with a CAGR of 3 ppm. Potential adverse impacts include extreme weather events, depleted biodiversity as well as agrarian distress. Scientific land husbandry practices including soil and agronomic strategies such as use of balanced fertilizers, nutrient management, less soil disturbance, better irrigation, cover crops, crop rotation, intensive farming operation, conservation tillage has proved to mitigate the consequences of increased atmospheric CO2. It restores degraded soils, enhances the land productivity, improves the diversity, protects the environment and reduces the enrichment of atmospheric CO2, hence shifts emission of GHGs and mitigates climate change. Globally, soils are estimated to contain approximately 2400 Pg of carbon twice more than the amount in vegetation (approximately 1750 Pg) and thrice that in the atmosphere (750 Pg). Carbon sequestration is a growing research topic that addresses one important aspect of an overall strategy for carbon management to help mitigate the increasing emissions of CO2, into the atmosphere. The present review attempts to congregate carbon sequestration work carried out in the country in general and north east in particular.

KEYWORDS- Carbon sequestration, climate change, GHGs.

Container Gardening

Swagata Seth And Dikshita Barman
Dikshita71192@Gmail.Com
Msc. (Agri), Aau, Jorhat

ABSTRACT

Growing of vegetables in container/pot is not a new idea, but gardening in containers is a new concept. It is the practice of growing edible plants in container or pots rather than growing them in ground. It is an alternative to kitchen gardening in the urban areas as due to urbanization the shortage of land is a major obstacle for cultivation of vegetables. In this system we can get a daily basis consumption of vegetables round the year. Studies show that average consumption of vegetable among urban people is reported to be 226g/day but according to National Nutrition guidelines consumption of vegetable should be 300g/day. From a statistical data, it has been revealed that 43.9% household expenditure is used under food. Recent survey revealed that the monthly consumption of vegetables for a middle class family is 6.8kg/person and the expenditure on vegetables is Rs. 4000/month. So the amount of money spend for buying vegetables can be reduced by producing vegetables under container gardening. Due to poor post harvest management of vegetables and lack of cold chain approximately Rs. 13,000 crores is lossed annually. So the transportation, storage, post harvest measures cost etc. can be reduced by this container gardening. For container gardening, we can use cemented pot, earthen pots, plastic jar, damaged bucket etc or any types of containers that can hold soil and have a proper drainage. There are certain advantages of container gardening viz. Proper utilization of space, fresh vegetables, economical, environment friendly etc.The study includes container gardening of crops such as Brinjal(Pusa Purple cluster,Pusa Purple long,Pusa kranti),Chilli(Pusa Jawala ,Pusa Sadabahar,Locals),Cucumber (Poinsette,Poona khira) ,French bean(Pusa Parvati,Contender),Knol-knol (White Vienna and Purple Vienna), Lettuce(Great Lakes, Chinese Yellow, Slowbolt),Okra(Varsha Uphar) , Spinach(Virginia savoy),Tomato(Pusa Gaurav ,Pusa early dwarf),Broccoli(Pusa Sumeet, Pusa Broccoli).Container gardening thus suffices the daily need of a family by giving fresh products and reducing the expenditure of a family without much investment.

KEYWORDS- Container gardening, vegetable, India.

Diversity of Insect Fauna In Cabbage Ecosystem

Sarma, D., Saikia, D. K. And Altaf, N.
Department of Entomology, Assam Agricultural University, Jorhat- 785013 Assam
E-Mail: Daizy.Aau@Gmail.Com

ABSTRACT

Field experiment was carried out in the Experimental farm, Department of Horticulture, Assam Agricultural University, Jorhat during September to December, 2016 to study the diversity of insect- pests in cabbage ecosystem. A total of 17 species of insects belonging to 5 orders, 8 families were recorded from transplanting to till harvesting the crops. Of these, Brevicoryne brassicae , Plutella xylostella, Agrotis ipsilon and Pieris canidia were the major in cabbage ecosystem. Micraspis discolor , Coccinella septempunctata, C. transversalis, Episyrphus belteotus, Cheilomenes sexmaculata, and predacious spiders like Oxyopes sp and Lycosa sp.. were noticed as the most abundant predators of the cabbage ecosystem. The pollinators associated with cabbage were the bees, wasp, ants and dipteran flies. The highest number of insect pests was recorded at the head formation stage of the crop.

KEYWORDS- Insects, predators, vegetable ecosystem, diversity.

Effect of Carica papaya seed extract on the growth and development against Indian mole rat

Sarma Sanghomitra, Borah Ratul and Dutta Bijan.
Department of Entomology, Assam Agricultural University, Jorhat-785013
Email: *sanghomitrasharmaaau@gmail.com*

ABSTRACT

Rodents cause 0.44 to 60 per cent tiller damage in paddy which accounts for 5-10 per cent total grain yield losses in pre harvested rice .In recent years, the emphasis on plant protection has definitely shifted from the dominant chemical pesticides to the integrated pest management (IPM), the focus is on biological control and other natural resources with reduced reliance on chemicals. Methanolic extract of C. papaya seed was tested at different dose level i.e. 100,200,300,400,500 and 600 mg/kg body wt in the laboratory to record the growth and toxic effect on Indian mole rat, B. bengalensis (Gray). The body weight of the rodent attained 186.08±1.87g compared to initial body wt 182.05±1.65g and 70% mortality was observed at 500 mg/kg body wt. Different reproductive organ viz. testis 0.623±0.003g, epidedymis 0.230±0.003g were observed at 500 mg/kg body wt as compared to control group i.e 0.273±0.002g . Phytochemical screening of seed extract revealed the presence of glycosides, saponins, flavenoid, alkaloid and tannins . Hence the study elucidated that the C. papaya seed was the most effective botanical that retard the growth and development of the rodent. These results suggest the presence of toxic substances in the botanicals that may be useful in developing bio rodenticide for use in integrated rodent pest management against rodent.

KEYWORDS- Tiller, Bandicota bengalensis , Phytochemical screening, Bio rodenticide, Integrated rodent pest management.

Effect of different management practices on root and shoot length against M. incognita in organic tomato

Palash Thengal, K. Hazarika and Milon Jyoti Konwar
Department of Nematology, Department of Agronomy,Assam Agricultural University,Jorhat-785013, Assam, India
Email Id: polu.thengal@gmail.com

ABSTRACT

Tomato (Solanum lycopersicum) belongs to the family Solanaceae is one of the most popular and widely grown vegetables in the world next to potato. India stands second in the production of tomato whereas in Assam its production account for 3.87 lakh tonnes sharing 2.30 per cent of India's tomato production during 2010-11 (Anon., 2011). Nematodes cause a major loss to growth of the tomato plant. Among the nematode species Meloidogyne incognita (root-knot nematode) is one of the most damaging nematode. So different management practices were taken in account to increase the root and shoot length of tomato. An experiment was conducted during the rabi season of 2014-15 in the organic block of Instructional-Cum-Research Farm, AAU, Jorhat-13 to evaluate clear plastic mulch, vermicompost, Trichoderma viride and organic amendment with Mustard oil cake alone as well as in combinations for the management of M. incognita on tomato. Results revealed from the experiment that maximum shoot length (68.93 cm) was recorded in the treatment with clear plastic mulch of 0.75 mm density + mustard oil cake @ 750 kg/ha followed by the treatment with clear plastic mulch of 0.75 mm density + vermicompost @ 2 t/ha (66.70 cm). In regards to root length, maximum root length (39.93 cm) was recorded in the treatment with clear plastic mulch of 0.75 mm density + mustard oil cake @ 750 kg/ha followed by the treatment with clear plastic mulch of 0.75 mm density + vermicompost @ 2 t/ha (35.23 cm) and minimum was recorded in control (18.80 cm).

Endosymbionts and their Role in Insects Nutrition –A review

N. Altaf, P. Milli and D. Sarma
Ph.D. Scholar,
Department of Entomology, Assam Agricultural University, Jorhat-785013
E-mail: *nilofaraltaf14@gmail.com*

ABSTRACT

Many plants and animals possess symbiotic microorganisms inside their body wherein intimate interaction occur between the partners. The class insecta is often rated as the most diverse animal group show various types of endosymbiotic associations, ranging from obligate mutualism to facultative parasitism. Symbiotic associations are widespread in nature and represent a driving force in evolution. They are known to impact fitness and thereby shape the host phenotype. Insects subsisting on nutritionally poor substrates have evolved mutualistic relationship with intracellular symbiotic bacteria (endosymbionts) that supply them with metabolic components lacking in their diets. In many species endosymbionts are hosted within specialized host cell, called the bacteriocytes and transmitted vertically along the host generation. The most developed nutritional associations are found in the obligatory symbionts (which are also referred to as primary endosymbionts) that provide essential amino acid and certain vitamins to insects with specialized feeding behaviours such as sap feeding aphids and blood feeding tsetse flies. Microbial symbionts, however, may also compensate for the nutrient deficiencies of less specialized herbivorous insects. For example, the intracellular endosymbionts Blochmannia in carpenter ants can provide essential amino acids that are deficient in the ant diet and that thereby sustain colony fitness. Similarly, cockroaches harbor intracellular bacteria (Blattabacterium sp.), which apparently recycle uric acid reserves, providing the insect with usable nitrogenous compounds during times of nitrogen famine. Thus endosymbionts play a vital role in providing nutrients to the insects for their successful growth and development.

KEYWORDS- Insecta, Endosymbionts, Bacteriocytes, Nutrients

Extreme rainfall events are among the natural hazards with catastrophic impacts on socio-economic sectors such as agriculture, hydrology and water resources

Bikash Jyoti Gharphalia
agrian2010@gmail.com
Assam Agricultural University,Jorhat

ABSTRACT

Changes in extreme rainfall events have received enormous attention during the past few decades. A proper estimation and assessment of the trends is important to understand the effects of climate change and variability on extreme rainfall. In this study, a thorough investigation of extreme rainfall events on annual basis has been conducted over the Guwahati city of North-East India using daily rainfall data for a period of 30 years (1986-2015). Sen's slope method was used to detect the trends and statistical significance of the trends was tested using Mann-Kendall rank statistics. Analysis revealed that the mean annual rainfall in Guwahati was 1732 mm, and it exhibited significant decreasing trend of 107.2 mm/decade. This was accompanied by the significant decrease in rainy days (4.4 days/decade). Extreme wet days, moderate wet days and very wet days and their corresponding rainfall fractions also exhibited non-significant decreasing trends. Moreover, the significant increase in the consecutive dry days by 9.2 days/decade also contributed to the decreasing trend of annual rainfall. On the other hand, maximum 1-day rainfall was found to exhibit a positive trend of 6 mm/decade. From this study, it can be inferred that increase in consecutive dry days coupled with decrease in rainfall fractions due to extreme wet days, moderate wet days and very wet days lead to the decrease in the annual rainfall.

KEYWORDS- Extreme rainfall, trend, Mann-Kendall rank statistics, Sen's slope estimator

Impact of Climate Change on Tea Productivity A case study in Sivasagar, Jorhat and Golaghat Districts

Supriya Sonowal*, Shyamal Kumar Phukon*, Mondira Borborah**
*Ph.D scholar and **M.Sc. scholar
Department of Tea Husbandry and Technology, AAU, Jorhat-13
supriyasonowal92@gmail.com

ABSTRACT

The impact of climate change has stood as a barrier in tea production. Tea production in Assam region has declined in recent years, although the area under tea cultivation has risen. Taking into consideration the impact of climate change on tea production, an economic study was conducted in Sivasagar, Jorhat and Golaghat districts. A random sampling technique was followed to select samples for the study. The samples consisted of 15 tea estates, with five tea estates selected from each district. Keeping in view the main objectives of the study, both primary and secondary data were collected and used for the study from published and unpublished sources for the period 1986-2015. The collected data was categorized into two periods, i.e. Period I (1986-2000) and Period II (2001-2015). Area, production and productivity data were collected from the tea estates of each district for the period 1986-2015 and long term weather data was collected from Meteorological observatories of respective tea gardens, Tocklai Tea Research Institute and Assam Agricultural University, Jorhat. Under the long term weather data, climatic parameters such as temperature and rainfall were taken for the research study. The study revealed that the variability of different climatic parameters indicated that rainfall and maximum temperature was higher in the Period II in comparison with the Period I. Maximum temperature and rainfall were found to have significant positive effect on yield of tea in Sivasagar district, but the minimum temperature had negative effect without significance in the Period I. In case of Period II, both temperature and rainfall had negative effect on productivity of tea. In Jorhat district minimum temperature was found to have significant effect on productivity of tea in both the periods. In Golaghat district, it was observed that significantly positive yield responses to maximum temperature in the both periods and negative yield responses to minimum temperature and rainfall during Period II.

KEYWORDS- Climate, Productivity, Temperature, Rainfall.

Influence Of Different Agronomic Management Practices In Days To Maturity For Substituting Monocropped Sali Rice Area To Double Cropped

Milon Jyoti Konwar, M.K Sarmah, K.N Das and P. Thengal
Department of Agronomy, Department of Soil Science, Department of Nematology, Assam Agricultural University, Jorhat-785013, Assam, India
Email Id: milonjyotikonwar20@gmail.com

ABSTRACT

Sali or winter rice is the dominant crop of Assam where maximum rice growing areas were left fallow after cultivation due to lack of time for land preparation, labour scarcity etc., for the second crop. With the increasing demographic pressure, demand of food grain is also increasing. Therefore monocropping areas need to be put in to double cropping for feeding the growing population. So keeping all these in mind different agronomic management practices viz., dates of sowing, methods of sowing and nutrient management practices treatments were taken in account to see whether a second crop can be grown effectively in an area or not. A field experiment was carried out at Instructional-cum-Research (ICR) farm, Assam Agricultural University, Jorhat-13 during 2015-2016. The experiment was laid out in split-plot design replicated thrice. The treatments consisted of four different sowing dates in main plot viz., 1st May (D1), 11th May (D2), 21st May (D3) and 31st May (D4) along with methods of sowing viz., direct seeding (M1), transplanting (M2) and nutrient management practices- recommended doses of fertilizer (F1) 60:20:40 N:P2O5:K2O kg/ha and INM package (F2) (Organic manure @ 1 t/ha + mixed innocula of Azospirillum sp. and Bacillus megaterium P-5 @ 4 kg/ha, Rock Phosphate @ 10 kg P2O5/ha, MOP @ 40 kg K2O/ha) in sub-plots. The results revealed from the experiment that there was significant differences in days to 50 per cent flowering and days to maturity in dates of sowing and methods of sowing treatments where May 11th (D2) and transplanting (M2) recorded the highest days to flower and mature than other dates. In nutrient management practices however there was no significant differences in respective days to 50 per cent flowering and maturity were observed.

IOrganic Cultivation Vis-À-Vis Climate Change With Special Reference To Tea

Priyanka Behera, Shyamal Kumar Phukan and Supriya Sonowal
ritupriyanka1994@gmail.com
M.Sc Student, Ph.D Student
Department Of Tea Husbandry And Technology, AAU, Jorhat-13
Assam Agricultural University

ABSTRACT

IOrganic Farming has been a trend in the modern agricultural practice which is largely practiced all over the world. Organic farming aims at human welfare without harming the environment and follows the principles of health, ecology, fairness and care for all, including soil. The modern concept of organic farming combines the tradition, innovation and science. Tea (Camellia sinensis) is the most widely consumed beverage in the world. It is one of the oldest beverages in the world (FAO, Intergovernmental Group on Tea, 2015). Public concerns over environmental health, food quality and safety have led to organic tea expanding rapidly in India during the past decade. Presently over 15,726 ha of tea plantation is under organic management with a percentage growth of over 50 percent during 2007-2015. The quantity of production is 11 million kg recording a percentage growth of 45.15 percent (FAO 2014). Only 1 percent of the total tea produced in India is organic tea due to the resulting decline in yield trend observed in plantations. Correspondingly, the world-wide price for organic tea is higher as compared to the price of conventionally produced tea. In the 2015-2016, about 2 percent organic tea was exported due to the increasing demand, worldwide, for organic tea. It has been observed that organic agriculture has helped in mitigating climate change to an extent. Climate change is a major reason for environmental degradation and depletion of nature but organic agriculture has been acting as a boon to save nature from the wrath of the climatic changes. Such practice, if adopted in a proper manner, may help mitigate climatic change and be converted to climate smart agriculture.

KEYWORDS- Organic Farming, Organic Tea, Climate Change, Climate Smart Agriculture.

Sensory Attributes And Chemical Composition Of Green And Black Tea

ParamitaBharadwaj*, PriyankaBehera* and AlijaBurhagohain*
*M.Sc. Student
Assam Agricultural University, Jorhat-785013

ABSTRACT

Tea, derived from Camellia sinensis L., is one of the most widely consumed beverages in the world. Tea can be categorized into three types, depending on the level of oxidation, as green, oolong and black tea (Senanayake, 2013).The quality of tea is normally assessed through organo-leptic method by a tea taster withfocus on leaf appearance, both before and after infusion; flavour and colour of the infusion. Colour of infusion is a key attribute that is affected by chemical compounds in different kinds of tea. Flavour in tea is defined by its roots of origin: Carotenoid, Lipid, Glycosides, Maillard Reaction and Strecker Degradation.The quality, both sensory and chemical, is influenced bycultivar, harvest season, age of plant, climate, environmentand processing condition (Theppakon, 2015).In addition to polyphenols which are the prime constituents, a wide variety of other components exists, including flavones, phenolic acids, carbohydrates, alkaloids, minerals, vitamins and enzymes (Ahmed et al., 2014). Catechins (Green Tea - 10-30%; Black Tea - 10-20%), Flavonols (Green Tea - 2%; Black Tea – 1%) and other polyphenols (Green Tea -3-6%;Black Tea - 3-10%) are among the most important compounds in tea (Yashinet al., 2015).Tea from different jats and clones differ considerably. The clones TV1, TV2, TV3, TV5, etc., are categorized as having strong Assam character. Individual clones do not produce a self-drinking tea. Thus blending according to market demand with tea, herbs, spices, etc. is practiced (Gogoi, 2014).The bio-active components in tea (EGCG, EGC, ECG and EC) possess antioxidant, anti-mutagenic, anti-diabetic, anti-inflammatory, anti-bacterial, and above all, cancer-preventive properties. It can be concluded that due to these extensive health benefits of tea, its' consumption and applications have increased to a large extent (Prakash, 2011).

KEYWORDS- Oxidation, Tea Taster, Infusion, Polyphenols, jats, EGCG, EGC, ECG, EC.

Methane Emission from Paddy Fields and its Mitigation Strategies- A review

A. N. Islam, R. L. Deka and B. J. Gharphalia
Department of Agrometeorology, Assam Agricultural University, Jorhat-13, Assam
E-mail: *athar.islam790@gmail.com*

ABSTRACT

Increasing levels of methane (CH4) concentration by 150% from 722 ppb in 1750 to 1803 ppb in 2011 has become a matter of utmost concern, as it has significant effect on the heat balance causing an elevation of the global temperature. Anthropogenic sources (paddy cultivation, sewage and waste, fossil fuel extraction etc.) are responsible for approximately 50% - 65% of global atmospheric inputs of CH4 wherein, the rice paddies have been identified as one of its major sources and its contribution to the global CH4 budget have been set at approximately 10% of the total emission. Methane in paddy fields are produced through methanogenesis, which is a biogenic process, involving metabolic activities of a small and highly specific bacterial group called methanogens. Using authentic guide lines and country specific data, it was revealed that global paddy fields would emit between 33 to 40 Tg (CH4) yr–1 and 90% of these emissions come from tropical Asia, with more than 50% from China and India. Data from FAO reveals that areas having high rice production are also the areas of high CH4 emission. Further, with the increase in the production of rice, CH4 emission is also showing an increasing trend. It has been strongly established that through proper selection of cultivar, intermittent flooding and fertilizer management, CH4 emissions can be substantially reduced. Other approaches such as application of amendments like silicate in combination with urea and silicate in combination with sulphate of ammonia decreased total seasonal CH4 flux. Thus, by adopting comprehensive approaches and providing feasible and sustainable adaptive packages to the farming community, sound mitigation of CH4 emissions from paddy cultivation can be achieved, which were critically reviewed in this study.

KEYWORDS- Methane, paddy, methanogenesis, mitigation

Morphological and biochemical characterization of tea (Camellia sinensis (L.) O. Kuntze) shoots of few industry clones of Upper Assam

Aditi Smith Gogoi[1], P.K. Borua[2]
Assistant Professor, Department of Tea Husbandry & Technology, Assam Agricultural University, Jorhat, Assam
Professor, Department of Life Sciences, Dibrugarh University, Dibrugarh, Assam
Email- aditi.smith@yahoo.com

ABSTRACT

Tea is receiving increased interest for its antioxidant properties and nutraceutical values in a well brewed tea. Along with various planting materials, more than 100 numbers of industry tea clones are under commercial cultivation which is yet to be explored and are verse of extinctionleading to the narrowing down of the genetic base of the crop (Konwar, 1999).
Fourteen industry tea clones of Upper Assam were profiled based on morphological and biochemical characters by field survey and laboratory investigation using physical methods, dimensional methods and morphological descriptor. Post hoc analysis was used to test the significance level and correlation similarity co-efficient matrix to analyze the genetic relationship among clones. Significant variation was observed in shoot and biochemical characters. Clone S3A3 showed highest shoot dry weight and plucking point density while clone P126 exhibited maximum shoot pubescence. The phenolic compounds present in tea shoots plays important role in determining the made tea quality (Hara et. al., 1995).The highest total polyphenol and caffeine was found in clone S3A3 (25.79 %) and L807 (2.49%) respectively. Chlorophyll gives blackness to tea liquor which is an important factors in commercial evaluation of tea (Liyanage et al., 1993). Total chlorophyll was highest in clone P126 (1.20mg/g) and lowest in clone S3A3 (1.01mg/g). Pigment profiles can be applied for fingerprinting of clones for selection of breeding material (Bajaj, 1975). Correlation similarity coefficient matrix ranged from 0.000 to 1.000 indicating a high degree of variation amongst the clones. Dendogram based clusters indicated that clones S3A3, P126, Keyhang and N325 formed a discriminated cluster and may be selected in future breeding programmes. Clones with low polyphenol and caffeine with high chlorophyll may be selected to produce quality green teas whereas clones with high polyphenol, high caffeine and low carotinoid may be preferred for quality black tea production.

KEYWORDS- Tea, Industry clone,Descriptors, Total polyphenol, Caffeine

Traditional Agricultural Practices And Its Prospects In The Modern Era

Kollol Pratim Baruah and Gaurav Phookan
kollolbaruah@gmail.com
M.Sc. Students
Department of Plant Pathology, AAU, Jorhat

ABSTRACT

Assam is a land occupied by thousands of villages in which more than 70 % of the population are more or less engaged in agriculture. Among the various crops grown, rice is one of the major crops occupying most of the areas. The farmers, as most of them are small and marginal, cannot afford the scientific methods of crop protection. Thus, from time immemorial, they have developed their own methods of management of pests and diseases, commonly referred to as Indigenous Technical Knowledge (ITK). As the ITK's have been in use for hundreds of years, they are mostly of biological origin and are free from side effects to human health such as Pomelo (Citrus grandis), Neem (Azadirachta indica) , ferns, bamboos, cow dung, etc. A few components, such as kerosene and tires are derived from non-biological sources as well.Thus, in the age where the government is giving more emphasis on Organic Farming, ITK's if developed properly with a scientific outlook, can very well suit into this new era of science and technology and go a long way in pest and disease management, maintaining the balance in the ecosystem.

KEYWORDS- Indigenous technical knowledge (ITK), Biological Origin, Organic farming, Assam, Small & marginal.

Aquaponics Aquaponics is the integration of Recirculating Aquaculture and Hydroponics into one single production system.

Ms. Kritina Boro
kritina_boro@hotmail.com
Cotton College, Guwahati

ABSTRACT

This system of farming makes use of nitrogen cycle, i.e., wastes produced by fish which are broken down by naturally occurring nitrifying bacteria initially into nitrites and subsequently into soluble nitrates which is then used up by plants as nutrients and the purified water is then returned back to the fish tanks to complete the cycle and start all over again. Aquaponics is the management of a complete ecosystem that includes three major groups of organisms: fish, plants and bacteria. This system can control soil-borne pests and diseases by avoiding contact between plants and soil. Two agricultural products (fish and vegetables) can be produced from only one input (i.e., fish feed). Aquaponics is a 100% organic method and here, food production creates zero waste during the process. The production units are extremely water efficient and the technological requirements are very basic. Despite being a very advantageous method for food production, it has a few disadvantages, and we have worked to lessen the disadvantages (such as making the system in such a way that it requires less energy, i.e., electricity, and making the system in an easier way so that anybody can set up an aquaponics unit at home). Aquaponics can also be used for ornamental reasons, with there being extra production apart from the ornamental needs.

Cases of mycetismus or mushroom poisoning have been on the rise during the recent years.

Assma Parveen
assma@aau.ac.in
Assam Agricultural University

ABSTRACT

In light of this, development of diagnostic kits to detect toxins present in wild mushrooms in situ or rapid detection of the toxin in affected patients for early diagnostics and treatment is important. In this study, we report the generation of antibodies against the Phallacidin (PCN) toxin present in poisonous mushrooms. Phallacidin, a bicyclic heptapeptide that belongs to the phallotoxin family of toxins is highly hepatotoxic. Phallacidin-BSA conjugate was synthesized and 500 µg injected into New Zealand white rabbit. Sensitivity and cross-reactivity of purified anti-PCN antibodies were evaluated using competitive inhibition assay which showed high sensitivity and selectivity towards the cyclopeptides group of toxins such as Amatoxins and Phallotoxins. The detection limit of Phallacidin was 13.01 ng/ml whereas for α-Amanitin, it was 7.64 ng/ml using ELISA format. The cross reactivity towards other group of toxins such as muscimol (IC50 40.12 ng/ml) and ibotenic acid (IC50: 45.23 ng/ml), respectively was also assessed. A lateral-flow-based dipstick immunoassay format using a antibody-gold conjugate for the rapid screening of phallacidin in mushroom samples. The immunoassay is based on the competitive inhibition, in which antibody-gold conjugate competes with the free antigen present in the sample, for the limited antibody binding sites available at test zone on dipstick membrane. The developed conjugate showed a high level of stability as it did not show any significant loss of activity even after 12 weeks of storage at ambient conditions. The color developed due to CG-Ab conjugate, based on competitive inhibition approach, is correlated with the concentration of phallacidin sample. The kit could serve as a rapid screening methodology for visual screening of phallacidin contamination of mushroom samples within 10 min of analysis time, as an inexpensive semi-quantitative assay.

Chemical Profiling And Antibacterial Activity Of Bioactive Compounds In The Peels Of Citrus Spp.

Snigdha Jyoti Das
Cotton College State University
dassnigdha725@gmail.com

The present study was carried out to determine the presence of pharmacologically active compounds present in the peels of Citrus spp., which gets discarded as wastes. Treating these compounds can help in waste management by production of antibacterial compounds at a mass scale. Methanol extracts from peels of Citrus spp. (Citrus sinensis and Citrus limetta) were investigated for antibacterial activities against common human pathogen, Escherichia coli by agar diffusion method. The extracts from peels of Citrus sinensis showed inhibition against gram negative pathogen Escherichia coli stronger than that of Citrus limetta. When the samples were subjected to analysis by GC-MS, varying amount of bioactive compounds were present in the two extracted samples.

KEYWORDS- GC-MS, Antibacterial*, Escherichia coli, Citrus spp.*

Voluntary Stem Cell Donor Recruitment Genebandhu registry bridging the gap between patients and donors

Vikash Chandra Mishra, , Naveen Vashisht, ,Gaurav Bhatt, Hina Solanki, Rekha Panwar, Manika Rana1, Deepak Sharma1', Parvind Singh', Dinesh Chandra, , Richa Chaudhary, ,Akhilesh Kumar,Girish Sharma
Genebandhu, New Delhi
Chimera Transplant Research Foundation, New Delhi
Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida
Email: *vikashbiotech01@gmail.com*

ABSTRACT

Background: Hematopoietic stem cell (HSC) transplant is used as a definitive treatment in hematological malignancies. For a successful HSC transplant, the donor and recipient should have a matching Human Leukocyte Antigens (HLA). 25% patients have a chance of finding matching HLA within family while rests 75% are dependent on voluntary stem cell donor. Globally there are 75 stem cell registries with more than 28 million donors registered. Among which India represents 0.17 million. So, finding a stem cell donor for Indian patient is difficult. The aim here is to guide about voluntary Stem cell donor recruitment camp for the dire necessity of larger data base of such donors.

Methods: Voluntary stem cell donor recruitment drives are conducted to spread awareness among the people and motivate them to register as a donor. Once the donors has given their consent, sample is taken and sent to laboratory for high resolution HLA typing and result is uploaded in Bone Marrow Donors Worldwide (BMDW),an international repository of worldwide donors.

Result: Genebandhu have organized over 100 recruitment camp since 2012 and recruited approximately 11000 donors. HLA typing of 4465 donors is completed. Genebandhu has facilitated lifesaving 7 HSC transplants from this small number of typed donors.

Conclusion: This data implicate that amplified efforts are needed to increase donor recruitment to create a larger data pool of voluntary stem cell donor in India so that chances of saving many vital lives are increased by multiple folds.

KEYWORDS- HSC, HLA

α-synuclein (αS) is a cellular protein of 140 amino acid residues which releases the neurotransmitters in the presynaptic terminals and whose abnormal aggregation results at the onset of Parkinson's disease.

Sunanda Paul
Tezpur University
paulsunanda14@gmail.com

ABSTRACT

Force field helps in calculating the potential energy, describing the atom interaction and in improving the parameters. There are various force-fields which are used in the study of intrinsically disordered proteins. In our study we have compared the 3-D structure of α-synuclein protein using ff99SB and ff99SBipq force field using molecular dynamics simulation with the AMBER12 simulation package .From our results, we observed the dynamics of α- synuclein protein is better explained using ff15ipq force field rather than ff99SB. From the root mean square deviation (fig: 1) and radius of gyration analysis (fig: 2) we can apparently see the intrinsic disorder (the rapid change in conformation) present in α-synuclein. This is because ff15ipq maintains the expected conformational propensities of structured proteins/peptides, as well as disordered peptides. Thus we can conclude that the ff15ipq force field is more efficient in determining the structure of intrinsically disordered proteins. Hence using the ff15ipq force field we can target various disordered proteins and develop further therapeutics drugs for clinical purpose.

Vermiconversion as a technology for mitigating industrial sludge waste laden with toxic metals from virgin paper mills

Jayeeta Hazarikaa*, Meena Khwairakpamb, Ajay Kalamdhadb
aDepartment of Civil Engineering (Environmental Division), NIT Meghalaya, India
bDepartment of Civil Engineering (Environmental Division), IIT Guwahati, India
Author for correspondance*: jayeeta.hazarika@gmail.com*

ABSTRACT
Sludge cakes generated on primary wastewater treatment from virgin paper mills has high content of lignocellulosics intermixed with various harmful inorganic components such as heavy metals, salts and fillers. The lignocellulosics exhibit poor degradability and casual application to soil may cause robbing of soil nitrogen apart from other adverse effects. Moreover current strategies undertaken are cost-intensive and insufficient to cater the growing need for such huge generation of primary sludge. However vermicomposting primary paper mill sludge in this regard, offers a sustainable solution as it demands no outstanding capital rather generates a value-added resalable product masking the harmful components as well. Current study is therefore carried out on vermicomposting primary sludge over 45 days timescale with continual assessment of its degrading, nutritional and transforming ability. Organic matter degradation was measured in terms of soluble BOD, soluble COD and volatile solids. Apparently 50% reduction was recorded in sBOD and sCOD with around 20% reduction in volatile solids. Compost nutritional quality also exhibited around 70% increase in total nitrogen content with apparently 60% increase in phosphorus levels due to mineralization. However this was accompanied by significant reduction in pathogens i.e., total and fecal coliform and also reduction in the water soluble, TCLP and DTPA extractable fractions of mostly all the experimented heavy metals. Thus indicating the prospective use of the vermicompost in subsequent soil enrichment.
KEYWORDS- Primary paper mill sludge, vermicomposting, organic matter degradation, nutrient quality, heavy metals.

Agro-morphological characterization of rice landraces variety (Oryza sativa L.) of Majuli Districts of Assam

Venus Borgohain, Debolina Bhattacharjee, Arunima Das Hazarika, Sourabh Kr Das, Nilave Bhuyan
Department of Botany, J.B. College
Department of Biotechnology, J.B. College
Department of Zoology, J.B. College

ABSTRACT
Rice varieties show extensive genotypic and phenotypic diversity, resulting in about 120,000 different accessions worldwide. Based on several morphological and genetic markers, Oryza sativa is broadly divided into two varietal groups, namely japonica and indica, and these groups are further subdivided into five distinct subpopulations. Apart from that, considerable morphological, ecological and physiological variations exist within each varietal subpopulation owing to selection for adaptations to different agro-climatic conditions. Therefore, assessment, documentation, analysis and conservation of the extant genetic diversity are essential prerequisites to mine useful genes for the development of the new, adaptive cultivars.
During this study, using a set of 10 descriptors, 50 rice landraces from Majuli district of Assam were morphologically characterized to investigate the major determinants of phenotypic diversity. Photographic records of the collected rice seeds were made. Variation in qualitative and quantitative characteristics of the collected seeds was also recorded. We further identified the core groups for seed characteristics using principal component analysis. Landraces can be useful source of genetic material for development of new adaptive cultivars in future. Therefore we also experimented on development of a simple method for DNA extraction from the collected landraces. A simple method of DNA extraction from Rice seeds was established and PCR amplification using primers specific to chloroplast and nuclear DNA was confirmed.
KEYWORDS- Rice, Landrace, Seed Characters, DNA isolation

Angshuman Rajbangshi
Assam Down town University
rajbangshi50@gmail.com

ABSTRACT
A comparative study of the different bacterial micro flora prevalent over the different cattle farms can be made to assess whether location, activities, hygienic conditions etc, influence the micro flora of the different cattle farms. Samples were collected from four cattle farms for the study, samples were inoculated into various differential and selective agar medium, various staining and biochemical test were also carried, in order to characterize the bacterial isolates. The study has been planned with the aim to cover four cattle farms located all over Guwahati region. 22 colonies were isolated from four cattle farm ; Jalukbari (private) cattle farm, Bharalu (private) cattle farm, Chandrapur (government) cattle farm and Khanapara (government) samples, (samples were collected form dust, feed and soil);out of them 20 colonies were characterized. Biochemical test and molecular techniques can be done for identification up to species level of isolated bacterial strains. Various environmental conditions and other factors (like hygienic, unhygienic, maintenance, water supply source, feed source, daily monitoring) can affect the type of micro flora prevalent in the environment of the cattle farm.

In-vitro anti-oxidant and anti-diabetic evaluation of Kigelia africana (Lam.) Benth.

Rantumoni Sharma*, Jayashree Dutta, Pankaj Bharali and Prof. M.C. Kalita
Department of Biotechnology, Gauhati University, Guwahati – 781014
*Email ID: rantu.rms20@gmail.com
Contact no: 7399753424

ABSTRACT
Herbal medicine plays an essential role to develop therapeutic strategies in the management of various diseases. Kigelia africana (Lam.) Benth. [Family – Bignoniaceae], commonly known as the Sausage tree, is a highly diversified potent medicinal plant. The plant is enriched for its anti-diabetic, anti-cancer, anti-ulcer, anti-aging, anti-oxidant, anti-malarial, genital infections, renal ailments, etc., properties in traditional databases. In the present study, the in vitro anti-oxidant activity, anti-diabetic activity and phytochemical evaluation of three different solvent extracts i.e, chloroform, methanol and water, from the fruits of Kigelia africana was determined. The phytochemical analysis of the aqueous extract of the fruit sample revealed the presence of alkaloids, tannins and flavonoids; on the other hand absence of saponins and tannins. Antioxidant activities of these extracts were evaluated through DPPH assay and ABTS assay, free radical scavenging activity and compared to the standard Ascorbic acid. The anti-diabetic activities of these extracts were determined by alpha-amylase and alpha-glucosidase inhibition assay. IC50 was calculated for both the anti oxidant and anti-diabetic activity of extracts which were found to be promising. The results obtained showed that the fruits of Kigelia africana have anti-oxidant and anti-diabetic properties, which could be a futuristic alternative for prevailing medicines for anti-oxidant and anti-diabetic.

Standardization of a non-lethal DNA extraction method in Antheraea assamensis

Jyoti Daga , Shradha Shandilya, Sourabh Kr Das, Nilave Bhuyan
1. Department of Zoology,
J.B. College
Department of Biotechnology

ABSTRACT

Sericulture is a major cottage industry of Assam and rearing of Antheraea assamensis plays an important role in the rural economy of this region. Recently a lot of progresses have been made in molecular diversity analysis of muga silk worm. However, for isolation of DNA from muga larvae, invasive methods are used which involves killing of the larva or moth. This limits the application of identified diversity of silkworms as well as identification of marker regions responsible for important cocoon characters. In view of the above, a rapid DNA extraction method from Antheraea assamensis was developed using two sources of tissue sample: exuviae shed during larval stage and wings of mature moth. This methodology is non-invasive, less expensive and reproducible with DNA recovery capacity of 15µl of 50-100ng DNA/µl. Using the DNA extracted by this method, reported microsatellite markers could be PCR amplified with high efficiency. The results presented will contribute in the development of a basic method for QTL based molecular marker analysis through DNA isolation of Muga silk worms in a non-destructive way without disturbing the larva, which will ultimately produce the cocoon.

KEYWORDS – Antheraea assamensis, DNA isolation, Non-invasive.

Study Of Comparative Foliar Architecture, Micro-Morphology And Neutraceutical Property Of Gynocardia Odorata R.Br. And Hydnocarpus Kurzii (King) Warb. (Achariaceae)

D. Kalita, N. Devi and M.C. Kalita
Department of Botany, Gauhati University, Guwahati-781014, Assam, India
Department of Biotechnology, Gauhati University, Guwahati-781014, Assam, India
dipkalita3191@gmail.com

ABSTRACT

Foliar architecture and micro-morphological studies of Gynocardia odorata R.Br. and Hydnocarpus kurzii (King) Warb. were carried out under light microscope for enhanced taxonomic comprehension and as an aid to identification. Both qualitative and quantitative characters like veins, vein order, areolation, cell and cell wall nature, length, breadth, number of epidermal cell, stomatal distribution, type, stomatal frequency and index were studied. The antioxidant activity was evaluated by using 1,1- diphenyl-2-picrylhydrazyl (DPPH) free radicals. The IC50 values of Gynocardia odorata R.Br. and Hydnocarpus kurzii (King) Warb. were found to be 14.42 ± 3.16 µg/ml and 80.37 ± 7.66 µg/ml respectively. Among the neutraceutical properties, carbohydrate, protein, total phenolic content and ascorbic acid were investigated. The study revealed that the leaves can be used as therapeutic agent as they exert several beneficial effects by virtue of their neutraceutical and antioxidant activity.

KEYWORDS- Foliar architecture, Micro-morphology, Antioxidant activity, Neutraceutical property, Gynocardia odorata R.Br., Hydnocarpus kurzii (King) Warb.

Encapsulation of Venlafaxine HCl in to Poly-e-caprolactone microspheres by oil-in-oil and water-in-oil-in water emulsion solvent evaporation technique and comparison for its controlled release properties

Manabendra Rabha, Bipul Nath
Girijananda Chowdhury Institute of Pharmaceutical Science

ABSTRACT

Venlafaxine HCl is a new generation serotonin reuptake inhibitor drug having antidepressant activity with half-life of 4-5 hours. Our present work investigates the method for the efficient encapsulation of highly water soluble Venlafaxine into Poly-e-caprolactone microspheres by oil-in-oil and water-in-oil-in water double emulsification technique and comparison for its controlled release properties. The solid state interaction was studied by FT-IR and DSC. The surface topography of the prepared microspheres was evaluated by scanning electron microscopy (SEM). Also, the microsphere was evaluated for particle size, drug entrapment efficiency and in-vitro drug release characteristics. Results showed that VLF can be successfully encapsulated in to all the microspheres and study led nearly to 80-87% encapsulation efficiency of VLF. The morphological characteristics of microspheres showed the particles with some imperfections like pits as well as craters on the surface in o/o. However the particles were smooth and spherical in w/o/w method. The particle size distribution showed mean diameter mostly between 140 µm and 265 µm in all the preparations. Of all formulations prepared drug–polymer ratio 1:2 was selected as the optimized formulation based on particle size, particle shape, drug entrapment and the release behavior. The in vitro release kinetics showed a burst release of 35- 40% in the case of o/o method while a 20-25% of burst release noticed in the case of w/o/w method in the first one hour and total of about 80% was released in 3 days.

Formulation And Evaluation Of Capecitabine Tablet For Colon Specific Drug Delivery Systeam

Mobarak Hussain*, Dr. Biswajit Das, Dr. Suvakanta Dash
Girijananda Chowdhury institution of pharmaceutical science, Azara, Hathkhoyapara, Guwahati-17

ABSTRACT

The aim of the present work was to develop and evaluate colon specific fast dissolving of Capecitabine tablet for the Colon cancer treatment, using pectin as enzyme dependent polymers. PH dependent polymers like Eudragit S100 and Cellulose acetate phthalate are used for coating material. Fast dissolving core tablet of Capecitabine was prepared by using CCS as a super disintegrant by direct compression method. The compression coating was done over the core tablets by using pectin. The enteric coating was done on the compression coated tablets by using ES100 and CAP in different ratios by dip coating method. The FTIR of drug-polymer and polymer-polymer was studied and revealed the compatibility of drug-polymer and polymer-polymer. In-vitro in-vivo evaluation of colon specific drug delivery of capecitabine, and evaluation of anticancer activity by using animal model. The results are to be compared with marketed formulation to see that whether any deviation occurred between the marketed formulation and the prepared formulation.

Oral fast disintegrating tablet of Ibuprofen: Formulation strategy and evaluation using two super disintegrants

Dr. Bipul Nath, Hrishav Purokayastha

ABSTRACT

The aim of the present investigation was to design and evaluate orally disintegrating tablet (ODT) of Ibuprofen, an NSAID drug used for the treatment of arthritis. Due to its low solubility, gastric irritation and its short biological half-life of 2 hours, fast dissolving tablets of Ibuprofen were prepared using superdisintegrants in order to improve the dissolution rate, thereby the absorption and to reduce gastric irritation. The tablets were characterized for hardness, thickness, friability, weight variation, content uniformity and disintegration time. The optimized ODT was found to meet the regulatory requirement of DT and friability specification. FTIR and DSC studies shown there was no interaction between drug, super disintegrants and other filler excipients. All the prepared formulations have disintegration time shorter than five minutes. The influence of concentration of the sodium starch glycolate was studied by a set of five formulations (F1, F2, F3, F4, F5) with concentrations of sodium starch glycolate viz, 1%, 2%, 3%, 4% & 5%w/w respectively. The influence of concentration of the Cross carmellose sodium was studied by a set of another five formulations (F6, F7, F8, F9, F10) with concentrations of 1 %, 2%, 3%, 4% & 5%w/w respectively. The formulation prepared with 5%w/w of sodium starch glycolate and 3% of cross carmellose sodium was offered relatively rapid release of Ibuprofen when compared with other concentrations of both the super disintegrant. The kinetic treatment showed that the release of drug follows Zero order followed by first order and closely related to higuchi spherical matrix release indicating diffusion mechanism. So, we can conclude that nature and concentration of the superdisintegrant showed influence on the rate of dissolution.

Morphological and Molecular identification of Tarantulas of Assam

Abinash Bharadwaj[1], Shifa Siddique1, Sourabh Kr Das[2], Nilave Bhuyan[1,2]
[1.] Department of Zoology, J.B. College; [2.] Department of Biotechnology, J.B. College

ABSTRACT

Tarantula is a common name, generally applied to any large hairy spider, and to some large wolf spiders found in southern Europe. Taxonomically, only members of the family Theraphosidae (suborder Mygalomorphae) are considered as true tarantulas. Theraphosids has worldwide distribution and are mostly represented in tropical or semi-tropical areas. The diversity of some tropical areas remains barely explored and it can be expected that many new species remain to be described. In addition, these animals have become increasingly popular as pets creating chances of illegal trading and threat to biodiversity. In Assam (and other North Eastern states of India, presence of Theraphosidae spiders representing species of Chilobrachys and Selenocosmia are reported by several authors (Pocock 1895; West and Nun, 2010). These reports were based on morphological identification and DNA based studies were not accompanied by it. Recently, DNA barcoding has evolved as a novel method for identification of animal species using mitochondrial Cytochrome Oxidase (Cox) gene sequence.

In this report we describe a DNA based approach to identify tarantulas reported from Assam using DNA barcode. Here we repost a simple method for extraction of total DNA from collected dead tarantula spiders or their exuviae and its PCR amplification using universal primers for Cytochrome oxidase gene. The sequence generated was compared with DNA database of NCBI and was found to have 75% similarity with Selenotholus sp.

KEYWORDS – DNA extraction, DNA barcoding, Tarantula

Determination of association pattern of Type 2 diabetes with anthropometric parameters in the north eastern Indian population

Ananya Bhowmicka, Purabi Sarkara, Manash P Baruahb, and Sofia Banua*
1 Department of Bioengineering and Technology, GUIST, Guwahati-14.
(ananya.benazir@gmail.com, purabisarkar7@gmail.com)
Excel Centre (Initiative of Excelcare Hospitals), Ulubari, Guwahati-7, India. (manashb2@gmail.com)

ABSTRACT

Type 2 diabetes (T2D) is a complex and polygenic metabolic disorder with numerous risk factors. Genome-wide association studies (GWASs) have revolutionized the complex disease genomics research worldwide and have illuminated polymorphisms in several genes including TCF7L2, PPARG, FTO, KCNJ11, SLC30A8 and HHEX. To investigate the involvement of these polymorphisms in conferring susceptibility to T2D in the North East Indian population, this study was undertaken as a pilot scale attempt.

Methods and Materials:
DNA was extracted 155 diabetic patients and 100 non-diabetic controls. The genes FTO, PPARG, KCNJ11, SLC30A8, HHEX, TCF7L2 and CDKAL1 were analyzed either by restriction digestion or by direct sequencing of the PCR amplicons. The statistical analysis was performed using SPSS.

Result and Discussion:
For SNP rs13266634, the genotypic frequency (control/case) for (CC/TT) homozygous mutation, (0.0040) was found to be statistically very significant. From the sequences obtained, the pattern of mutation of FTO (rs9939609) and FTO (rs9926289) gene shows strong disposition to each other. The genotypic frequency (control/case) for rs9939609 (AA/TT) heterozygous mutant, (0.0294) was found to be statistically significant, indicating significant differencing in the mutation pattern between cases and controls. The incidence of the mutant TT genotype was significantly higher ($p = 0.0291$) in the BMI > 26 group and for the CDKAL1 gene variant (rs9465871), significant association was observed between the inheritance pattern of heterozygotic mutants CT and wild type CC variants ($p = 0.0102$). Hence high BMI levels emerged as a significant covariate with confounding effects.

Conclusions:
The results indicate more than 50 percent of the study population carried the mutations. For the polymorphisms of gene SLC30A8, CDKAL1, HHEX and FTO, our study was able to establish a positive association between the inheritance pattern of mutation with anthropometric parameters, primarily with elevated BMI, HbA1c and LDL cholesterol levels and can serve as a potential tool to tailor therapy for T2D prevention and management.

Acknowledgments:
We are highly grateful to Gauhati University and Excel Care Centre for providing the infrastructural support to perform this work.

An approach to mitigate the transgression of elephant into the human-habitat

Murchana Malakar, Afsana Rahman, Pallavi Devi
M.Sc Student
Department of Extension Education, AAU, Jorhat

ABSTRACT

The man-elephant conflict is spreading like a wildfire in Assam. Rapid loss of dense forests, infrastructure projects taken up in elephant habitats and rising frustration of villagers due to loss of property and lives have contributed to this transgression phenomenon. It has become a serious threat for their mutual survival around the globe. In India, over 100 people are killed by elephants each year. Its frequency has grown in recent decades, mainly because of the exponential increase in human population and the resulting expansion of human activities. Unfortunately with no option left, poor wildlife creatures had to adopt a refugee life in green vicinity around human habitat. The shrinkage of forest cover has not only accelerated human elephant conflict but has also resulted in increasing casualties on both sides. National Crime Records Bureau highlighted the gravity of the problem, Assam stood second in the country of killing by animals from 2009-2011.Within these 3 years, 290 people faced the wrath of the animals in Assam. Apart from these at least 70 people have been killed. Elephants are highly intelligent creatures and can communicate using very low frequency sounds, with pitches below the range of human hearing. These low-frequency sounds (infrasound) can travel several kilometers, and provide elephants with a "private" communication channel. If this channel can be interrupted then it might create a barrier, hampering their communication channel and if the barrier can be used to transmit signals alarming the human population around the vicinity then it can be used as an effective precautionary measure. This review illustrates an approach which can be adopted to mitigate the human-elephant conflict.

KEYWORDS- Transgression, infrasound, human-elephant conflict.

Agro-morphological characterization of rice landraces variety (Oryza sativa L.) of Majuli Districts of Assam

Venus Borgohain1, Debolina Bhattacharjee1, Arunima Das Hazarika1,
Sourabh Kr Das2, Nilave Bhuyan1,3
Department of Botany, J.B. College; 2. Department of Biotechnology, J.B. College; Department of Zoology, J.B. College

ABSTRACT

Rice varieties show extensive genotypic and phenotypic diversity, resulting in about 120,000 different accessions worldwide. Based on several morphological and genetic markers, Oryza sativa is broadly divided into two varietal groups, namely japonica and indica, and these groups are further subdivided into five distinct subpopulations. Apart from that, considerable morphological, ecological and physiological variations exist within each varietal subpopulation owing to selection for adaptations to different agro-climatic conditions. Therefore, assessment, documentation, analysis and conservation of the extant genetic diversity are essential prerequisites to mine useful genes for the development of the new, adaptive cultivars.
During this study, using a set of 10 descriptors, 50 rice landraces from Majuli district of Assam were morphologically characterized to investigate the major determinants of phenotypic diversity. Photographic records of the collected rice seeds were made. Variation in qualitative and quantitative characteristics of the collected seeds was also recorded. We further identified the core groups for seed characteristics using principal component analysis. Landraces can be useful source of genetic material for development of new adaptive cultivars in future. Therefore we also experimented on development of a simple method for DNA extraction from the collected landraces. A simple method of DNA extraction from Rice seeds was established and PCR amplification using primers specific to chloroplast and nuclear DNA was confirmed.

KEYWORDS– Rice, Landrace, Seed Characters, DNA isolation.

Effect of botanicals in sericulture

Silkworms are beneficial insects which are reared mainly for the production of silk. Anything consumed by them directly or indirectly affect the silkworm biology. The health and growth of silkworms greatly influence the cocoon parameters and production of silk. Available information on nutritional ecology of silkworm is a prerequisite for determining the health and growth of silkworm larvae and its cocoon parameters. The indiscriminate use of insecticides against the various insect pest and disease of silkworm and their host plants has led to development of insecticidal resistance besides leading to environmental pollution and health hazard to non-target species, thus necessitating the adoption of alternative methods to manage the insect pests, keeping the health of silkworms and non-target species as prime concern. Recently there has been a concerted effort to promote the use of botanicals as possible alternatives to treat infectious diseases (Chanda et al., 2011). In some cases they are believed to function as biochemical defense (Jain et al., 2004). These plants produce many compounds as secondary metabolites that have no apparent metabolic, physiological and structural role in the producer, but often have effects on others organisms. There are number of plants which are having Insect Growth Regulatory (IGR) activity, when used in higher concentrations they are detrimental to the insects but useful at lower concentrations particularly for productive insects (Devi, 2013). Several studies also indicates promising effect of botanicals in sericulture.

Ms. Clarissa Handique
J B college, Jorhat

ABSTRACT

Tea [Camellia sinensis (L.) O. Kuntze], belongs to the family Theaceae, is one of the economically important non-alcoholic beverage yielding perennial crop, extensively cultivated in Northeast India. About 80% of the tea crop loss is associated with tea pests and pathogens that are responsible for extensive damage of this plantation crop and thereby cause emerging threat to the larger industry in the country. Exploitation of a few entomopathogens such as Beauveria bassiana (MTCC 984), Metarhizium anisopliae and Verticillium lecanii (MTCC 956) were tried in the present investigation to control tea pests such as Hyposidra talaca and Buzura suppressaria. Pre-pupa, pupa and late pupa were the three different stages of growth of the tea pests against which the activity of the entomopathogenic fungi were tested. Infections in pre-pupa stage of each pest by entomopathogens are more in comparison to other tested stages. Spore load of 21.8± 1.1 X106 spores/ml caused maximum mortality up to 70% at pre-pupa stage for the tested pests whereas the mortality in late pupa stage is relatively low. However, the percent mortality varied with species. As chemical pesticides are creating enomorous damage to soil health and caused lethal and sub-lethal effects to human beings besides creating residue problems in made tea, pest resussarence etc., the present approach of exploiting bioagents (entomopathogen) in management of common tea pests would be a cost effective alternative approach to bring sustainable tea cultivation.

Dr. Sourabh Kumar Das
Jagannath Barooah College

ABSTRACT

Oil spill and plastic deposits are the most significant pollutants in the environment as they are capable of causing serious damages to humans and the ecosystem. Physical, chemical and mechanical methods are available for clearing of these pollutants. However, these methods are very expensive. Therefore, there is a need to establish a cost effective and eco-friendly method for removal of these pollutants.

North-Eastern region of India, especially Assam has four oil refineries which are continuously extracting oil from different sources. This is increasing the chance of oil spill related pollution. Moreover, daily use of plastic in different household activities as well as different industries causes a huge deposition of plastic wastes to the ecosystem.

Recent Studies have shown that it is possible to eliminate a wide range of pollutants and waste by biological treatments using microbes. In order to establish an experimental basis for bioremediation of soil contaminated with crude oil and plastic, eighteen strains of bacteria with hydrocarbon-degrading ability were isolated from the contaminated soil in Jorhat, Assam. The ability to utilize crude oil as carbon source for their growth was ascertained. Further study under soil conditions is underway to determine biodegradation potential of bacterial mixture in natural condition.

KEYWORDS – Bacteria, Biodegradation, Oil spill, Plastic, Pollution.

Effectiveness of Arbuscular Mycorrhizae in paddy rhizosphere as influenced by different doses of Phosphorus

Ipsita Ojah* and Dhruba Jyoti Nath
Department of Soil Science, Assam Agricultural University, Jorhat-13, Assam 785 013

ABSTRACT

Arbuscular Mycorrhyzal (AMF) Fungi spores obtained through mass multiplication in maize (in a previous experiment) used as a host and roots were tested for their effectiveness in a pot experiment in rice with three levels of P2O5 (0, 20 and 40 kg/ha) under submerged condition. By reducing levels of P2O5 (20kg/ha) comparable plant biomasses were recorded ($P<0.05$) under AMF inoculation with that of highest level of P2O5 (40kg/ha) with or without AMF inoculation. By reducing the P supply (20kg/ha), the measurable effect of AMF ($P<0.05$) was obtained for P and N concentration (1.27 and 7.88mg/g respectively) and their uptake (20.63 and 127.50 mg/plant respectively) in rice plants which were comparable with uninoculated plants at 40kg P2O5/ha. AMF spores and root colonization were found at all levels of P supply, although overall the numbers of AMF spores and per cent root colonization decreased with increasing P under AMF inoculation which implies that saturation or inundation does not necessarily prevent the development of AMF association.

KEYWORDS- Arbuscular Mycorrhyzal Fungi, Phosphorus, Spore abundance, Root colonization

Studies on the effect of Trichoderma inoculation during Storage of Tea Seeds

Indrani Gogoi, Junamoni Dutta, Dr. Liza Handique Bhattacharyya

ABSTRACT

Tea [Camellia sinensis (L.) O. Kuntze] is an economically important, non-alcoholic, aromatic beverage yielding perennial crop, extensively cultivated in North East India, Assam. Propagation in tea plant is usually done through the seeds and cuttings. In case of propagation from seeds, it is important to monitor the quality and health of seeds. Although chemicals are also used in storage of tea seeds but sometimes it may have detrimental effect to the seedlings and, thus, it affects the overall tea cultivation in large. Application of alternative strategies such as microbial inoculants might be helpful in this aspect to protect the seeds. In the present investigation, we have tried a Trichoderma based seed protection strategy to protect the seeds during storage. Different concentrations of the microbial were used for different incubation periods to standardize the antagonist for healthy tea seed preservation. Maximum growth of the Trichoderma fungus and seed protection ability was observed in the treatments with seed treated with Trichoderma @5% spore treatment for 2hrs, 4hrs and 6hrs followed by 10% and 20% in 7days within an incubation temperature of 10°C -21°C. In most of the cases, it was observed that the dark green colored Trichoderma viride colonized all around the seeds, after 7 days of incubation periods, thus, shown the ability of the bio control agent for providing maximum protection.

KEYWORDS- Bio control agent; chemical application; microbial inoculants; seed storage; tea; Trichoderma viride.

Insecticidal activity of Phlogocanthus thyrsiflorus Nees (Acanthaceae) against Pulse beetle Callosobruchus chinensis
(L.) (Coleoptera: Bruchidae) in stored green gram seed (Vigna radiata L.)

C. Murasing1, P. Das2 , P. Saikia3 and P. Borbaruah4
1SRF, 2Assistant Professor, 3M.Sc. Student, 4 M.Sc. Student ,Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam, India

ABSTRACT

Petroleum ether, ethanol and water extracts of Phlogocanthus thyrsiflorus Nees were evaluated to find out their effect on biological parameters against Pulse beetle (Callosobruchus chinensis L.) in green gram seeds. It was observed that the botanical was superior over control to suppress some biological parameters such as adult mortality, oviposition deterrence and adult emergence. Among the solvent extracts petroleum ether was found to be significantly superior over rest of the solvent extracts, registered the highest percent of mortality (100%) at 5% conc. after 96 hour of treatment followed by ethanol (80%) and water extract (78%) respectively. The LC50 value of petroleum ether extract of P. thyrsiflorus at 72 HAT recorded the lowest LC50 (2.278%).After 7 days of seed treatment at 5 % conc. highest oviposition deterrence was found in petroleum ether extract (66.62%), followed by ethanol (57.16%) and water extract (52.38%) respectively. In terms of inhibition rate of insect, petroleum ether extract at 5% conc. was found to be most effective (82.45%), followed by ethanol (79.77%) and water extract (78.11%) respectively from 1st day to 10th days of adult emergence. The present review focused on botanicals for controlling pulse beetle.

KEYWORDS: Phologocanthus thyrsiflorus, Callosobruchus chinensis, Adult mortality, Oviposition deterrence, Adult inhibition rate, LC50.

Isolation and Characterization of Hydrocarbon Degrading Microorganisms

Shravanika Mahanta1, Jyotishmoyee Boruah1, Mousumi Rajkumari1,Sourabh Kr Das2, Runjun Gogoi Rajkumari1, Nilave Bhuyan3
1. Department of Botany, J.B. College; 2. Department of Biotechnology, J.B. College; 3. Department of Zoology, J.B. College

ABSTRACT

Oil spill and plastic deposits are the most significant pollutants in the environment as they are capable of causing serious damages to humans and the ecosystem. Physical, chemical and mechanical methods are available for clearing of these pollutants. However, these methods are very expensive. Therefore, there is a need to establish a cost effective and eco-friendly method for removal of these pollutants. North-Eastern region of India, especially Assam has four oil refineries which are continuously extracting oil from different sources. This is increasing the chance of oil spill related pollution. Moreover, daily use of plastic in different household activities as well as different industries causes a huge deposition of plastic wastes to the ecosystem. Recent Studies have shown that it is possible to eliminate a wide range ofpollutants and waste by biological treatments using microbes. In order to establish an experimental basis for bioremediation of soil contaminated with crude oil and plastic, eighteen strains of bacteria with hydrocarbon-degrading ability were isolated from the contaminated soil in Jorhat, Assam. The ability to utilize crude oil as carbon source for their growth was ascertained. Further study under soil conditions is underway to determine biodegradation potential of bacterial mixture in natural condition.

KEYWORDS – Bacteria, Biodegradation, Oil spill, Plastic, Pollution.

Exploring microbial bioagents for suppression of Ralstonia solanacearum associated with micropropagated banana plantlets

Dutta J. and Bora L.C.
Department of Plant Pathology Assam Agricultural University, Jorhat-785013, Assam *duttajoli@gmail.com*

ABSTRACT

Generally, micropropagated plantlets are free from any pests and diseases. But after hardening, when it is transferred from controlled environment to a new environment, then some pathogens are associated with these micropropagated plantlets. To overcome this problem, bioprospective microbial antagonists are incorporated with these plantlets. To have a sustainable agricultural system with minimum contamination and risks to the environment, a consortial formulation of microbial antagonists should be applied to manage disease problems. Four antagonistic microorganisms Trichoderma viride, Metarhizium anisopliae, Pseudomonas fluorescens and Bacillus thuringiensis and their consortia were used to suppress Ralstonia solanacearum, the causal agent of bacterial wilt disease of micropropagated banana during 2014-16. The compatibility tests conducted in vitro among these bioagents showed that all the bioagents were compatible amongst themselves. The consortia of different antagonists were tested to assay their ability to inhibit the growth of R. solanacearum in vitro. Combination of B. thuringiensis, T. viride, M. anisopliaeand P. fluorescens showed maximum inhibition (97.06%) followed by combination of T. viride,P. fluorescens and M. anisopliae(93.40%) and combination of T. viride, B. thuringiensisand M. anisopliae(86.67%). The efficacy of the microbe based consortial formulations was also tested for their ability to suppress diseases caused by R. solanacearum in vivo in pot grown micropopagated banana plantlets. There was a significant reduction of bacterial wilt disease incidence (19.08%) accompanied by enhancement of yield attributing characters in banana due to application of consortial formulation of bioagents applied as root treatment and soil treatment.

KEYWORDS- Micropropagated banana, *Ralstonia solanacearum*, antagonistic microorganism

Standardization of a non-lethal DNA extraction method in Antheraea assamensis

Jyoti Daga1, Shradha Shandilya1, Sourabh Kr Das2, Nilave Bhuyan1,2
1. Department of Zoology, J.B. College; 2. Department of Biotechnology, J.B. College

ABSTRACT

Sericulture is a major cottage industry of Assam and rearing of Antheraea assamensis plays an important role in the rural economy of this region. Recently a lot of progresses have been made in molecular diversity analysis of muga silk worm. However, for isolation of DNA from muga larvae, invasive methods are used which involves killing of the larva or moth. This limits the application of identified diversity of silkworms as well as identification of marker regions responsible for important cocoon characters. In view of the above, a rapid DNA extraction method from Antheraea assamensis was developed using two sources of tissue sample: exuviae shed during larval stage and wings of mature moth. This methodology is non-invasive, less expensive and reproducible with DNA recovery capacity of 15µl of 50-100ng DNA/µl. Using the DNA extracted by this method, reported microsatellite markers could be PCR amplified with high efficiency. The results presented will contribute in the development of a basic method for QTL based molecular marker analysis through DNA isolation of Muga silk worms in a non-destructive way without disturbing the larva, which will ultimately produce the cocoon.

KEYWORDS – Antheraea assamensis, DNA isolation, Non-invasive.

Carbon sequestration: A way towards mitigating climate change related to crop production

Lekhika Borgohain[1] and Danish Tamuly[2]
[1]M. Sc. (Agri.) student and [2] Assistant Professor
Department of Soil Science, Assam Agricultural University

ABSTRACT

The global standpoint depicts 2015 as important vis-à-vis climate change (CC) as three global treaties viz., Paris agreement (2015-30), sustainable development goal (2015-30) and Sendai Framework (2015-30) for disaster risk reduction was agreed upon by the world leaders. Anthropogenic drivers viz., over dependence on fossil fuels, deforestation, imbalance fertilizer application etc have caused substantial increase in carbon dioxide (CO2) concentration leading to global warming induced CC. Over the past two and a half century (1750-2014), CO2 concentration has increased from 280 parts per million (ppm) in 1750 to 400 ppm with a CAGR of 3 ppm. Potential adverse impacts include extreme weather events, depleted biodiversity as well as agrarian distress. Scientific land husbandry practices including soil and agronomic strategies such as use of balanced fertilizers, nutrient management, less soil disturbance, better irrigation, cover crops, crop rotation, intensive farming operation, conservation tillage has proved to mitigate the consequences of increased atmospheric CO2. It restores degraded soils, enhances the land productivity, improves the diversity, protects the environment and reduces the enrichment of atmospheric CO2, hence shifts emission of GHGs and mitigates climate change. Globally, soils are estimated to contain approximately 2400 Pg of carbon twice more than the amount in vegetation (approximately 1750 Pg) and thrice that in the atmosphere (750 Pg). Carbon sequestration is a growing research topic that addresses one important aspect of an overall strategy for carbon management to help mitigate the increasing emissions of CO2, into the atmosphere. The present review attempts to congregate carbon sequestration work carried out in the country in general and north east in particular.

KEYWORDS- Carbon sequestration, climate change, GHGs.

STATUS OF CORPORATE SOCIAL RESPONSIBILITY (CSR) IN NORTH EASTERN REGION OF INDIA

LH Changde Catherine[1] and Panthoi Chongtham[2]*
[1,2]M.Sc. (MBA) scholar, Department of Agricultural Economics & FM (MBA- Agri Business), FA, Assam Agricultural University, Jorhat-13, Assam
Email id of corresponding author: changwar@rediffmail.com

ABSTRACT

India has a long tradition in the field of Corporate Social Responsibility (CSR) and Industrial Welfare and it has been put to practice since late 1850s. Business practices, in the 1900s, that could be termed socially responsible took different forms: philanthropic donations to charity, service to the community, enhancing employee welfare and promoting religious conduct. Going by the new norms, the two per cent spending on CSR is not mandatory, but reporting about it is mandatory. Proper disclosure of the CSR policy by the corporate, reasons for not meeting the required expenditure and various activities that may be included in the CSR agenda of the companies are on the rising trend in the new CSR provisions. Thousands of companies are expected to fall under the CSR obligations which may lead to estimate CSR spending amounting to thousands of crores of rupees. The concept of CSR has evolved from being regarded as detrimental to a company's profitability, to being considered as somehow benefiting the company as a whole, at least in the long run. Corporate Social Responsibility gives benefits to the community, general public, environment and the companies. In North Eastern Region, oil companies like Indian oil, ONGC etc. have been involving themselves in societal responsibilities through the provisions of CSR. Companies have started to realize the importance of CSR and initiate the steps towards it.

KEYWORDS- Corporate social responsibility, Oil companies, North eastern region.

Morphological and Molecular identification of Tarantulas of Assam

Abinash Bharadwaj1, Shifa Siddique1, Sourabh Kr Das2, Nilave Bhuyan1,2
1. Department of Zoology, J.B. College; 2. Department of Biotechnology, J.B. College

ABSTRACT

Tarantula is a common name, generally applied to any large hairy spider, and to some large wolf spiders found in southern Europe. Taxonomically, only members of the family Theraphosidae (suborder Mygalomorphae) are considered as true tarantulas. Theraphosids has worldwide distribution and are mostly represented in tropical or semi-tropical areas. The diversity of some tropical areas remains barely explored and it can be expected that many new species remain to be described. In addition, these animals have become increasingly popular as pets creating chances of illegal trading and threat to biodiversity. In Assam (and other North Eastern states of India, presence of Theraphosidae spiders representing species of Chilobrachys and Selenocosmia are reported by several authors (Pocock 1895; West and Nun, 2010). These reports were based on morphological identification and DNA based studies were not accompanied by it. Recently, DNA barcoding has evolved as a novel method for identification of animal species using mitochondrial Cytochrome Oxidase (Cox) gene sequence.

In this report we describe a DNA based approach to identify tarantulas reported from Assam using DNA barcode. Here we repost a simple method for extraction of total DNA from collected dead tarantula spiders or their exuviae and its PCR amplification using universal primers for Cytochrome oxidase gene. The sequence generated was compared with DNA database of NCBI and was found to have 75% similarity with Selenotholus sp.

KEYWORDS– DNA extraction, DNA barcoding, Tarantula.

Implementation of artificial gene networks that smell

Ms. Tasrin Shahnaz, Ms. Heena Kauser
Gauhati University Institute of Science and Technology

ABSTRACT

Till date there is no model device that can measure smell. The sense of smell is even more complicated than the sense of taste. The olfactory receptor family is among the largest known mammalian gene family with approximately 900 genes in human. Bioelectronics noses have been intended to mimic the signal processing of the sense of smell. But receptor materials of the conventional electronic noses are actually totally different from human olfactory receptors. However, the execution of programs that can rival natural biological systems, which have been fine-tuned by million years of evolution, has remained a challenge. In the past two decades, much has been learned about the smell sensing mechanism in biological systems. With each and every minute exploration of biological olfactory system and techniques for the expression of receptor proteins, researchers are able to utilize biological materials and systems to bio mimic the human nose. Bioengineers have designed synthetic olfactory system with consortium of human cells with an artificial sense of smell and thereby making the cells to detect, quantify, and also remember the presence of gaseous volatile compounds in their environment and are mainly used in distinguishing edible products adulterants.

An approach to mitigate the transgression of elephant into the human-habitat

Murchana Malakar, Afsana Rahman, Pallavi Devi
M.Sc Student
Department of Extension Education, AAU, Jorhat

ABSTRACT

The man-elephant conflict is spreading like a wildfire in Assam. Rapid loss of dense forests, infrastructure projects taken up in elephant habitats and rising frustration of villagers due to loss of property and lives have contributed to this transgression phenomenon. It has become a serious threat for their mutual survival around the globe. In India, over 100 people are killed by elephants each year. Its frequency has grown in recent decades, mainly because of the exponential increase in human population and the resulting expansion of human activities. Unfortunately with no option left, poor wildlife creatures had to adopt a refugee life in green vicinity around human habitat. The shrinkage of forest cover has not only accelerated human elephant conflict but has also resulted in increasing casualties on both sides. National Crime Records Bureau highlighted the gravity of the problem, Assam stood second in the country of killing by animals from 2009-2011.Within these 3 years, 290 people faced the wrath of the animals in Assam. Apart from these at least 70 people have been killed. Elephants are highly intelligent creatures and can communicate using very low frequency sounds, with pitches below the range of human hearing. These low-frequency sounds (infrasound) can travel several kilometers, and provide elephants with a "private" communication channel. If this channel can be interrupted then it might create a barrier, hampering their communication channel and if the barrier can be used to transmit signals alarming the human population around the vicinity then it can be used as an effective precautionary measure. This review illustrates an approach which can be adopted to mitigate the human-elephant conflict.

KEYWORDS- Transgression, infrasound, human-elephant conflict.

Role of remote sensing & gis in land use planing

Danswrang Basumatary , Dr. Marami Dutta.
Deptt. Of Soil Science, Assam Agricultural University, Jorhat-13
Email Id:- *dans.basumataryb410@gmail.com*

ABSTRACT

The application of Remote Sensing, GIS and precision farming techniques in the management of agricultural resources are increasing rapidly due to improvements in space science supported by computer and communication technologies. Remote Sensing technology has the potential of revolutionizing the detection and characterization of agricultural productivity based on biophysical attributes of crops and/or soils (Liaghat et al., 2010). Plant spectral properties reflect crop nutrient status and soil nutrient availability and they can be useful for directing in season variable N application (Scharf et al., 2002). Multispectral airborne satellite data & hand held radiometer have potential to map areas of soil textural calss with reasonable accuracy (Barnes et al., 2000). Multi-temporal remote sensing data-based crop inventory, NDVI and crop evapotranspiration estimation could rank the performance of the distributaries and also identify those having problems in water allocation and utilization (Ray et al., 2002). Bobade et al.,(2009) compiledsoil based GIS data and interpreted for agricultural land use suitability and fertility assessment and found 44% was non aerable and 56% of land was arable. Maurya & Rao (2014) used Advanced Microwave Scanning Radiometer 2s to estimate the surface soil moisture using brightness temperature data and found positive correlation with in situ soil moisture measurement.

Effect of Meloidogyne incognita infestation on plant growth parameter of Ivy gourd

Binita Basumatary[1], Rimi Deori[1], B. Mahanta[1]
[1] Department of Nematology, Assam Agricultural University, Jorhat-785013, Assam, India
E-mail- *basumatarybinita3@gmail.com*

ABSTRACT

The experiments was conducted to study the Effect of Meloidogyne incognita infestation on plant growth parameter of Ivy gourd (local variety) in nematode infested field (374 J2/200 cc soil) in the field of Department of Nematology located at Instructional-cum-Research (ICR) Farm, AAU, Jorhat during the rabi season of 2015.The experiment was laid out in Paired plot technique with ten replications. Required quantity of carbofuran granules @ 3 kg a.i./ha was applied at the spot two days before planting. Ten plots each of 3.0m x 3.5m size were treated and another ten plots were kept untreated control (without carbofuran application).Data indicated that mean fresh and dry weight of shoot and root of ivy gourd were reduced in untreatedplots of ivy gourd by 32.86, 14.62, 34.71 and 10.31 per cent respectively. And number of fruits were also reduced in untreated plots by 27.58 per cent over treated control plots.

KEYWORDS- *Meloidogyne incognita*, Ivy gourd, plant growth parameter, carbofuran.

Morphological and Molecular identification of Tarantulas of Assam

Abinash Bharadwaj1, Shifa Siddique1, Sourabh Kr Das2, Nilave Bhuyan1,2
1. Department of Zoology, J.B. College; 2. Department of Biotechnology, J.B. College

ABSTRACT

Tarantula is a common name, generally applied to any large hairy spider, and to some large wolf spiders found in southern Europe. Taxonomically, only members of the family Theraphosidae (suborder Mygalomorphae) are considered as true tarantulas. Theraphosids has worldwide distribution and are mostly represented in tropical or semi-tropical areas. The diversity of some tropical areas remains barely explored and it can be expected that many new species remain to be described. In addition, these animals have become increasingly popular as pets creating chances of illegal trading and threat to biodiversity. In Assam (and other North Eastern states of India, presence of Theraphosidae spiders representing species of Chilobrachys and Selenocosmia are reported by several authors (Pocock 1895; West and Nun, 2010). These reports were based on morphological identification and DNA based studies were not accompanied by it. Recently, DNA barcoding has evolved as a novel method for identification of animal species using mitochondrial Cytochrome Oxidase (Cox) gene sequence.

In this report we describe a DNA based approach to identify tarantulas reported from Assam using DNA barcode. Here we repost a simple method for extraction of total DNA from collected dead tarantula spiders or their exuviae and its PCR amplification using universal primers for Cytochrome oxidase gene. The sequence generated was compared with DNA database of NCBI and was found to have 75% similarity with Selenotholus sp.

KEYWORDS– DNA extraction, DNA barcoding, Tarantula.

Isolation and Characterization of Hydrocarbon Degrading Microorganisms

Shravanika Mahanta1, Jyotishmoyee Boruah1, Mousumi Rajkumari1,Sourabh Kr Das2, Runjun Gogoi Rajkumari1, Nilave Bhuyan3
Department of Botany, J.B. College; 2. Department of Biotechnology, J.B. College; 3. Department of Zoology, J.B. College

ABSTRACT

Oil spill and plastic deposits are the most significant pollutants in the environment as they are capable of causing serious damages to humans and the ecosystem. Physical, chemical and mechanical methods are available for clearing of these pollutants. However, these methods are very expensive. Therefore, there is a need to establish a cost effective and eco-friendly method for removal of these pollutants.

North-Eastern region of India, especially Assam has four oil refineries which are continuously extracting oil from different sources. This is increasing the chance of oil spill related pollution. Moreover, daily use of plastic in different household activities as well as different industries causes a huge deposition of plastic wastes to the ecosystem.

Recent Studies have shown that it is possible to eliminate a wide range of pollutants and waste by biological treatments using microbes. In order to establish an experimental basis for bioremediation of soil contaminated with crude oil and plastic, eighteen strains of bacteria with hydrocarbon-degrading ability were isolated from the contaminated soil in Jorhat, Assam. The ability to utilize crude oil as carbon source for their growth was ascertained. Further study under soil conditions is underway to determine biodegradation potential of bacterial mixture in natural condition.

KEYWORDS – Bacteria, Biodegradation, Oil spill, Plastic, Pollution.

PERFORMANCE OF SERICULTURE INDUSTRY IN MANIPUR

Panthoi Chongtham[1] and LH Changde Catherine[2]*
[1,2]M.Sc. (MBA) scholar, Department of Agricultural Economics & FM (MBA- Agri Business), FA, Assam Agricultural University, Jorhat-13, Assam
Email id of corresponding author: chpanthoi@gmail.com

ABSTRACT

Silk is a highly priced agricultural commodity which accounts for about 0.2% of the total world production of textile fiber. India is the only country in the world which produces all varieties of silk namely tasar, muga, eri and mulberry. India occupies a predominant position in the world and it is the second largest producer of silk after China. In India Manipur is ranked among top ten silk producing states with a contribution of nearly 2%. A huge section of people is dependent on sericulture for their livelihood generation in the state. Area covered under mulberry plantation is highest in Imphal East district followed by Thoubal district. The processed silk is used to prepare different traditional dressed such as Manipuri saree, enaphi, phanek, phige phanek, lengyan phi, waist coat etc. and the producers can sell these products in the range of Rs. 1,000-12,000. All the silk products have a very good demand in all the districts of Manipur and limited fine finished products are popular throughout the country. Presently government is trying to popularize sericulture industry among the farmers and initiated a few farmer-oriented policies which may attract more farmers towards this lucrative industry in future.

KEYWORDS- Silk, Manipur, Cocoon, Mean silk weight.

Performance of microbial consortium on french bean (Phaseolus vulgaris L.)

Jamini Saikia1, Luchon Saikia1 and Dhruba Jyoti Nath2
1Department of Horticulture, Assam Agricultural University, Jorhat-785013, Assam
2Department of Soil Science, Assam Agricultural University, Jorhat-785013, Assam
*E-mail: *jaminisaikia.saikia@yahoo.com*

ABSTRACT

An experiment was carried out during 2014-2015 at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat to study the performance of microbial consortium on french bean (Phaseolus vulgaris L.). The experiment was laid out in a randomized block design (RBD) with seven treatments and replicated thrice. The treatments were T1: FYM 20 t/ha+ NPK @ 30:40:20 kg/ha (RDF), T2: Enriched compost @ 3 t/ha, T3: Enriched compost @ 3 t/ha + Consortium, T4: Vermicompost @ 3 t/ha, T5: Vermicompost @ 5 t/ha, T6: Vermicompost @ 2.5 t/ha + Consortium and T7: Consortium (Rhizobium + Azotobacter + Azospirillum + PSB). The performance of french bean was greatly influenced by different treatments. Application of recommended dose of fertilizer in T1 recorded significantly higher yield attributing characters viz., pod/plant (28.57), pod length (15.07 cm), pod girth (0.96cm), seed/pod (6.73), pod yield (11.27 t/ha) and harvest index (67.67%) respectively. Among the organic treatments, T3 reflected the maximum for all the yield attributing characters which was closure with T1. Further, T3 also recorded the best for soil parameters viz., bulk density (0.83 g/cm3), pH (5.33), P2O5 (47.40 kg/ha), microbial biomass carbon (630.33µg/g/24h), dehydrogenase activity (711.50 µg TPF/g/24h) and phosphomonoesterase activity (442.43µg p-nitrophenol/g/h) respectively. T5 recorded highest organic carbon (0.68%); while T1 also revealed maximum N and K (220.56 and 119.31kg/ha) content. Hence, from the present study an alternative to RDF management, enriched compost 3 t/ha along with consortium is found to be effective to get more yields and improving the quality of french bean as well as maintains soil sustainability.

Insecticidal activity of Phlogocanthus thyrsiflorus Nees (Acanthaceae) against Pulse beetle Callosobruchus chinensis (L.) (Coleoptera: Bruchidae) in stored green gram seed (Vigna radiata L.)

C. Murasing1, P. Das2 , P. Saikia3 and P. Borbaruah4
1SRF, 2Assistant Professor, 3M.Sc. Student, 4 M.Sc. Student ,Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam, India

ABSTRACT

Petroleum ether, ethanol and water extracts of Phlogocanthus thyrsiflorus Nees were evaluated to find out their effect on biological parameters against Pulse beetle (Callosobruchus chinensis L.) in green gram seeds. It was observed that the botanical was superior over control to suppress some biological parameters such as adult mortality, oviposition deterrence and adult emergence. Among the solvent extracts petroleum ether was found to be significantly superior over rest of the solvent extracts, registered the highest percent of mortality (100%) at 5% conc. after 96 hour of treatment followed by ethanol (80%) and water extract (78%) respectively. The LC50 value of petroleum ether extract of P. thyrsiflorus at 72 HAT recorded the lowest LC50 (2.278%).After 7 days of seed treatment at 5 % conc. highest oviposition deterrence was found in petroleum ether extract (66.62%), followed by ethanol (57.16%) and water extract (52.38%) respectively. In terms of inhibition rate of insect, petroleum ether extract at 5% conc. was found to be most effective (82.45%), followed by ethanol (79.77%) and water extract (78.11%) respectively from 1st day to 10th days of adult emergence. The present review focused on botanicals for controlling pulse beetle.

KEYWORDS- Phologocanthus thyrsiflorus, Callosobruchus chinensis, Adult mortality, Oviposition deterrence, Adult inhibition rate, LC50.

Invasive weeds as Potential Feedstock for Biofuel Production-A pain to gain

Arupjyoti Borah [1], Mriganka Saha[1], Deep Bora[1], Arun Goyel [1, 2] and Vijayanand S. Moholkar [1,3,*]
[1]Center for Energy, [2]Dept. of Biotechnology, [3]Dept. of Chemical Engineering
Indian Institute of Technology Guwahati, Guwahati – 781 039, Assam, India
* - Author for correspondence: Email: vmoholkar@iitg.ernet.in, Fax: +91-361 2582291

ABSTRACT

In the present study, screening of potentially invasive feedstock that outcompete local vegetation was done on the basis of total carbohydrate present, which further can be converted to fermentable sugars. The feedstocks were selected, considering their abundant seed production and tolerance to wide range of soil and climatic conditions, for investigation of their feasibility as a potent candidate for biofuel production. The objective is to examine a two step bioconversion process that involves liberation of fermentable sugars from lignocellulose which will be eventually followed by conversion into liquid biofuels and/or chemicals by fermentation. Composition of lignocellulosic biomass was determined for all plant material. The feedstocks are mainly Bush Morning Glory (Ipomea carnea), Siam weeds (Chromolaena odorata) and rice straw (as model substrate). Total carbohydrate (hemicelluloses and cellulose) content was found to be 67.2 ± 2.1% w/w in Ipomea carnea.; 10.66% w/w in blue green algae; 65.3 ± 0.8% w/w in Chromolaena odorata and 36.66% w/w in rice straw.
Feedstock processing involved dilute acid treatment followed by steam explosion at 121oC, 15 psi for 15 min to reduce the crystallinity and depolymerize lignocellulosic biomass into its components i.e. monomeric sugars and phenolics. The individual sugars such as glucose, xylose, arabinose, and cellobiose in biomass samples were quantified by HPLC equipped with refractive index detector. Proximate and ultimate analyses of each biomass were carried out to analyze the composition of biomass. The structure and composition of untreated and treated biomass were also characterized using FTIR and XRD. Separate hydrolysis and Fermentation of all biomass was carried with mathematical modeling with HCH-1 model.

KEYWORDS- Biofuels, Invasive Biomass, Cellulose, Hemicellulose, fermentable sugars.

Recent Advances in Bio-Butanol Production by Clostridium spp.

Haimantika Seel[1,2], Saumya Ahlawat[1,2], Gargi Goswami1, Debasish Das[1,2*]
[1] Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati 2 DBT PAN IIT Center for Bioenergy

ABSTRACT

Increasing oil prices and growing awareness of global warming has brought significant attention to the production of biofuel from biomass. Acetone butanol ethanol (ABE) fermentation has recently gained renewed interest in the bio-refinery approaches for the production of fuels and chemicals from renewable resources. In the industrial scale, biobutanol is produced through ABE fermentation in Clostridium strains. Butanol has physiological properties similar to gasoline which makes it a competitive alternate energy source. Butanol produced during anaerobic fermentation exerts a strong inhibitory effect on cell growth and butanol production which in turn leads to low cell densities, low butanol titre, low butanol productivity and added complications of butanol recovery from the culture broth. These limitations countered during butanol production can be overcome through new technologies, which includes the latest developments in metabolic engineering, the exploitation of biodiversity and discoveries of new regulatory systems such as those aimed at enhanced microbial stress tolerance, as well as technological aspects, such as bio- and down-stream processing.

Effect Of Biofertilizer And Integrated Nutrient Management On Yield Of Potato And Soil Microbial Activity

Chutia R[1], Bhagawati P.C [1] and Nath D.J [2]
Department of Agronomy[1] and Department of Soil Science[2]
Assam Agricultural University, Jorhat-785013
Email : *rojichutia10@gmail.com*

ABSTRACT

Integrated nutrient management through bio-fertilizers, organic fertilizer and chemical fertilizers can sustain soil quality and improve plant growth. An experiment was conducted to study the effect of integrated nutrient management through a bio-fertilizer consortium consisting of Azotobacter sp., Phosphobacteria (Bacillus sp.), Pseudomonas sp. and K-mobilising bacteria on soil quality and growth and yield of potato. The experiment was conducted during rabi seasons of 2014-15 and 2015-16 at the instructional cum research farm of Assam agricultural university. Soil physico-chemical characters at harvest of potato were significantly influenced by INM practices of which T6 (50% RD of N + 25% N through EC + 25% N through VC) recorded the highest values for all the soil parameters viz., soil pH (5.58 and 5.62), soil organic carbon (SOC) (0.96 and 1.08%), available N (405 and 548.15 kg/ha), P (23.20 and 23.96 kg/ha) and K (333.89 and 336.55 kg/ha) during both the years of experimentation. Soil biological characters were also found to be statistically superior in respect of microbial biomass carbon (335.55 and 367.41µg g-1 soil), dehydrogenase activity (191.29 and 201.19 µg TPFg-124hr-1), phosphomonoesterase activity (356.44 and 382.46 µg p-nitrophenol g-1 hr-1), fluorescein di-acetate hydrolysis activity (9.22 and 9.26 µg fluorescein g-1 hr-1) at T6 followed by T4 (50% RD of N+ 50% N through EC).

KEYWORDS- Biofertilizer, Soil microbial biomass carbon, Dehydrogenase activity, Phosphomonoesterase, Fluorescein di-acetate, Enriched compost, Vermicompost

Morphological and biochemical characterization and estimation of antioxidant properties of pigmented and non-pigmented rice varieties.

Sankarjyoti Bora, Jyotshna Baruah, Sangeeta Das*
Department of Botany, Bahona College, Jorhat, Assam, India.

ABSTRACT

Two pigmented and two non-pigmented rice varieties collected from Majuli District of Assam were analysed for various physical, physicochemical properties, colour values and antioxidant properties. Betguti (BG) and chokua (CH) collected were the non-pigmented whereas Deuri Bao (DB) and Moimonsingia Bao (MB) were red in colour. The rice varieties differed in size and shape of kernels. Non-pigmented rice varieties were of low amylase content whereas pigmented rice varieties were of high amylase content. Highest level of total phenolic content (TPC) and Trolox equivalent antioxidant capacity (TEAC) were observed to be highest in MB (60.00 mg GAE/100g and 16.80 mg TEAC/100g). MB was observed with maximum level of anthocyanin content (25.62mg cyanidin-3-glucoside equivalent 100−1 g). The study revealed that pigmented rice varieties has higher iron content, polyphenol content as well as antioxidant capacities than white rice varieties. Thus, wide differences exist in the properties of the pigmented and non-pigmented rices.

KEYWORDS- Total phenolic content, antioxidant content, iron content, pigmented rice.

Response Of Gerbera Cv. Antibes To Different Organic Growing Media Under Naturally Ventilated Polyhouse

Sewali Saikia and Madhumita Choudhury Talukdar
Department of Horticulture, Assam Agricultural University
Jorhat-785013, Assam

ABSTRACT

An investigation was carried at department of horticulture, Assam Agricultural University, Jorhat district, to study the effect of different growing media in improving growth, flowering, physiological, soil microbial and bio-chemical properties of gerbera (Gerbera jamasonii Bolus) cv. Antibes. The experiment was conducted with five different growing media i.e. partially decomposed rice husk, vermicompost, enriched compost, soil based biofertilizer and control. . The experimental design was laid out in Completely Randomized Design with three replications. Enriched compost was found to be superior with respect to plant height (66.05 cm), no. of leaves per plant (38.50), plant spread (53.50 cm), leaf area per plant (5828.37 cm2), leaf area index (2.06), net assimilation rate (0.067 mg cm-2 day-1), leaf area duration (64.40 LAI days), leaf relative water content (87.14%). Diameter of flower (10.43 cm), no. of flower per plant (13.50) were recorded highest in enriched compost and also cause earliness in flower bud visibility (19.44days). The soil enzymes Fluorescein di-acetate (FDA), phosphomonoesterase (PMEase) and dehydrogenase (DH) involved in energy flow and nutrient cycling showed significant higher activities under different growing media. Enriched compost demonstrated clear increase in Phosphomonoesterase (374.22 µg p-nitrophenol g-1 soil h-1), Fluorescein di-acetate (10.03 µg fluorescein g-1 soil h-1), Dehydrogenase (281.82 µg TPF g-1 soil 24 hr-1) in this experiment. Available N, P2O5, K2O in soil were also increased in application of organic growing media. Application of enriched compost resulted in highest available P2O5 content (33.72 kg ha-1) in soil.

Extraction of Lignin and its Characterization from various Invasive Weeds for Biorefinery Prospect.

Arup Jyoti Borah, [1] Prachi Arya, [4] Shivangi, [4] Arun Goyal, [1, 3]
Vijayanand S. Moholkar[1, 2,*]

[1] Center for Energy, [2] Department of Chemical Engineering, [3] Department of Biosciences and Bioengineering, [4]
Department of Biotechnology, Heritage Institute of Technology Kolkata,- 700107, India
Indian Institute of Technology Guwahati, Guwahati – 781 039, India
* Corresponding author. Tel: +91 361 2582258, Fax: +91 361 2582291, E-mail: vmoholkar@iitg.ernet.in

ABSTRACT

Fast adaptation and commercialization of biofuels has been hindered due to plethora of generic and non-sustainable constriction. Invasive weeds on the other hand, cause a negative impact in the current economy around the globe. Sustainable utilization of this waste biomass as a feedstock for biorefinery prospect would nullify the cost required for managing and manipulating the ecosystem and also its dependency of feedstock availability, which plays a critical role in biofuel Industry. Up to the present time no such measures of success has been achieved to use weeds for the extraction of the lignin in native form. The aim of this experiment is to extract the lignin and also to obtain all the byproducts obtained during the extraction for an eco-friendly process. In this study, lignin was extracted from seven different invasive weeds by Soxhlet extraction method. Lignin obtained from this method is in native form and also to obtain the other products present in the biomass. The lignin was extracted by treating biomass with the solvent in a soxhlet extractor. Lignin was dissolved in the solvent which was then recovered by distillation, using the vacuum rotary evaporator until a concentrated solution is obtained. The recovered solvent was reused. The concentrated lignin solution was precipitated using warm water and small amount of ammonium chloride dissolving sugars and carbohydrates. Sugar were released in the water when the concentrate was washed with warm water and was estimated which can be used for fermentation and other process. The precipitated lignin was dried and was then washed with diethyl ether dissolving all the fatty acids, resins and waxes. Isolated lignin were purified to remove impurities and characterized by Fourier transform infrared spectroscopy (FTIR), Thermogravimetric analysis (TGA) and Differential scanning calorimetry (DSC) analysis to compare thermal properties and chemical composition.

KEYWORDS- Lignin, Invasive weeds, Soxhlet apparatus, TGA and FTIR.

Isolation and Characterization of Hydrocarbon Degrading Microorganisms

Shravanika Mahanta1, Jyotishmoyee Boruah1, Mousumi Rajkumari1,Sourabh Kr Das2, Runjun Gogoi Rajkumari1, Nilave Bhuyan3
1. Department of Botany, J.B. College; 2. Department of Biotechnology, J.B. College; 3. Department of Zoology, J.B. College

ABSTRACT

Oil spill and plastic deposits are the most significant pollutants in the environment as they are capable of causing serious damages to humans and the ecosystem. Physical, chemical and mechanical methods are available for clearing of these pollutants. However, these methods are very expensive. Therefore, there is a need to establish a cost effective and eco-friendly method for removal of these pollutants.

North-Eastern region of India, especially Assam has four oil refineries which are continuously extracting oil from different sources. This is increasing the chance of oil spill related pollution. Moreover, daily use of plastic in different household activities as well as different industries causes a huge deposition of plastic wastes to the ecosystem.

Recent Studies have shown that it is possible to eliminate a wide range of pollutants and waste by biological treatments using microbes. In order to establish an experimental basis for bioremediation of soil contaminated with crude oil and plastic, eighteen strains of bacteria with hydrocarbon-degrading ability were isolated from the contaminated soil in Jorhat, Assam. The ability to utilize crude oil as carbon source for their growth was ascertained. Further study under soil conditions is underway to determine biodegradation potential of bacterial mixture in natural condition.

KEYWORDS – Bacteria, Biodegradation, Oil spill, Plastic, Pollution

Standardization of a non-lethal DNA extraction method in Antheraea assamensis

Jyoti Daga1, Shradha Shandilya1, Sourabh Kr Das2, Nilave Bhuyan1,2
1. Department of Zoology, J.B. College; 2. Department of Biotechnology, J.B. College

ABSTRACT

Sericulture is a major cottage industry of Assam and rearing of Antheraea assamensis plays an important role in the rural economy of this region. Recently a lot of progresses have been made in molecular diversity analysis of muga silk worm. However, for isolation of DNA from muga larvae, invasive methods are used which involves killing of the larva or moth. This limits the application of identified diversity of silkworms as well as identification of marker regions responsible for important cocoon characters. In view of the above, a rapid DNA extraction method from Antheraea assamensis was developed using two sources of tissue sample: exuviae shed during larval stage and wings of mature moth. This methodology is non-invasive, less expensive and reproducible with DNA recovery capacity of 15µl of 50-100ng DNA/µl. Using the DNA extracted by this method, reported microsatellite markers could be PCR amplified with high efficiency. The results presented will contribute in the development of a basic method for QTL based molecular marker analysis through DNA isolation of Muga silk worms in a non-destructive way without disturbing the larva, which will ultimately produce the cocoon.

KEYWORDS– Antheraea assamensis, DNA isolation, Non-invasive

Standardization of a non-lethal DNA extraction method in Antheraea assamensis

Jyoti Daga1, Shradha Shandilya1, Sourabh Kr Das2, Nilave Bhuyan1,2
1. Department of Zoology, J.B. College; 2. Department of Biotechnology, J.B. College

ABSTRACT

Sericulture is a major cottage industry of Assam and rearing of Antheraea assamensis plays an important role in the rural economy of this region. Recently a lot of progresses have been made in molecular diversity analysis of muga silk worm. However, for isolation of DNA from muga larvae, invasive methods are used which involves killing of the larva or moth. This limits the application of identified diversity of silkworms as well as identification of marker regions responsible for important cocoon characters. In view of the above, a rapid DNA extraction method from Antheraea assamensis was developed using two sources of tissue sample: exuviae shed during larval stage and wings of mature moth. This methodology is non-invasive, less expensive and reproducible with DNA recovery capacity of 15µl of 50-100ng DNA/µl. Using the DNA extracted by this method, reported microsatellite markers could be PCR amplified with high efficiency. The results presented will contribute in the development of a basic method for QTL based molecular marker analysis through DNA isolation of Muga silk worms in a non-destructive way without disturbing the larva, which will ultimately produce the cocoon.

KEYWORDS – Antheraea assamensis, DNA isolation, Non-invasive

Ms. Sudeshna Saikia
Jagannath Barooah College

Tea [Camellia sinensis (L.) O. Kuntze], belongs to the family Theaceae, is one of the economically important non-alcoholic beverage yielding perennial crop, extensively cultivated in Northeast India. About 80% of the tea crop loss is associated with tea pests and pathogens that are responsible for extensive damage of this plantation crop and thereby cause emerging threat to the larger industry in the country. Exploitation of a few entomopathogens such as Beauveria bassiana (MTCC 984), Metarhizium anisopliae and Verticillium lecanii (MTCC 956) were tried in the present investigation to control tea pests such as Hyposidra talaca and Buzura suppressaria. Pre-pupa, pupa and late pupa were the three different stages of growth of the tea pests against which the activity of the entomopathogenic fungi were tested. Infections in pre-pupa stage of each pest by entomopathogens are more in comparison to other tested stages. Spore load of 21.8± 1.1 X106 spores/ml caused maximum mortality up to 70% at pre-pupa stage for the tested pests whereas the mortality in late pupa stage is relatively low. However, the percent mortality varied with species. As chemical pesticides are creating enomorous damage to soil health and caused lethal and sub-lethal effects to human beings besides creating residue problems in made tea, pest resussarence etc., the present approach of exploiting bioagents (entomopathogen) in management of common tea pests would be a cost effective alternative approach to bring sustainable tea cultivation.

Studies on the effect of Trichoderma inoculation during Storage of Tea Seeds

Indrani Gogoi, Junamoni Dutta, Dr. Liza Handique Bhattacharyya

ABSTRACT

Tea [Camellia sinensis (L.) O. Kuntze] is an economically important, non-alcoholic, aromatic beverage yielding perennial crop, extensively cultivated in North East India, Assam. Propagation in tea plant is usually done through the seeds and cuttings. In case of propagation from seeds, it is important to monitor the quality and health of seeds. Although chemicals are also used in storage of tea seeds but sometimes it may have detrimental effect to the seedlings and, thus, it affects the overall tea cultivation in large. Application of alternative strategies such as microbial inoculants might be helpful in this aspect to protect the seeds. In the present investigation, we have tried a Trichoderma based seed protection strategy to protect the seeds during storage. Different concentrations of the microbial were used for different incubation periods to standardize the antagonist for healthy tea seed preservation. Maximum growth of the Trichoderma fungus and seed protection ability was observed in the treatments with seed treated with Trichoderma @5% spore treatment for 2hrs, 4hrs and 6hrs followed by 10% and 20% in 7days within an incubation temperature of 10°C -21°C. In most of the cases, it was observed that the dark green colored Trichoderma viride colonized all around the seeds, after 7 days of incubation periods, thus, shown the ability of the bio control agent for providing maximum protection.
Keywords: Bio control agent; chemical application; microbial inoculants; seed storage; tea; Trichoderma viride.

Optimization Studies on Biosorption of Cr (VI) in Aqueous Solution Using Immobilized *Sargassum sp.*in a Packed Bed Bioreactor

Dharanidaran Jayachandran[1], Sushma Chityala[1], Ashish A Prabhu[1] and Veeranki Venkata Dasu[1*]
[1]Department of Biosciences and Bioengineering,IIT Guwahati, India

ABSTRACT

In the present investigation, continuous column studies were carried out to remove hexavalent chromium (Cr (VI)) from the aqueous solution using alginate immobilized *Sargassum sp.* biomass. The effects of significant parameters such as feed flow rate, bed height and initial Cr (VI) concentration were optimized using Taguchi orthogonal method of optimization. From the studies, it was observed that with a flow rate of 3.33 ml/min, bed height of 10 cm and initial Cr (VI) concentration of 74 mg/L, a maximum biosorption of 95.98% was achieved with the correlation coefficient of 96.2%. Predicted percent biosorption of the selected heavy metal ions by the Minitab 16 software is in agreement with experimental results of biosorption.

Hyaluronic Acid Biosynthesis By Resting Cells of Streptococcus Zooepidemicus

Mr. S.Manoj Kumar , Dr. Senthilkumar Sivaprakasam
Department of Biosciences and Bio-Engineering, IIT Guwahati, India
E-mail: sm.kumar@iitg.ernet.in

ABSTRACT

Hyaluronic acid (hyaluronan, HA) is a linear glycosaminoglycan composed of repeated disaccharide units containing *N*-acetyl-D-glucosamine and D-glucuronic acid. Because of its high molecular weight and unique visco-elastic properties, it has been widely used in cosmetics and pharmaceutical industries. Traditionally HA was extracted from rooster combs and now it is mainly produced through microbial fermentation. Microbial production via streptococcal fermentation has received an increasing attention due to potential toxins and cross-viral contaminations in rooster combs extraction. There is an increasing number of research articles published which deals with the production of microbial hyaluronic acid in batch and fed-batch fermentations. However, intermediates of hyaluronic acid biosynthesis pathway such as UDP-glucose, UDP-glucuronic acid is also been used for cell wall formation during streptococcal fermentation. Thus, there is an intense competition for intermediated between hyaluronic acid production and biomass formation. This proposed work provides an alternative approach by decoupling the production of streptococcal growth from hyaluronic acid biosynthesis. In this work, we are trying to improve the hyaluronic acid production by employing the resting cells of *Streptococcus zooepidemicus*. Streptococcus cells are used as a biocatalyst for the conversion of glucose into hyaluronic acid. The fermentation is carried out in two phases: growth phase and the biotransformation phase. The enzymes necessary for the hyaluronic acid production were synthesized during growth phase. Subsequently the cells were harvested and suspended in biotransformation media for hyaluronic acid production. The ideal production conditions for the maximum enzyme production and biotransformation would be optimized for enhanced hyaluronic acid production. This work demonstrates the use of resting cells of Streptococcus in the biosynthesis of hyaluronic acid.
Keywords: Biotransformation, Streptococcus, Resting Cells

Purification and characterization ofa thermostable endo-β-1,3-glucanase (*Ct*GH81) from *Clostridium thermocellum*

Krishan Kumar[1],Virgínia M.R. Pires[2], Carlos M.G.A. Fontes[2] and Arun Goyal[1]
[1]Carbohydrate Enzyme Biotechnology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.
[2]CIISA-Faculdade de Medicina Veterinária, Avenida da Universidade Técnica, 1300-477 Lisbon, Portugal.
E-mail: krishan.kumar@iitg.ernet.in

ABSTRACT

Family 81 glycoside hydrolases (GH) are known for their endo-β-1,3-glucanase activity and are widely distributed in plants, yeast, fungi, bacteria, archaea and viruses. An endoglucanase (*Ct*GH81) of GH family 81 from *clostridium thermocellum* was cloned, expressed and purified. Substrate specificity analysis of *Ct*GH81 showed that it is active against β-1,3-glucans. *Ct*GH81 showed maximum activity at pH 7.0 and 75°C. It showed maximum activity of 98 U/mg against laminarin and 70 U/mg against curdlan. The enzyme displayed stability in the pH range from 7.0 to 9.0 and thermal stability up to 75°C. The activity of *Ct*GH81 was significantly enhanced by Ca^{2+} and Co^{2+} ions, while, it was inhibited by Cu^{2+} and Zn^{2+} ions. The activity of *Ct*GH81 was lowered by EDTA, which indicates that Ca^{2+} and Co^{2+} cations play an important role in the catalysis. The endo mode of action of *Ct*GH81 was confirmed by TLC analysis of the degraded products of laminarin and curdlan.

Investigating the effect of post-translational modification on structure of c-Myc PEST region

Mohd. Ziauddin Ansari[1], L. Padmavathi[2], **Rashna Bhandari[2]** and Rajaram Swaminathan[1]
[1]Department of Biotechnology, Indian Institute of Technology Guwahati, Guwahati-781039
[2]Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad-500001, India
(mohd.ansari@iitg.ernet.in)

ABSTRACT

The c-Myc is a highly unstable transcription factor which is responsible for various processes like cell growth, proliferation and apoptosis. It's centrally located intrinsically disordered PEST region (amino acid 201 to 268), is rich in Pro, Glu, Ser and Thr. This PEST region is responsible for rapid degradation of the c-Myc. The c-Myc undergoes various post-translational modifications like phosphorylation, glycosylation and acetylation at different sites which is responsible for its stability and proper functions. The aim of our present study is to investigate the consequences of phosphorylation on the structure of c-Myc PEST region. For this purpose we have cloned and expressed the wild type, Trp and Ser mutants of c-Myc PEST region in bacteria. Further these proteins were purified and characterized using UV-Vis spectroscopy and fluorescence techniques. The effect of phosphorylation on structure of c-Myc PEST shall be presented at the meeting.

Physiological and Biochemical studies on Dihydrolipoamide dehydrogenase variants of *Leishmania donovani*

Adarsh Kumar Chiranjivi[1]and Vikash Kumar Dubey[1]
[1]Department ofBiosciences and Bioengineering,IIT Guwahati,India
E-mail: vdubey@iitg.ernet.in

ABSTRACT

The life threatening disease leishmaniasis is caused by *Leishmania* parasite having some key redox enzyme that regulates the vital metabolic pathways. These pathways are the main source of energy flow in the parasite. Some pathway intermediates are also responsible for the parasite membrane fluidity and morphology like steroid metabolism. Dihydrolipoamide dehydrogenase (LdBPK323510.1, LdBPK291950.1) is a key enzyme in *Leishmania donovani* that regulate the redox reaction and neutralize the free radicals generated during biochemical processes so that it acts as a protective candidate inside the host. Mechanism of action starts when *Leishmania donovani* dihydrolipoamide dehydrogenase (*Ld*DLDH) converts the dihydrolipoamide (DLD) into lipoamide (LA) in reversible manner and providing most important intermediates to the life saving metabolic pathways such as acetyl CoA and succinyl CoA in TCA cycle, 5,10-methylene tetrahydrofolate in folic acid metabolism, and keto acid for the steroid synthesis. Many reports suggest that it is a part of multienzyme complex such as Pyruvate dehydrogenase complex (PDH), Glycine cleavage complex (GCC) and α-Ketoglutarate dehydrogenase complex. Practical approach to know the physiological and biochemical behavior of two *Ld*DLDH variants would be interesting observation. Cloning, expression, purification and characterization of both the variants were done and kinetic parameters like Km and Vmax were calculated for all the substrates in both the directions. Physiological and biochemical importance will be confirmed by knock out strategies. All the knock out constructs have been prepared and currently mutants are being screened. Functional roles of *Ld*DLDH variants in the knockout parasite will be estimated using metabolite analysis by HPLC.

Calcineurin – a serine/threonine protein phosphatase and its role in calcium signalling

Ajeet Kumar;Dibakar Gohain, Avishek RoyandRanjan Tamuli
Department of Biosciences and Bioengineering, IIT Guwahati
E-mail:ajeetkumar.2014@iitg.ernet.in, g.dibakar@iitg.ernet.in, r.avishek@iitg.ernet.in

ABSTRACT

Calcium (Ca^{2+}) is a ubiquitous secondary messenger molecule that governs important cell processes in eukaryotes and considered as a life and death signal. In *Neurospora crassa*,calcineurin (CNA), the only known serine/threonine protein phosphatase require calcium and calmodulin for its activity and dephosphorylates transcription factors including CRZ-1. CNA is consisting of a catalytic subunit A (CNA-1), and a regulatory subunit B (CNB-1). CNA is an essential gene in *N. crassa*,therefore, we utilized repeat induced point mutation (RIP), a genome defense mechanism in *N. crassa*, to mutate the CNA. In our lab 2 CNA-1 and 3 CNB-1 RIP mutants have been generated with $CNA\text{-}1^{RIP}$ having mutations in the catalytic domain and CNB binding domain whereas $CNB\text{-}1^{RIP}$ mutants have mutations in the EF hand domain -2, 3, 4. Furthermore, various morphological studies were performed for all these mutants including growth, calcium tolerance assay, carotenoid assay, and fertility assay.$CNA\text{-}1^{RIP}$ mutants had retarded growth and a less amount of carotenoid accumulation as well as had defect in fertility. Also $CNB\text{-}1^{RIP}$ mutants had shown reduced carotenoid content, improper hyphal septation, and defect in fertility. Work is going on to study different interacting partners of calcineurin other than CRZ-1.

The *NcZrg-17* gene of *Neurospora crassa* encodes a cation diffusion facilitator transporter required for vegetative development, tolerance to endoplasmic reticulum stress and cellulose degradation under low zinc conditions

Anand Tiwari[1] and Ranjan Tamuli[1]
[1]Department of Bioscience and Bioengineering, IIT Guwahati
E-mail:*anand.bio@iitg.ernet.in*

ABSTRACT

The members of cation diffusion facilitator (CDF) family of transporters play an important role in zinc transport. We performed the functional evaluation of a putative zinc CDF transporter gene *NcZrg-17*, in the filamentous fungus *Neurospora crassa*. The knockout mutant of the *NcZrg-17* gene exhibited zinc suppressible phenotypes on low zinc medium. The Δ*NcZrg-17* mutant has reduced growth rate, short aerial hyphae, increased hyphal branching, early and enhanced conidiation and delayed conidial germination. Furthermore, the *NcZrg-17* gene was found to be crucial for survival under conditions inducing endoplasmic reticulum (ER) stress in low zinc media. The *NcZrg-17* gene is dispensable for response against cell wall perturbing agents. The expression analysis of *NcZrg-17* revealed that up-regulation under zinc-deficient conditions and down-regulation under elevated zinc exposure.

Free Bilirubin sensing from its interaction with Carbon Nanotubes.

Anil Kumar[1], Harsh Chaturvedi[2], Pranab Goswami[1]*
[1]Department of Biosciences and Bioengineering, [2]Centre for Energy, IIT Guwahati, Guwahati-781039, Assam, India.
Email: pgoswami@iitg.ernet.in

ABSTRACT

Bilirubin is a tetrapyrrole yellow colored compound formed in the blood from the degradation of hemoglobin. Bilirubin in free form is sparingly soluble in aqueous system, and hence, in blood serum, albumin acts as its carrier from the tissue site to the liver for further metabolism and thereby neutralizes the toxic effect of bilirubin. However, in certain pathological and aberrant metabolic conditions, the level of free bilirubin increases in the blood serum. This causes life-threatening diseases, particularly to the new borne babies. Therefore, there is a strong demand to develop an inexpensive, rapid and reliable analytical method for the determination of free bilirubin. So, we propose a non-enzymatic method to overcome the instability and other hurdles being encountered by the enzyme-based detection approaches. Most of these alternative methods increasingly utilize the properties of nanomaterials. The development of the sensor requires understanding of the interaction between bilirubin and nano-materials. Pristine single wall carbon nanotube (P-SWCNT) has attracted tremendous attention in sensor applications because of its fascinating properties such as large surface area, excellent chemical/thermal stability, hydrophobicity, adsorption, optical properties, and superior electrical conductivity. We studied the interaction of P-SWCNT and bilirubin with various analytical techniques. The fluorescence quantum yield of bilirubin was extremely low. However, when it was introduced with P-SWCNT, the fluorescence ($\lambda_{excitation}$ 450nm) increased significantly. The interactions were also investigated with micro laser Raman Spectroscopy. The peak intensity of these materials increased as compared to the individual peak of P-SWCNT. Additionally, the peaks were red shifted in the radial breathing mode (RBM), tangential mode (G band) thus, indicating a strong interaction between bilirubin and P-SWCNT. No change in the disorder-induced mode (D-band) was observed. These results will be used for developing optical sensors based on functionalized SWCNTs. Detailed findings on the subject will be presented in this paper.

Keywords: *Pristine single walled carbon nanotube, free bilirubin, neonatal jaundice, fluorescence, micro laser Raman Spectroscopy*

Potentials of *Plasmodium Falciparum* FIKK kinase(s) in drug discovery and diagnostics

Anil Kumar D, Vishal Trivedi#
Malaria Research Group, Department of Biosciences and Bioengineering, Indian Institute of Technology-Guwahati, Guwahati-781039, Assam, India.
Dr. Vishal Trivedi, Malaria Research Group, Department of Biosciences and Bioengineering, Indian Institute of Technology-Guwahati, Guwahati-781039, Assam, India.
Email: vtrivedi@iitg.ernet.in, Vishalash_1999@yahoo.com,
Phone : +91-361-2582217,Fax : +91-361-258-2249.

ABSTRACT

Malaria caused by *PlasmodiumFalciparum*is most virulent. Emergence of drug resistance against front running antimalarials bring the necessasity to identify and validate drug target to discover therapeutic agents. *Plasmodiumfalciparum* genome encodes for ~5,300 proteins but more than 50% proteins are uncharacterized. Malaria parasite Kinome consists of 65 Eukaryotic Protein kinases (ePKs) and several of them are significantly diverged from humans. It has 20 novel orphan FIKK kinases with no homology to known human kinases. Bioinformatic analysis evoked that they contain highly distinct N-terminal domain with no similarity to existing eukaryotic protein kinases and a well defined C-terminal kinase domain. Eleven FIKK kinases from malaria parasite were modelled using modeller 9.15 and I-TASSER. Preliminary structural studies indicate that among these kinases, FIKK9.1 might be a good candidate due to distinct structural and antigenic features from host. Structure of FIKK9.1 exhibits six α-helices, eight β-sheets and a long stretch of loop at N-terminal, whereas C-terminal catalytic domain consists of nine α-helices and seven β-sheets. ATP binding region is present in a deeper cleft with conserved residues required for kinase activity. ATP makes extensive interactions with the residues present at the active site. Adenosine ring is making extensive interaction with E313, C379 whereas ribose is interacting with N242,T315, D318 and phosphate group is lined by L250, L369, I443 and F263. Hence our preliminary molecular modelling and structural analysis strongly suggests that FIKK kinases have potentials to be used as drug target and their exclusive antigenic sites can be probed for developing diagnostics to detect malaria.

Store Oparated Calcium Entry in Oral Cancer

Anuj Kumar Singh[1], Piruthivi Sukumar[1] and Ajaikumar B. Kunnumakkara[1]
[1]Department ofBio-Engineering,IIT Guwahati,India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Oral cancer is the eleventh most common cause for cancer death among men in the world. According to the GLOBCAN 2012 data, mortality for male and female due to oral cancer was shown worldwide 97,919 and 47,409 respectively for year 2012 alone. This situation demands new drug targets for oral cancer (OC). In this context we explored store operated calcium channels (SOC) to find any novel target for the treatment or diagnosis of oral cancer. Store operated calcium entry (SOCE) is one of the key of Ca^{2+} signaling mechanisms in most cells which play many pivotal roles in different pathophysiological processes including cell division, secretion, fertilization, cell migration etc. With the literature showing the involvement of SOCE in cancer pathology, we hypothesized that SOCE may be important in pathophysiology of oral cancer as well. We first determined the Ca^{2+}-influx in an oral cancer cell and compared with normal epithelial cell. The result showed high Ca^{2+}-influx in OC compared to normal. Further, we investigated the mRNA level expression of store operated calcium channel (SOCC) genes using quantitative RT-PCR (qPCR) in OC cells which concluded with high Orai1 and STIM1 expression compared to normal epithelial cells. To investigate various cancer hallmarks in co-relation with SOCC we used known SOCE chemical inhibitors such as 2-APB, $LaCl_3$ and SKF96365 for MTT assay, wound healing and Ca^{2+}-influx. Some inhibitors significantly inhibited at high concentration and some at low. These results showed that SOCE inhibitors are able to block Ca^{2+}-influx (*i.e.* SOCE) significantly in OC and blocking SOCE can affect cell proliferation and cell migration in OC cells. We have also investigated the effect of tobacco, one of the major risk factors for oral cancer on SOCE. The tobacco components individually showed proliferative behaviour for OC cells. The results showed that crude extract of tobacco induced SOCE. Overall our results showed that there is a direct relation with SOCE and oral cancer.

Synthesis, *In silico* studies and *In vitro* evaluation for Antioxidant and Antibacterial Properties of Diarylmethylamines: A Novel Class of Structurally Simple and Highly Potent Pharmacophore

Sujit Mahato[1],Anuma Singh[2],
Latha Rangan[2] andChandan K. Jana[1]
[1]Department ofChemistry,IIT Guwahati,India
[2]Department of Biosciences and Bioengineering,IIT Guwahati,India
E-mail: anuma@*iitg.ernet.in*

ABSTRACT

A series of novel diarylmethylamines were synthesized via simple three component condensation reaction. *In vitro* antibacterial activity of the synthesized compounds was assessed against Gram-positive and Gram-negative bacteria. Compound **1f** containing phenyl and N-methyl piperazine moiety was found to be potent against both pathogenic bacteria with MIC value of 31 µg/mL. Diarylmethylamine **1l** containing sesamol and N-methyl piperazine units was found to be the most effective against Gram-positive bacteria with MIC value of 15 µg/mL. The compound leads to the damage of the bacterial cell membrane which was demonstrated by flow cytometry (FC) and field emission scanning electron microscopy (FESEM). Radical scavenging activity of compounds **1l** and **1m** was found out to be comparable with that of standard antioxidant BHT. Further, *in silico* studies were carried out to calculate the physico-chemical parameter of the synthesized compounds.

Keywords: Antibacterial activity, Antioxidant activity, Diarylmethylamines/Betti bases, DPPH assay, Flow cytometry

One-pot green synthesis of silver nanoparticles, its characterization and biomedical application

Anupriya Baranwal, Kuldeep Mahato ,Pranjal Chandra*
Department ofBiosciences and Bioengineering,
Indian Institute of Technology Guwahati,
Guwahati – 781039, India
E-mail:banupriya@*iitg.ernet.inm.kuldeep@iitg.ernet.in*,*pchandra13@iitg.ernet.in*

ABSTRACT

Nanotechnology deals with the production of nanomaterials and incorporating them for myriad applications in the field of medicine, material science and technology. Over the years, several chemical and physical approaches have been utilized to generate metallic nanoparticles (MNPs) and these techniques continue to generate MNPs even today. However, various shortcomings have been reported with these conventional approaches; for instance, chemical reductants involved in chemical reduction can pose serious menace to human health and environment. Physical approaches have emerged as an expensive technique to generate MNP as they require highly expensive and sophisticated instruments which call for trained personnel to work on them thus, limiting its usage on commercial scale. [1] As a result, a need for rapid yet facile, inexpensive and green approach has come into focus. In last few decades, various biological routes such as, microbes (bacteria, fungus, yeast, algae, etc.), plants as a whole or its tissues, etc. have been reported to carry out MNP synthesis. Biological approaches prove to be advantageous not only because they can overcome the aforementioned drawbacks but can also bring out MNP synthesis at commercial scale. [2] Phytofabrication has gained more importance over microbe mediated routes to generate MNPs because unlike microbes it doesn't require any special preparation like maintenance of asceptic condition, culture preparation and maintenance, etc. A wide variety of plant species have been reported to produce MNPs of varied shapes and sizes however; application of these MNPs has ceased only to a limited number of fields. [1] Herein, we present a systematic work on phytofabrication of silver nanoparticles (AgNPs) under optimized conditions, its characterization and biomedical application.

Elucidating the Role of Spo0A in Butanol Biosynthesis through Fluorescence Quenching Study from Clostridium acetobutylicum

Anwesha Purkayastha1,2, Mayurketan Mukherjee1,2, Payel Sarkar1,2, Mehak Kaushal1,2, Saumya Ahlawat1,2, Debasish Das1,2*.
1 Department of Biosciences and Bioengineering. Indian Institute of Technology Guwahati.
2 DBT Pan-IIT Centre for Bioenergy. **I**
E-mail: drishti.anwesha@iitg.ernet.in, debasish@iit.ernet.in

ABSTRACT

Sporulation Factor Stage 0 protein (Spo0A) belongs to a large family of bacterial regulatory proteins called response regulators. It is basically a transcription factor and as the name suggests, it is primarily involved in control and regulation of sporulation. The role of this protein has been well elucidated in Bacillus, wherein it not only plays a major role in sporulation but also in many other primary metabolic cycles like virulence, biofilm production, competence, motility and production of peptide antibiotics (Strauch and Hoch, 1993). Recently, Spo0A has been studied in the context of butanol synthesis in Clostridium sp. It regulates the synthesis of solventogenic gene products by either upregulating or downregulating the genes associated by binding to their promoter regions consisting a particular sequence stretch of nucleotides referred to as 0A box and comprises a 7-bp sequence 5'-TGNCGAA- 3' (N=T preferably). In this regard, the current study focuses on understanding the effect of certain elements (Zn and Ca) that positively regulate butanol production leading to enhanced butanol synthesis.

A novel family 35 Carbohydrate Binding Module (*Rgl*-CBM35) from *Clostridium thermocellum* binds rhamnogalacturonan I

Arun Dhillon* , Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory
Department of Biosciences and Bioengineering, IIT Guwahati, India
E-mail: *d.arun@iitg.ernet.in*

ABSTRACT

Plant cell walls represent a vast and renewable source of carbohydrates which could beconverted to bioethanol [1]. Efficient production of bioethanol requires enzymes with better stability and high activity. Several enzymes that degrade plant cell wall carbohydrates contain ancillary substrate interacting domains called Carbohydrate Binding Modules (CBM). CBMs allow prolonged contact between catalytic domains associated with them and carbohydrate substrates, thus promoting catalysis. CBMs are being employed for developing enzymes that degrade the pectin component of the plant cell wall are employed in for various applications such as cell immobilisation, development of affinity tags, probes for polysaccharide identification [2]. Protein engineering for addition of CBMs to various catalytic modules is a potential method for enhancing plant biomass degradation and eventually bioethanol production. Several CBMs targeting cellulose, xylan and mannan have been characterised but there is no CBMtargeting rhamnogalacturonanknown.

In this study a CBM, *Rgl*-CBM35 associated with rhamnogalacturonanlyase of family 11 polysaccharide lyase (PL11) was cloned, expressed and characterised. The gene (cthe_0246; GenBank accession number: ABN51485.1) encoding and expressed as a 16 kDasoluble protein in *E. coli* (DE3) BL21 cells. *Rgl*-CBM35 was purified by immobilised metal ion (Ni^{2+}) affinity chromatography. Affinity of *Rgl*-CBM35 for various soluble and insoluble plant cell wall carbohydrates was studied. Affinty gel electrophoresis revealed that *Rgl*- CBM35 binds rhamnogalacturonan I, sugarbeetarabinan, potato galactan, birchwoodxylan, beechwoodxylan and rye arabinoxylan. Among insoluble ligands, *Rgl*-CBM35 bound wheat arabinoxylan.The ITC analysis showed that the affinity constant (K_a) of *Rgl*-CBM35 for unsaturated rhamnogalacturonanoligosaccharides,pectic oligosaccharides and β-D-glucuronic acid was $1.4\times10^5M^{-1}$, $2.1\times10^4M^{-1}$and $2.5\times10^4M^{-1}$,respectively.ITC analysis also displayed significant binding affinity with rhamnogalacturonanand sugar beet arabinan. The results showed that *Rgl*-CBM35 binds a variety of ligands. To the best of our knowledge a CBM with affinity for such varied type of ligands including rhamnogalacturonan I is not known.

Overexpression of Endoplasmic reticulum (ER) based chaperons to modulate the expression level of human interferon gamma (hIFN-γ)in *Pichia pastoris*

Ashish A Prabhu, Biju Bharali and V. Venkata Dasu*
Biochemical Engineering Laboratory, Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India
E-mail: veeranki@iitg.ernet.in, ashish.prabhu@iitg.ernet.in

ABSTRACT

In recent years, Pichia pastoris has become most attractive host for the high yield production of heterologous protein. However over expression of foreign proteins may sometimes leads to suboptimal protein folding in the endoplasmic reticulum (ER). It is reported that co-expression of some molecular chaperones assists in proper folding and translocation of proteins, ultimately leading to enhanced protein yield. In the present study, we have cloned the gene encoding human interferon gamma in Pichia pastoris and observed low expression of recombinant human interferon gamma (rhIFN-γ). To evaluate the role of chaperons on protein production, we have co expressed Kar2p and PDI genes from Pichia pastoris GS115. With the introduction of kar 2p (Binding immunoglobulin protein) over 2.5 and with PDI (Protein disulphide isomerase) over 3 fold enhancement in rhIFN-γ was observed. While the synergetic effect of Kar2p+PDI gene has shown about 6 fold enhancement in rhIFN-γ production. The batch reactor kinetics of strain with Kar2p+PDI gene in BMMH medium illustrated growth associated production having maximum rhIFN-γ production of 1.36 mg/L.

KEY WORDS: Human interferon gamma (hIFN-γ), Pichia pastoris, Protein Disulfide Isomerase, Binding immunoglobulin protein, batch reactor.

Effect of Labdane diterpene dialdehyde – a bioactive compound from seeds of *Alpinia nigra,* on RBCs

Aswitha Vijayasekar, Ishani Chakrabartty, Latha Rangan*
Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati, Assam.
E-mail: l.rangan@iitg.ernet.in

ABSTRACT

Aiming at unveiling the potential of natural bioactive compounds, the present investigation deals with isolation of "Labdane diterpene dialdehyde" – a bioactive compound from seeds of *Alpinia nigra*. Soxhlet apparatus (hot solvent) and room temperature mechanical maceration were employed to extract phyto-constituents from seeds. Labdane diterpene dialdehyde was isolated by column chromatography and characterized using NMR and HR-MS. The yield of compound was 61 mg/g of extract (w/w) in Soxhlet extraction and 48 mg/g of extract (w/w) in room temperature maceration. For any drug molecule to be used through IV administration, it's essential to study its effect on the blood cells. Here the effect of compound (0.2, 0.4, 0.6, 0.8 and 1.0 mg/mL in 2% EtOH) on RBCs was studied qualitatively and quantitatively. Light microscopy was used to determine the morphological changes in RBCs after treatment. The results of hemolytic assay showed that at higher concentration (1 mg/mL), the hemolysis was 4 %, whereas 0.4 mg/mL showed lower hemolysis of 0.38%. The light microscopic study revealed that the compound doesn't lyse the RBCs although it has caused the leakage of hemoglobin by other mechanism which is yet to be explored. From this study it can be concluded that Soxhlet extraction is more effective for compound isolation and the dosage should be less than 0.4 mg/mL to prevent adverse effect on RBCs. As continuation of this investigation, future work will be to study the compound's effect on WBC's and platelets.

Key words: Labdane diterpene dialdehyde, yield, RBCs, hemolysis and morphology.

Green Synthesis Of Silver Nanoparticles Using B-Glucan, and their 2 Incorporation Into Doxorubicin-Loaded Water-In-Oil Nanoemulsions For 3 Antitumor And Antibacterial Applications

Girnar Goyal a1 , Jangsun Hwang b1, Jaiswal Aviral a1, Youngmin Seo b, Yeonho Jo b, Jaewoo Son b, Jonghoon Choi b,*
a Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India
b: School of Integrative Engineering, Chung-Ang University, Seoul 06974, Republic of Korea
E-mail: aviraljaiswal6010@gmail.com

ABSTRACT

The use of nanoparticles has seen a dramatic increase in the last few decades. However, nanotoxicity, i.e. toxicity caused by nanoparticles, is one of its major limitations, and needs to be reduced for human safety. Furthermore, the use of green methods should be encouraged for their synthesis. In this study, we synthesized silver nanoparticles (AgNPs) with an average size of 15 nm using the natural biopolymer β-glucan, which ensured the environmental benignity of their preparation. The AgNPs prepared in this manner were shown to be effective against microbes. In addition, we developed an efficient nanoemulsion delivery method for the AgNPs. Since nanoemulsions are identified as a promising drug delivery agent, we prepared nanoemulsions containing the AgNPs and successfully Q3 loaded them with a hydrophilic drug at an effective loading of 15–30%.

In Vitro Models to Study Mechanisms and Circumvention Approaches to Radioresistant Pancreatic Cancer Cells

Bibari Boro[1]
[1]Department ofBioscience and Bioengineering,IIT Guwahati,India
E-mail:*borobibari@iitg.ernet.in*

ABSTRACT

Research Idea: Radiotherapy has been widely used for the pancreatic cancer (PC) treatment. Despite numerous efforts in the cure of pancreatic cancer in the last decade the overall survival rate (< 5 years) has not significantly improved. The poor success in the management of pancreatic cancer is due to frequent late diagnosis of pancreatic cancer, scarcity of effective therapeutic agents and most significantly the frequent occurrence of chemo and radioresistance in pancreatic cancer. The main purpose of the research project is to develop and characterize radioresistant human pancreatic cancer cell lines, to identify genes which are differentially expressed (mRNAs and miRNAs) and proteins which play key roles in conferring the radioresistance behavior in pancreatic cancer radiotherapy. The human pancreatic cancer cells Panc1, BxPc-3, Pk-1 and MiaPiaCa2 will be treated with fractionated irradiation to establish radioresistant pancreatic cancer cells. The microarray and proteomics analysis followed by bioinformatics data processing will be employed to identify the key genes and their related functions in the complex mechanisms of radioresistance which will provide new insights into the development of potential strategies to overcome the radioresistance. The *in vitro* and *in vivo* functional analysis of identified genes will help to develop selective targeted treatments in combination with radiotherapy and to find novel combinations of existing chemotherapeutic agents with radiotherapy in treatment to prolong the survival rate in patients diagnosed with pancreatic cancer. The research project will also include concurrent *in vitro* chemoradiation treatment to investigate novel combinations of chemotherapeutic agents (Chk inhibitor, Akt inhibitors and gemcitabine) with radiotherapy which may radiosensitize the pancreatic cancer cell lines.

Key words: Pancreatic cancer, radioresistance, proteomics, gene expression analysis.

Cloning, expression, purification and biochemical characterization of family 8 glycoside hydrolase from *Clostridium thermocellum*(*Ct*GH8)

Bibari Boro[1],Aruna Rani[1]andArun Goyal[1]
[1]Department ofBioscience and Bioengineering,IIT Guwahati,India
E-mail:*borobibari@iitg.ernet.in*

ABSTRACT

Glycoside hydrolases(GH) are the group of enzymes which catalyse the hydrolysis of the glycosidic bond between two or more carbohydrates or between a carbohydrate and a non carbohydrate moiety.These enzymes have received much attention due to application in biofuel industry. GH of family 8 catalyses the hydrolysis of β-1, 4-glycosidic bonds present in cellulose, chitosan and xylan. These enzymes are mainly found in bacteria, and not in the members of eukaryotic or archaeal origin. In present study *Ct*GH8, an endoglucanase A with accession No ABN51508.1 was amplified from *Clostridium thermocellum* ATCC 27405. *Ct*GH8(1059bp) was amplified by PCR using gene specific primers containing *Nhe*I and *Xho*I restriction sites. The amplified *Ct*GH8 was cloned in pET-28a(+) expression vector and expressed in *Escherichia coli* BL-21 cells. *Ct*GH8 was purified by immobilized metal ion affinity chromatography (IMAC) in a single step. The purity and molecular mass (approximately, 39 kDa) of recombinant *Ct*GH8 was verified by SDS-PAGE. The optimum temperature and pH of *Ct*GH8 was 60°C and 5.8 respectively. *Ct*GH8 showed maximum specific activity of 103 U/mg against carboxymethylcellulose (CMC) and 115 U/mg against **ß-glucan (low viscosity).** Protein melting studies by UV-Visible spectroscopy showed that protein starts melting at 75°C. The result of biochemical characterization will be presented in detail.

Media Optimization and Overexpression of TAG Enhancing Genes for An Improved Production of Neutral Lipids from *Rhodococcus opacus* PD630.

BapiMandal[1], Ashish Prabhu[1], V. Venkata Dasu[1] and Kannan Pakshirajan[1*]
[1]*Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati.*
E-mail:bapi85mandal@gmail.com.

ABSTRACT

The increasing dependence on petroleum reserves due to sprawling industrialization has kindled a great interest in the production of bio-based alternative fuels. Even so, we are unable to come up with a viable solution to minimize the conflict between food and fuel use. The bioconversion of dairy waste, which is the most abundant food industry in India, could become an important cornerstone for the development of cost effective bioprocesses towards renewable fuels. Rhodococcus opacus PD630, an oleaginous bacterium, accumulates large amounts of Triacylglycerol (TAGs), which can be processed into advanced liquid fuels. In this organism TAG biosynthesis occurs via the Kennedy and Pyruvate-Malonyl-CoA pathway and the fundamental understanding of this process and its regulation remains to be clarified. The abundantly available genomic information for several rhodococcal species provides the possibility for comparative genome analysis on the occurrence and distribution of key genes and pathways involved in TAG metabolism. The present study is directed towards mathematical optimization of a media for an improved biofuel production. Furthermore, identification and overexpression of genes involved in the key step of TAG biosynthesis led to more better bio-synthesis of TAG. The parametric optimization on both wild type and mutant showed some interesting results with incolumn size, carbon to minimal salt media (MSM) ratio and culture time.

Cancer Therapeutics: Where We Have Reached Thus Far

Bethsebie Lalduhsaki Sailo, Javadi Monisha, Choudhary Harsha, Ganesan Padmavathi, Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Recent developments in cancer research have led to paradigm shift from use of traditional cytotoxic drugs to advanced methods such as targeted therapy. The current standard modalities for cancer patients consist of surgery, radiotherapy, chemotherapy, and targeted therapy. Surgery is the oldest method for cancer treatment and remains an integral part of cancer management. Less invasive surgical techniques include laparoscopic, endoscopic and robotic surgery. Additionally, relatively new surgical techniques include radiofrequency ablation, cryosurgery, microwave ablation and high-intensity focused ultrasound (HIFU). Radiotherapy (RT) is another primary management tool for cancer patients. Generally, RT involves the use ionizing radiation, including X-rays, gamma rays, and particle radiation to kill cancer cells.. Chemotherapy is another treatment method that involves the use of one or more chemotherapeutic drugs. Cisplatin or cis-diamminedichloroplatinum (II) is well-known platinum based chemotherapeutic drug that has been used for the management of various cancers. Gemcitabine, doxorubicin, vinblastine are among the drugs used in combination with cisplatin. Targeted cancer therapy is another type of treatment that works by using inhibitors that block cancer cell proliferation by inhibiting specific proteins involved in tumorigenesis such as epidermal growth factor receptor (EGFR, also known as HER1), vascular endothelial growth factor (VEGF), and HER2/neu. Essentially, timely and equitable access to cancer therapies is crucial for successful outcome in cancer patients.

Tuibur: A Tobacco Smoke Infused Water and its Link to Cancer

Bethsebie Lalduhsaki Sailo, Nand Kishor Roy, Amrita Devi Khwairakpam, Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Cancer has become a worldwide pandemic with approximately 14 million new cases and 8.2 million cancer related mortality in 2012 alone. Use of tobacco is the leading cause of cancer, and is responsible for about one-third of all cancer-related deaths. It is estimated that tobacco kills one person in every six seconds. The main carcinogens in tobacco include polycyclic aromatic hydrocarbons, tobacco-specific N-nitrosamines, aromatic amines, aldehydes, and certain volatile organic compounds. The smokeless tobacco products used in India are: khaini, mishri, zarda, kiwam, pan masala, etc. Unlike other smokeless tobacco products, a unique water (liquid preparation) containing the extracts of tobacco smoke is used by the indegenous people of Mizoram and is locally known as "tuibur". It is made by passing smoke, generated by burning tobacco, through water till the preparation turns cognac in colour and has a pungent smell. It is sipped and retained in the mouth for 5 to 10 minutes and then spat out. Heavy metals such as cadmium, lead, nickel, arsenic, triethylene glycol and high concentration of N-nitrosonornicotine (NNN) were found in tuibur. About 7% of persons surveyed in Aizawl, Mizoram (872 of 12185) used tobacco water. Tuibur was found to be one of the causes of stomach cancer in Mizoram. Further epidemiological and experimental studies are essential to elucidate the risk of tuibur use in the development of cancer.

Reloadable Silk-Hydrogel Hybrid Scaffolds for Sustained and Targeted Delivery of Molecules

Saket Kumar Singh[1], Bibhas Kumar Bhunia[1],Nandana Bhardwaj[2], Sween Gilotra[1], Biman B. Mandal[1]*
[1]Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati – 781 039, India
[2]Biological and Chemical Sciences Section, Life Sciences Division, Institute of Advanced Study in Science and Technology, Guwahati – 781 035, India
*Corresponding author, E-mail: biman.mandal@iitg.ernet.in; mandal.biman@gmail.comTel: +91-361-258 2225

ABSTRACT

Tunable repeated drug administration is often inevitable in number of pathological cases. Reloadable 3D matrices for sustained drug delivery are predicted as a prospective avenue to realize this objective. This study was directed towards sonication-induced fabrication of novel reloadable *Bombyx mori* silk fibroin (SF) (4, 6 and 8 wt%) hydrogel, injected within 3D porous (8 wt%) scaffolds. The focus was to develop a dual-barrier reloadable depot system for sustained molecular cargo-release. Both the varying SF concentration (4, 6 and 8 wt%) and the sonication time (30, 45 and 60 s) dictated the extent of cross-linking, β-sheet content and porosity (1-10 μm) influencing the release behavior of model molecules. Release studies of model molecules (trypan blue, TB, 961 Da and bovine serum albumin, BSA, 66 kDa) for 28 days attested that the variations in their molecular weight, the matrix crosslinking density and the scaffold-hydrogel interactions dictated the release behavior. Ritger and Peppas equation was further fitted into the release behavior of model molecules from various SF matrices. The hybrid constructs exhibited high compressive strength along with *in vitro* compatibility using primary porcine chondrocytes andtunableenzymatic degradation as assessed for 28 days. The aptness of the constructs was evinced as a reloadable model molecule (BSA and Fluorescein isothiocyanate-Inulin, 3.9 kDa) depot system through UV-visible and fluorescence spectroscopic analyses. The novel affordable platform developed using silk scaffold-hydrogel hybrid constructs could serve as sustained and reloadable drug depot system for administration of multiple and repeated drugs.

KEYWORDS:*silk, hydrogel, scaffold, reloadable, drug delivery, tissue engineering*

Understanding the molecular mechanism of calmodulin and calcium/calmodulin-dependent kinases in *Neurospora crassa*

Christy Noche K Marak and Ranjan Tamuli
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.
E-mail: c.marak@iitg.ernet.in

ABSTRACT

Calcium ion (Ca2+) is an important intracellular second-messenger molecule that regulates various cellular processes in eukaryotes. Calmodulin (CaM) and calcium/calmodulin-dependent kinase(Ca2+/CaMKs) are important proteins that regulate the Ca2+ signaling machinery in Neurospora crassa. CaM serves as an intracellular receptor for Ca2+ and binds to it with high affinity and specificity. The Ca2+/CaMKs are Ser/Thr protein kinases that are sensitive to any change in intracellular concentration of calcium. Studies in our laboratory have shown that these genes are involved in the growth, sexual development, thermotolerance, carotenoid production, survival under ultraviolet and oxidative stress conditions in N. crassa. Presently we are trying to understand the molecular mechanism of CaM and Ca2+/CaMKs in growth, development and fertility. We are investigating the putative interacting partners and the important regulatory sequences of CaM and Ca2+/CaMKs.

Functional and molecular analysis of *plc-1, splA2*and *cpe-1* genes in *Neurospora crassa*

Darshana Baruah and Ranjan Tamuli
Department ofBiosciences and Bioengineering,IIT Guwahati,India
E-mail: darshana@iitg.ernet.in

ABSTRACT

Calcium ion (Ca^{2+}) is an essential intracellular messenger in all organisms, from prokaryotes to humans. The model organism *Neurospora crassa* has a unique calcium (Ca^{2+})-signaling system that is significantly different from those in plants and animals, especially, in relation to the secondary messenger involved in Ca^{2+} release from the internal stores. The Ca^{2+} signaling genes encoding for phospholipase C1 (PLC1), secretory phospholipase A_2 ($sPLA_2$), and a Ca^{2+}/H^+ exchanger proteins play important roles in regulating the Ca^{2+} homeostatis, vegetative, and sexual development in *N. crassa*. Previous studies from our laboratory have shown multiple roles of the *plc-1*, *splA2* and *cpe-1* genes in the regulation of $[Ca^{2+}]_c$, carotenoid accumulation, survival under stress conditions and acquisition of thermotolerance induced by heat shock. In addition, genetic interactions of these genes was found to affect colonial growth, development of aerial hyphae, conidiation and germination, pigmentation, and female fertility. Ongoing work will reveal the localization, secretion and interacting partners of these Ca^{2+} signaling proteins.

The Plant Polyphenol from *Toxicodendron vernicifluum* Exhibits Anti-cancer Potential Against Human Oral Squamous Cell Carcinoma

Devivasha Bordoloi, Javadi Monisha, Nand Kishor Roy, Ganesan Padmavathi, Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India.
E-mail:*kunnumakkara@iitg.ernet.in*

ABSTRACT

Oral cancer is one of the most prevalent cancers in India killing more than 2,00,000 people every year and the North-East states have the highest number of reported oral cancer cases in India. Notably, more than 95% of the total intra-oral carcinomas are squamous cell carcinomas. Despite the remarkable advances in the field of oncology, no effective therapies are available thus far for treating this disease. Therefore, discovering and developing drugs against cancer which are efficacious, devoid of extreme toxicities and reasonably inexpensive is highly critical. Butein (3,4,2',4'-tetrahydroxychalcone), isolated from Toxcicodendron vernicifluum is one such potential compound with enormous anti-inflammatory, pro-apoptotic and anti-oxidative effects. However, its anticancer potential has not been evaluated in OSCC yet. Therefore, we investigated the anticancer effect of butein in OSCC and the underlined mechanism of action. Its effect on the proliferation and survival of OSCC were evaluated by MTT assay and PI-FACS analysis. The effects of butein on the invasion and metastases of OSCC cells was determined by wound healing and matrigel invasion assay. The mechanism of action responsible for its anticancer activity was evaluated using western blot. This is the first report which shows the anticancer activity of butein against OSCC. It inhibited the proliferation of SAS, KB and RPMI-2650 cells effectively with IC50 values of 8, 10 and 9.5 μM respectively. Butein induced cytotoxicity at the concentration of 20μM in SAS cells and 40 μM in case of KB and RPMI-2650 cells. Moreover, it prevented the migration of OSCC cells at 10μM. Further, the findings implied that butein inhibited the activation of NF-κB and NF-κB regulated gene products such as Cox-2, Cyclin D1, Bcl-2, Survivin, CXCR-4 and MMP-9 which are involved in cell proliferation, survival, invasion and metastases.Collectively, the results indicate butein to possess profound potential as a promising treatment option for OSCC. However, in vivo validation is necessary before moving to clinical trial.

Curcumin, The Golden Nutraceutical: Multitargeting for Multiple Malignancies

Devivasha Bordoloi, Kishore Banik, Choudhary Harsha, Khwairakpam Amrita Devi, Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India
E-mail:*kunnumakkara@iitg.ernet.in*

ABSTRACT

Research over the past several years has developed many mono-targeted therapies for the prevention and treatment of cancer, but it still remains one of the fatal diseases in the world. Development of chemoresistance in cancer cells against mono-targeted chemotherapeutic agents is the prime reason behind the failure of cancer chemotherapy. Therefore, inhibition of those pathways involved in chemoresistance by non-toxic multi-targeted agents seem to possess profound potential in preventing drug resistance and sensitizing cancer cells to chemotherapeutic agents. Investigations carried over the last few decades showed that curcumin, obtained from the rhizomes of Curcuma longa is a highly potent, non-toxic chemosensitizer with ability to target diverse molecular and cellular pathways. The safety, tolerability and non-toxicity of this compound even at high doses are some other inevitable yet added advantages. Curcumin has a diverse range of molecular targets such as transcription factors, inflammatory cytokines, enzymes, kinases, growth factors, receptors, various other proteins and it regulates them through direct interaction or via modulation of their expression. It serves as an effective chemosensitizer for different chemotherapeutic agents such as 5-FU, doxorubicin, paclitaxel, cisplatin, celecoxib etc. in different malignancies. Additionally, the concept of hybrid curcumin which aids in overthrowing various deficits related to chemoresistance is found to be another potential strategy for cancer treatment. Thus, curcumin offers plausible clinical applications in combination with conventional therapies and caters new clues for the development of diverse synergistic combinations, including different hybrids of this compound.

The Potential Influence of a Tetrahydroxychalcone "Butein" to Obliterate Cancer

Devivasha Bordoloi, Bethsebie Lalduhsaki Sailo, Ganesan Padmavathi, Krishan Kumar Thakur, Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India
E-mail:*kunnumakkara@iitg.ernet.in*

ABSTRACT

Cancer is one of the major health concerns of the people today with a very high incidence and mortality rate. Extensive research in the field of cancer has resulted in the development of numerous chemotherapeutic drugs, however majority them are associated with adverse side effects such as bonemarrow suppression, myelosuppression, hepatic dysfunction etc. and they often lead to chemoresistance and radioresistance. Hence, it is requisite to develop new therapies with higher efficiency yet fewer side effects. In the present days, "Phytochemicals"; the natural compounds found in plants, fruits and vegetables have gained considerable attention due to their diverse biological significance especially medicinal importance which primarily includes their use in the treatment of different chronic diseases like diabetes, cardiovascular diseases, neurological disorders and diverse neoplasms. Butein; a tetrahydroxychalcone, is one such phytochemical, first isolated from Toxicodendron vernicifluum formerly known as Rhus verniciflua. R. verniciflua Stokes which is commonly known for its immense medicinal values. It has a wide range of molecular targets such as NF-κB, EGFR, COX-2, STAT3, ERK, JNK, Akt, p38, caspases, Bax etc. which are involved in survival, proliferation, angiogenesis, invasion, metastasis and chemoresistance of different cancers such as breast cancer, colorectal cancer, leukemia, pancreatic cancer, prostate cancer etc. Taken together, butein possess enormous potential as a chemotherapeutic, chemopreventive and chemosensitizing agent with multi targeting ability against different cancers with negligible adverse reactions. However, further investigations are warranted for bringing this highly prospective agent as a cutting edge therapeutic strategy for the prevention and treatment of varied neoplasms.

Debadrita Basu
Department of BSBE, IITGuwahati, India

Stop codon (UAA, UAG, UGA) recognition in the ribosome and catalytic cleavage of polypeptide chain from the P-site tRNA by the release factor ensure translation termination. Incorrect translation termination could be linked to 11% of hereditary diseases in human. Recently reported Cryo-EM complexes of stop codon programmed mammalian ribosome with eukaryotic release factor (eRF1) have shown a very specific eRF1-stop codon interaction in the ribosomal A-site. As a case study, we decided to quantitatively compute the underlying energetics which ensures correct selection of stop codons rejecting sense codons by eRF1 in the ribosome.

Few reported structures (pdb codes: 3JAG, 3JAH, 3JAI) have suggested a conserved Mg^{2+} ion interacting with the 2nd base of the stop codon in the ribosomal A-site. Mg^{2+} is well known for playing crucial roles in biochemistry. Hence we wanted to address the following issues:
(a) Is Mg^{2+} in the ribosomal A-site crucial for structural integrity of translation termination complex?
(b) Is Mg^{2+} capable of tuning the discrimination strength of eRF1 in stop codon selection over sense codon in the ribosome?
Using the reported Cryo-EM structures as template, we did molecular dynamics simulations for the following models:
Case 1: Termination complex with Mg^{2+} in the A-site of ribosome
Case 2: Termination complex with shifted Mg^{2+} (30Å away from the resolved A-site location)
Case 3: Termination complex with shifted Mg^{2+} (30Å away from the resolved A-site location) and restraining the same in the new location.
For case 1, simulations show that the Mg^{2+} is stable in the ribosomal A-site with a minor drift of ~2.5Å. Case 2, shows that Mg^{2+} comes back during the course of simulations to the ribosomal A-site and occupy a position very near to the structurally resolved location. This suggests that the Mg^{2+} has a tendency to occupy the A-site of the ribosome. In case 3, due to the restraint the Mg^{2+} could not come back to the ribosomal A site, but the mRNA-eRF1 is weakened and also the p-site tRNA-mRNA interaction is seen to be deformed. Our preliminary data suggests that Mg^{2+} might be playing a very important role in structural stabilization. The role of Mg^{2+} in the energetics of discrimination is under process.

Proteomic identification of plasma signatures to delineate novel colloquial early responsive markers against deltamethrin induced acute hepatotoxicity

Deepika Arora[1a 2], Mohammed Haris Siddiqui,[2] Pradeep Kumar Sharma[1b], Sheelendra Pratap Singh[1b], AnuragTripathi[1c], Payal Mandal[1c], Uma Shankar Singh[3], Pradhyumna Kumar Singh[4] and Yogeshwer Shukla[1a*]
1[a] Proteomics &Environmental Carcinogenesis Laboratory, [b] Analytical Toxicology division, [c] Food Toxicology Laboratory, CSIR-Indian Institute of Toxicology Research, Mahatma Gandhi Marg, Lucknow -226001 (U.P), India
2 Department of Bioengineering, Faculty of Engineering, Integral University, Lucknow- 226026 (U.P) India
3 King George's Medical University, Lucknow 226001 (U.P.), India
4 Plant Molecular Biology & Genetic Engineering, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow -226001 (U.P), India
*E-mail:*yshukla@iitr.res.in*

ABSTRACT

Uprising reports towards deltamethrin (DLM)-induced toxicity in non-target species including mammals have raised a worldwide concern. Moreover, in the absence of any identified marker, the prediction of DLM elicited early toxic manifestations in non-targets remain elusive. Here, in the present *invivo* study a comprehensive approach of proteome profiling along with conventional toxico-physiological correlation analysis was performed to classify novel protein based markers in the plasma of DLM exposed Wistar rats. Animals were exposed orally to DLM (low dose: 2.56mg/kg b.wt. high dose: 5.12mg/kg b.wt.) up to 7 consecutive days. The UPLC-MS/MS analysis revealed a dose dependent dissemination of DLM and its primary metabolite (3-phenoxy benzoic acid) in rat plasma. Through 2-DE-MS/MS plasma profiling and subsequent verification at the transcriptional level, we found that 6 liver emanated acute phase proteins (Apolipoprotein-AIV, Apolipoprotein E, Haptoglobin, Hemopexin, Vitamin D Binding protein, and Fibrinogen gamma chain) were significantly ($p<0.05$) modulated in DLM treated groups in a dose-dependent manner. Accordingly, DLM exposure resulted in adverse effects on body growth (body weight & relative organ weight), serum profile, liver function and histology, inflammatory changes (enhanced TNF-α, TGF-ß and IL6 level), and oxidative stress. Moreover, these toxic manifestations were suppressed upon N-acetyl cysteine (NAC) supplementation in DLM treated animals. Thus, DLM-induced inflammatory response and subsequent oxidative

injury to liver grounds the reduced expression of identified acute phase proteins. In conclusion, we proposed these plasma proteins as novel candidate markers against DLM toxicity in non-targets that could be utilised to assess early DLM-induced hepatotoxicity in non-target species with a minimal invasive mean.

Silk based functionalized nanofibrous dressings for treating diabetic foot ulcers

Dimple Chouhan and Biman B. Mandal*
Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati – 781039, Assam, India.
E-mail:*biman.mandal@iitg.ernet.in*

Keywords: Deltamethrin, 2-DE, Acute phase proteins, Inflammation, Oxidative stress, Hepatotoxicity

ABSTRACT

Diabetic cutaneous wounds are associated with several abnormalities like bacterial colonization, chronic inflammation, abnormal cell migration and impaired matrix deposition which altogether contribute to wound chronicity. There is a substantial need of bioactive dressing to trigger healing pathways and influence matrix deposition for quick wound repair. Silk fibroin (SF) is a natural protein polymer having favorable wound healing properties aiding in cellular recruitment towards wound bed. SF from non-mulberry variety possesses cell-binding motifs and higher number of positively charged amino acids offering cell-material interactions for accelerated wound healing. The present work deals with extensive study of wound healing under hyperglycemic conditions using various silk based nanofibrous mats in alloxan induced diabetic rabbit model. Functionalization of the mats with growth factors and LL-37 stimulated wound healing process and provided antimicrobial activity respectively. Non-mulberry SF (NMSF) based mats demonstrated faster wound closure (85-90 %) within 14 days and faster re-epithelialisation exhibiting pancytokeratin markers in keratinocytes. Development of healthy granulation tissue showing angiogenesis and regulated expression of matrix metalloproteinases (MMPs) and collagen fibers was observed. Higher wound breaking strength (60-65 %) after 4 weeks and organized ECM deposition (collagen type I, type III, elastin and reticulin) further validated the potential of NMSF based dressing patches to influence ECM deposition in diabetic conditions. The NMSF based nanofibrous mat represents potential bioactive dressing patch for faster and complete repair of chronic cutaneous wounds.

Novel immunosuppressive mechanism adapted by*Leishmania donovani* parasite during infection

Gundappa Saha and Vikash Kumar Dubey*
* Department of Biosciences & Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039
Email: vdubey@iitg.ernet.in

ABSTRACT

Leishmaniasis is a parasitic disease caused by the parasite of genus *Leishmania*. It affects mostly people from poor socio-economic background. The chemotherapeutics available against this disease are having major drawbacks like high cost, toxicity, duration of treatment, route of administration and development of drug resistance. Therefore, there is a huge urge to develop novel strategy for long term treatment which can be addressed by the development of novel immuno-therapeutics. In this study, we will be highlighting a novel strategy that *Leishmania donovani* modulate to cause immunosuppression in the host cell. The inflammatory pathway or more precisely the "inflammasome" formation help the host cells to get rid of any infection like bacteria, fungi, viruses, protozoa, etc. Till date, no reports have been found regarding host NLRP3 inflammasome inhibition during infection. The preliminary studies suggest that the NLRP3 inflammasome formation is inhibited upon *L. donovani* infection in human monocyte-differentiated macrophage cells (U937 cell line). The significant decrease in Caspase 1 level highlights the fact that the parasite is modulating the inflammasome formation, so as to get rid of host defense mechanism. In a nutshell, the results hypothesize that the parasites modulate the inflammasome complex to get rid of host defense strategy and creating a suitable niche inside the host cell for their long term survival.

Gold nanoparticles reduced by *Dillenia indica* preferentially target cancer cells

Choudhary Harsha, Kishore Banik, Nand Kishor Roy, Amrita Khwairakpam, Devivasha Bordoloi, Ajaikumar B. Kunnumakkara#
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

The major limitation of most anticancer drugs is that they exert cytotoxicity to the surrounding normal cells in addition to tumor cells. This restricts the use of these therapeutic agents for the prevention and treatment of this disease. Therefore, the drugs that can preferentially kill cancer cells are sought for effective therapy. In this study, we have synthesized gold nanoparticles using leaves of Dillenia indica (DI-GNPs) and evaluated its anticancer potential against oral cancer cells and normal cells. To begin with, the leaves of Dillenia indica were collected, washed and shade-dried. The dried leaves were grinded and 70% methanolic extract was prepared. GNP was synthesized by incubating this 5% methanolic extract with 1mM aqueous solution of AuCl4, follwed by heating for 15-20 seconds. The color change of the solution, observed upon heating, indicated the synthesis of DI-GNP. The DI-GNP solution was subsequently centrifuged and the pellet was lyophilized. The synthesis of DI-GNP was further confirmed using UV-visible spectrophotometry, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and Transmission electron microscopy (TEM) analysis. UV-visible spectroscopy exhibited characteristic peak of GNPs at around 550nm, XRD analysis showed peaks in the range of gold metals and FTIR analysis identified adsorbed active phytochemicals on the surface of GNPs. TEM analysis illuminated the shape and size of the DI-GNP. Subsequently, the anticancer activity of DI-GNP was estimated using MTT assay, FACS and Western blot. MTT and FACS assay demonstrated decreased proliferation and survival of oral cancer cells treated with DI-GNP. Western blot analysis exhibited downregulation of Cox-2 and Survivin, thereby confirming the anti-proliferative and anti-survival potential of DI-GNP. Thus, gold nanoparticles synthesized using Dillenia indica leaf extract are a promising anticancer agent that does not affect normal cells at the effective dose required to kill cancer cells.

Spices- an "age-old" antidote to cancer

Choudhary Harsha, Kishore Banik, Javadi Monisha, Nand Kishor Roy, Ajaikumar B. Kunnumakkara#
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Cancer is a deadly disease which consumes millions of lives per year. The incidence of cancer and rate of mortality due to cancer is higher in the western world than the eastern world. Studies have shown that spices constitute an important factor which contributes to the relatively low rate of cancer-related deaths in India and the eastern world. Investigations into the potential of spices have enlisted a number of different spices effective against cancer. These spices have been consumed since ages for enriching flavor and color of food and for preserving food. The commonly used spices include turmeric, red chilli, ginger, cloves, cardamom, fennel, kokum, fenugreek, black cumin, etc. The principle components of these spices are curcumin, capsaicin, eugenol, zerumbone, cadamonin, anethole, gambogic acid, and thymoquinone respectively. These spices exert their potential by modulating the various transcription factors and cell signalling pathways involved in growth, proliferation and survival of cells. The active compounds of the spices suppress the inflammatory pathways thereby playing an effective role in the prevention and treatment of cancer. Owing to the efficacy of these compounds, the spice-based nutraceuticals are emerging as potential therapies for the treatment of cancer.

Cancer diagnosis- an overview

Choudhary Harsha, Devivasha Bordoloi, Bethsebie Sailo, Ganesan Padmavathi, Ajaikumar B. Kunnumakkara#
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Diagnosis of cancer is a great challenge at initial stage; however, detection of this disease at early stage is crucial for complete cure. The first step to cancer diagnosis is the examination of blood, urine, or other body fluids that estimates the level of certain protein or biomarkers in the patient samples. This is confirmed by imaging techniques like CT Scan, Nuclear scan, Ultrasound, MRI, PET scan, X-rays, etc. which help to identify or locate the tumor. The diagnosis of cancer is further facilitated by biopsy where the tumor sample or tissue is removed and examined by a pathologist. The protein, DNA, and RNA analysis of the biopsy specimen or other samples like blood also provides more information about the cancer. The other commonly used techniques available at most cancer diagnostic units are Barium Enema, Bone Marrow Aspiration and Biopsy, Bone Scan Breast, Colonoscopy, Digital Rectal Exam (DRE), Donating Blood and Platelets, EKG and Echocardiogram, Fecal Occult Blood Tests, Mammography, MUGA Scan, Sigmoidoscopy, etc. Despite the advent of various diagnostic tests for the detection of cancer, the overall survival rate for this disease is poor and most of the cancers are diagnosed at later stages. The treatment of cancer thus demands early stage biomarkers for detection of the disease. Advanced technologies for detection of cancer have emerged such as Next-Gen sequencing, digital PCR, cell free DNA technology, DNA microarray. They have shown promising results for detection of mutations, variants, transcriptomic analysis, and methylation detection. Cytogenetics and immunohistochemistry also provide information about molecular changes such as mutations, fusion genes and structural and numerical changes in chromosomes. Besides, FISH, CGH, flow cytometry and electron microscopy also play an important role in the diagnosis of cancer and application of nanomaterials has largely facilitated the diagnosis of cancer

(E)-labda-8(17), 12-diene-15, 16-dialfrom *Alpinia nigra:* Is it a potential agent against *Candida albicans*??

Ishani Chakrabartty, Latha Rangan*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati
*Corresponding Author: lrangan@iitg.ernet.in

ABSTRACT

Plant extracts, concoctions and plant based compounds have been used since time immemorial to treat a number of diseases. A number of bioactive compounds have been isolated from the genus *Alpinia*, belonging to Zingiberaceae. Labdane diterpene, (E)-labda-8(17), 12-diene-15, 16-dial, was isolated from the moderately mature seeds of *Alpinia nigra*, having diverse biological attributes. This compound, isolated from the hexane extract of moderately mature seeds of *Alpinia nigra*. The structure was deduced by numerous analytical techniques viz. HRMS, FTIR, NMR and Raman spectroscopy. *Candida albicans* is a dimorphic fungus that grows both as yeast and filamentous fungus.The compound showed pronounced inhibitory effect on the growth of this pathogenic fungus. Significant changes in the membrane of the fungus were observed by electron microscopy. Further, dissolved oxygen and growth curve analysis indicated that the compound has a static effect on the growth of the fungus in a dose dependent manner. Flow cytometric investigation along with leaky experiment confirms the absence of lysis of microbial cell after treatment with the compound; hence no DNA leakage is observed.
Keywords: *Alpinia nigra*, Labdane diterpene, *Candida albicans*, DNA leakage

Exploring the Intrinsic Fluorescence Properties of Fibroin and Sericin, Extracted from Sil Varieties Endemic to NorthEast India

Jadi Praveen Kumar[1], Rocktotpal Konwarh[1], and Biman B. Mandal[1*]
[1]Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, India
*E-mail:biman.mandal@*iitg.ernet.in*

ABSTRACT

Aromatic amino acid present in the protein polymer contributes to the intrinsic fluorescence properties. Silk is a protein polymer gaining much impetus in the field of tissue engineering and regenerative medicine. Exploring the intrinsic fluorescence properties of fibroin and sericin extracted from the mulberry (*Bombyx mori*) and non-mulberry (*Antheraea assamensis* and *Philosamia ricini*) silk varieties endemic to Northeast India might develop new fluorescence agents. In this study, fibroin was extracted from the *B. mori* cocoons and glands of *A. assamensis* and *P. ricini*. Silk sericin was extracted from the cocoons of mulberry and non-mulberry silkworms by urea, acid and alkali-degradation. Extracted fibroin and sericin were characterized for their secondary structure and fluorescence using circular dichroism (CD) spectroscopy and fluorometer. CD spectroscopic studies displayed that the secondary structure of silk proteins varied based on their extraction method and source. Intrinsic fluorescence spectra of the silk proteins in solution and different formats (films, scaffolds and nanoparticles) were recorded in the excitation range of 280 to 330 nm and emission from 295 to 345 nm. A common chemical quencher, acrylamide was used for the quenching studies. Contrasting spectral profiles of the mulberry and non-mulberry based silk proteins extracted by different methods gave an idea that not only the ecological niche including the feeding habit but also the extraction routes influence the fluorescence of the silk proteins.
Keywords: *Fibroin, sericin, fluorescence, CD spectroscopy.*

The link of Obesity and Cancer

Jai Prakash, *Nand Kishor Roy and Ajaikumar B Kunnumakkara**
[a]*Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India*
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Due to the rapid adoption of a modernized lifestyle that results in increased carbohydrate and fat-rich dietary intake, reduced physical activity and extended life expectancy, Obesity is a growing problem in contemporary societies. Obese people often have chronic low-level inflammation, which can, over time, cause DNA damage that leads to cancer. Overweight individuals are more likely than normal-weight individuals to have conditions or disorders that are linked to or that cause chronic local inflammation and that are risk factors for certain cancers. For example, Chronic ulcerative colitis and hepatitis are risk factors for different types of liver cancer. Obese people often have increased blood levels of insulin and insulin-like growth factor-1 (IGF-1). High levels of insulin and IGF-1 may promote the development of colon, kidney, prostate, and endometrial cancers. Insulin resistance and a chronic, subclinical inflammation in the visceral fat are the major metabolic events, causing alterations in the levels of insulin, glucose, free fatty acids, insulin-like growth factor-1 and -2, adipose tissue-derived proinflammatory factors such as tumor necrosis factor-α and interleukin-1, -6, -12, and -23. All these factors may act directly or indirectly on the tumor microenvironment to drive tumor progression via the stimulation of cell survival/ antiapoptosis, cell proliferation, angiogenesis, and invasion/metastasis of cancer cells.

3D silk scaffold based culture system for enhanced functionality of hepatocytes.

Janani GandBiman B. Mandal*
Biomaterials and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati - 781 039, India.
*E-mail:*biman.mandal@iitg.ernet.in,mandal.biman@gmail.com*

ABSTRACT

Liver, a highly regenerative organ performs numerous functions like albumin synthesis, detoxification of toxic compounds, bile secretion, hormonal regulation and maintaining homeostasis. Cirrhotic liver patients are highly dependent on orthotopic liver transplantation, often challenged by the paucity of healthy liver leading to around 50 million deaths annually, as stated by World Health Organization. As a plausible solution, lab grown bioartificial liver device (BAL) with functional hepatocytes is needed. Simulating *in vivo* micro-environmental niche *in vitro* for three dimensional (3D) cultures of functional liver cells requires a suitable scaffold system supporting bidirectional mass transport of nutrients and toxins. In our study, we fabricated 3D porous scaffolds from both mulberry (BM) and non-mulberry (AA) silk fibroin and cultured with primary hepatocytes for its potential in hepatocyte tissue engineering. Physical characterization studies revealed interconnected porous network with high porosity, suitable mechanical strength (5-25 kPa), water uptake capacity, blood and cell compatibility exhibiting apt physical mileu for cellular attachment and proliferation. Cellular behaviour in scaffolds signified high hepatic cell support by spheroidal growth providing optimal cell-cell and cell-matrix interactions. Cell proliferation and expression of signature marker genes like metabolic (ALB, FET) and detoxification genes (CYP450) was significantly enhanced in blend scaffolds. Improved albumin secretion, urea synthesis and cytochrome P450 activity were observed over 21 days. Presence of extracellular matrix components and 3D niche helps in maintaining hepatocyte viability and functional characteristics. Our findings revealed that integral biochemical property of blend scaffolds as an exciting biomaterial environment influencing spheroidal growth with enhanced proliferation, expression of hepatic markers and metabolic activities. Taken together, findings revealed a close connection between cell-matrix and cell-cell interaction concluding 3D matrix application in future for bioartificial liver, drug screening and construction of *in vitro* tissue engineering.

Keywords: Liver tissue engineering, primary hepatocyte culture, Non-mulberry silk fibroin and 3D scaffolds

NGAL, A Promising Target to Persecute Cancer

Javadi Monisha[1*], Nand Kishor Roy[1], Ganesan Padmavathi[1], Devivasha Bordoloi[1], Ajaikumar B. Kunnumakkara[1#]
[1]Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

NGAL, also known as Lipocalin-2 (LCN2) belongs to the family Lipocalin. It is a 24 kDa secreted glycoprotein in humans encoded by LCN2 gene located on the chromosome locus 3p11. It was first purified from a culture of mouse kidney cells infected with simian virus 40 (SV-40) and in humans it was isolated from supernatant of human neutrophils. NGAL is a small molecule and usually binds and helps in transport of hydrophobic ligands. It is involved in innate immune response and protects the body against bacterial infection, by sequestering iron, thus limiting the bacterial growth. In addition to ligand binding, it is also involved in protein-protein interaction, and hence sometimes appears to be complexed with MMP9. It is expressed in neutrophils, kidney, prostate, and epithelia of the respiratory and alimentary tracts, and is majorly used as biomarker in kidney injury. In breast cancer, NGAL binds with MMP9 and promotes invasion. High expression of NGAL is strongly involved in the progression of colorectal cancer, esophageal cancer, chronic myeloid leukemia, hepatocellular carcinoma, gastric and endometrial cancers. However, in other cancers such as pancreatic cancer and oral cancer, downregulation of NGAL leads to disease progression. In recent years it has emerged as a biomarker for several benign and malignant diseases. Therefore, understanding the function of NGAL in the development of cancer would provide us new insights to cancer treatment.

Biomimetic Electrospun Silk-Bioactive Glass Composites for Osteochondral Interfacial Tissue Engineering

Joseph Christakiran M.[1], Philip J. T. Reardon [2], Rocktotpal Konwarh [1], Jonathan C. Knowles [2], Biman. B. Mandal [1]*
[1]Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
[2]Division of Biomaterials and Tissue Engineering, UCL Eastman Dental Institute, University College London, 256 Gray's Inn Road, London WC1X 8LD. UK
*E-mail: biman.mandal@*iitg.ernet.in*

ABSTRACT

The anatomical complexity and slow regeneration capacity of hyaline cartilage at the osteochondral interface pose a great challenge in the repair of osteochondral defects (OCD). In this study, we utilized the processing feasibility offered by the sol derived 70S bioactive glass and silk fibroin (mulberry *Bombyx mori* and endemic Indian non-mulberry *Antheraea assama*), in fabricating a well-integrated, biomimetic scaffolding matrix with a coherent interface. Differences in surface properties such as wettability and amorphousness between the two silk groups resulted in profound variations in cell attachment and extracellular matrix protein deposition. The mechanical assessment showed that the biphasic composites exhibited both an elastic region pertinent for cartilage tissue and a stiff compression resistant region simulating the bone phase. *In vitro* biological studies revealed that the biphasic mats presented spatial confinement for the growth and maturation of both osteoblasts and chondrocytes, marked by increased alkaline phosphatase (ALP) activity, osteopontin (OPN), sulphated glycosaminoglycan (sGAG) and collagen secretion in the co-cultured composite mats. The non-mulberry silk based biphasic composite mats performed better than their mulberry counterpart, as evidenced by enhanced expression levels of key cartilage and bone specific marker genes. Therefore, the developed biphasic scaffold show great promise for improving the current clinical strategies for osteochondral tissue repair.

Keywords: silk fibroin, mulberry, non-mullberry, bioactive glass, osteochondral, tissue engineering

Biochemical characterization of Heparinase II/III of family 12 polysaccharide lyase (PL12) from *Pedobacter saltans*

Karthika B., Kedar Sharma, Aruna Rani and Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory, Department of Biosciences & Bioengineering
Indian Institute of Technology Guwahati, Assam, India. Email: karthika@iitg.ernet.in

ABSTRACT

Bacterial heparinase is a class of polysaccharide lyases that cleaves α-(1-4) glycosidic linkages in heparin and heparan sulfate yielding unsaturated oligosaccharides and disaccharides. Three types of heparinases are produced by microbes viz. I, II and III. Heparinase I cleaves only heparin, Heparinase II cleaves both heparin and heparan sulfate and Heparinase III cleaves only heparan sulfate. These heparinases have various pharmacological and physiological applications. They are used in production of low molecular weight heparin, an effective anticoagulant and also used in analyzing the structures of heparin and heparan sulfate which play a crucial role in angiogenesis. The aim of this work was to clone a new heparinase encoding gene (Uniprot ID F0S8P2, Accession No. ADY52373.1) from heparinolytic bacterium Pedobacter saltans. The gene encoding heparinase belong to family 12 polysaccharide lyase (PL12). The ORF coding region (1.93 kb) was amplified by PCR and cloned into pET-28(a) expression vector and expressed using BL21(DE3) E. coli cells. Protein expression was found to be maximum at 16°C after induction with 1 mM IPTG. The purification of PsPL12a was carried out in a single step using Immobilized Metal-ion Affinity Chromatography (IMAC). The purified enzyme gave a single band of molecular size approximately, 76 kDa on SDS-PAGE. The initial characterization of enzyme was carried out by using the substrate heparin (0.1%). PsPL12a displayed the optimum temperature range of 45°C-50°C and optimum pH 6.0. The kinetic parameters of the enzyme such as K_m and V_{max} was found to be 3.2 mg/ml and 52 U/mg respectively. The maximum specific activity (V_{max}) of the enzyme was achieved at 1% (w/v) heparin concentration.

Leishmania donovani L-asparaginase: Its role in growth and infectivity of the parasite

Kartikeya Tiwari[1], Vikash Kumar Dubey*[1]
[1]Department ofBiosciences and Bioengineering,IIT Guwahati,India
*E-mail: vdubey@iitg.ernet.in

ABSTRACT

Leishmania donovani, a digenetic and dimorphic protozoan parasite is the causative agent of visceral leishmaniasis. A worldwide attempt to curb this disease either by development of efficient drugs or by vaccines is in progress. Researchers continue to probe various metabolic pathways of this parasite in a search for effective drug targets. In the current study we are trying to understand the role played by the aspartate metabolism in the parasitic growth and survival. The conversion of asparagine to aspartate is the key reaction of this metabolic pathway which is mediated by asparaginase. Generation of null mutant for asparaginase gene in the parasite will fetch information about the vitality of this enzyme and related metabolic pathways in the growth and infectivity of the parasite. Since the human counterpart lacks the asparaginase, this makes it a attractive target, and it becomes interesting to observe how the parasite handles the aspartate metabolic pathway in the absence of this gene. The aspartate formed by the action of asparaginase is siphoned in the *de novo* pyrimidine pathway in the from of N- carbamoyl aspartate and in the citric acid cycle in the form of oxaloacetate and fumarate. Thus the *de novo* pyrimidine and citric acid cycle pathways will be perturbed in the parasite devoid of asparaginase gene. The lack of host counterpart of asparaginase and the altered metabolic flux in the parasitic null mutants will help in gaining insights on the functionality of asparaginase and also in assigning asparaginase as a novel drug target. The single knockout mutant of the *L. donovani* parasite were generated using conventional homologous recombination approach. The single knockout mutant displayed retarded growth phenotype as compared to the wild type. Generation of null mutant is in progress and will provide useful insights in the role of asparaginase in the *L. donovani* parasite.

Low-resolution structure of glucuronoxylan-xylanohydrolase (CtXynGH30) of family 30 glycoside hydrolase from Clostridium thermocellum by SAXS

Kedar Sharma[1], Anil Kumar Verma[1], Carlos M.G.A. Fontes[2],
Shabir Najmudin[2] and Arun Goyal[1]
[1]Carbohydrtae Enzyme Biotechnology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.
[2]CIISA-Faculdade de Medicina Veterinária, Universidade de Lisboa, Avenida da Universidade Técnica, 1300-477 Lisbon, Portugal. E-mail: s.kedar@iitg.ernet.in

ABSTRACT

Glucuronoxylan endo-β-1,4-xylanase (*Ct*XynGH30) from *Clostridium thermocellum*participates in degradation of hemicelluloses and interact synergistically with other hemicellulases resulting in bioconversion of lignocellulosic biomass. Protein sequence analysis showed that *Ct*XynGH30 is composed of two modules, an endo-β-1,4-xylanase as a catalytic module and a family 6 carbohydrate binding module (CBM6) and both are separated by a 14-amino acid O-glycosylated linker. Global structure of full-length modular *Ct*XynGH30 is not fully understood and the presence of flexible linker makes virtually impossible to crystallize. Therefore, Small Angle X-ray Scattering (SAXS) analysis of *Ct*XynGH30 was carried out which showed a Radius of gyration (Rg) 3.33 nm for globular protein and Rc 0.91 nm for Rod shape. *Ct*XynGH30 possesses an elongated structure of 11.09 nm length having two globular domains connected via a linker. M_w of *Ct*XynGH30 calculated by Datmow Program was 65.09 kDa, suggesting its monomeric nature. Fully folded state of *Ct*XynGH30 in solution was confirmed by Kratky analysis. *Ct*XynGH30 solution structure was modelled by processing scattering profiles by *ab initio* approaches. Superposition of modelled *Ct*XynGH30 structure with SAXS analysed low-resolution structure revealed close matching with two differences, (i) linker being unstructured, long and flexible by SAXS, (ii) central bending in linker in modelled structure.

Anticancer activity of Outenga (*Elephant Apple*) against Oral Cancer

Kishore Banik, Harsha Choudhary, Devivasha Bordoloi, Monisha Javadi,
Ajaikumar B. Kunnumakkara#
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Background: Despite the developments in diagnosis and treatment of Oral cancer, it still remains the sixth most common malignancy in the world. It has been estimated that approximately 2,63,000 people are diagnosed with this cancer every year and 1,28,000 people are dying due to this disease globally. Chemotherapy, radiotherapy and surgery, still remain the corner stone of treatment of this cancer type; though these approaches are not very effective and linked with chemoresistance and multiple side effects. Henceforth, herbal medicines are extremely vital in this regard on account of their minimal side effects for the prevention and treatment of oral cancer. *Elephant apple* is one such herbal medicine, commonly used in the North-East region of India as traditional medicine for the treatment of tumor.
Objective: To examine the anticancer effects of *Elephant apple* in oral cancer.
Materials and Methods: To examine the anticancer effect of *Elephant apple* on oral cancer MTT assay, flow cytometry and wound healing assays were performed. To determine the mechanism of action of *Elephant apple*, the expression of the genes involved in cancer cell proliferation, survival, invasion and metastasis were analysed after treating the oral cancer cells with the extract.
Result: The extract has shown potent anticancer effect in oral cancer cells. The IC_{50} value was found to be 150 μM. The extract also showed high potential in inducing apoptosis and inhibiting metastasis of oral cancer cells by *in vitro* methods. The gene expression analysis showed that the extract significantly inhibited the expression of the genes involved in cell proliferation, survival, invasion and metastasis.
Conclusion: The effect of Elephant *apple* extract correlate with its traditional use as an anticancer agent, thus making it an interesting source for further investigation.

Global Cancer Statistics

Kishore Banik, Choudhary Harsha, Javadi Monisha, Ajaikumar B. Kunnumakkara#
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India.
Email: kunnumakkara@iitg.ernet.in

ABSTRACT

Cancer is one of the major leading cause of death, causing approximately 8.8 million deaths in 2015. About 70% of deaths from cancer occur in low- and middle-income countries. High body mass index, less intake of fruits and vegetables, lack of physical activity, tobacco use, and alcohol use are the major risk factors contributing one third of cancer related deaths. The most commonly diagnosed cancers worldwide are of lung, breast, colorectum, prostate, stomach and liver cancer. Lung cancer is the most common cancer in the world. In 2012, lung cancer accounted to 1.8 million new cases and 1.59 million deaths. About 58 per cent of lung cancer cases occurred in less developed countries. Breast cancer is the second most common cancer worldwide, with 1.7 million new cases being diagnosed in 2012. It represents about 12% of all new cancer cases and 25% of all cancers in women. Colorectal cancer is the third most common cancer in the world, with nearly 1.4 million new cases diagnosed in 2012. Overall 14 million cases have been reported in 2012 which is expected to rise to 2.4 million cases by 2035.

Silk-based Macrocapsules for Islet-like Spheroid Formation and Sustained Insulin Production

Manishekhar Kumar[1], Samit K. Nandi[2], David L. Kaplan[3], Biman B. Mandal[1,*]
[1]Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati (IITG), Assam, India
[2]Department of Veterinary Surgery and Radiology, West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal, India
[3]Department of Biomedical Engineering, Tufts University, Medford, Massachusetts, USA
*Author for correspondence: biman.mandal@iitg.ernet.in, mandal.biman@gmail.com

ABSTRACT

The current study describes the fabrication of cell-encapsulated 3D silk scaffolds as bio-artificial pancreas (BAP) towards sustained insulin release. Developed silk-based scaffolds provided pancreatic like extracellular niche to re-establish the growing microenvironment of cells. Within silk scaffolds, insulin producing cells were encapsulated in alginate/agarose hydrogels for immune-isolation and enhancement of graft survival and function *in vivo*. The scaffolds were extensively characterized using scanning electron microscopy for pore architecture and cell distribution. Swelling index, matrix degradation, density, porosity, cell encapsulation and water uptake properties of scaffolds were also evaluated. Further, suitability of these cell seeded scaffolds was assessed through diverse in vitro tests, including measurement of cell proliferation, viability, glucose consumption and insulin secretion with time. Viability and proliferation studies of RIN- 5F cells were done to assess compatibility of scaffolds and suggested significant increase in cell number with time after encapsulation. Similarly, Live/Dead assay showed formation of 3D spheroid like pancreatic structures within scaffolds in vitro. Cells remain viable for a prolonged period and maintained insulin secretion in response to glucose stimulation. Further, improved glucose consumption index suggested metabolically active cells within encapsulated silk structures. This work demonstrated successful encapsulation of insulin producing cells within silk matrices with enhanced cell viability and function. Further development in this direction may have potential as a sustainable platform for in vivo pancreatic tissue engineering.

Keywords: silk; macroencapsulation; immunoisolation; bio-artificial pancreas; biomaterials; tissue engineering

Leela Manohar Chinni[1], TSUDA, Katsutoshif[2]
[1]Department ofBiosciences and Bioengineering,IIT Guwahati,India
[2]National Institute of Genetics, Experimental Farm, Japan
E-mail: m.chinni@*iitg.ernet.in*

ABSTRACT

In plants, most of the aboveground body was formed post-embryonically by the continuous organogenic potential of the shoot apical meristem (SAM). KNOTTED1-like homeobox (KNOX) genes are crucial regulators of SAM activity in vascular plants. To understand the function of KNOX gene (osh1) in rice. We have created an osh1 mutant plant. After 4- days of germination, we have observed that the mutant plant could not maintain SAM. Therefore, we have regenerated the mutant osh1 plant from the callus, which showed moderate phenotype from wild type. To find the further differences between the mutant and the wild type, we observed some tissues of osh1 mutant and wild type. We have also seen that there is a signification interaction between the KNOX and BELL protein in the development of Maize plant. As the both plants share some come characteristics, we decided to work on the interactions between KNOX and BELL proteins in rice plant.

Simultaneous sulfate reduction and carbon monoxide conversimmobilized anaerobic biomass : batch and continuous studies

Manoj Kumar, Arindam Sinharoy, Kannan Pakshirajan*
Department of Biosciences & Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India.

ABSTRACT

Sulfate rich wastewater from industries such as mining, paper and pulp lead to environmental problem in terms of excess mineralization of surface waters. A large number of processes including biological methods can be used to treat this type of wastewater. In our previous study an anaerobic microbial consortia capable of sulfate reduction with carbon monoxide as the sole source of carbon was reported. In this study immobilization of the anaerobic biomass with polyvinyl alcohol (PVA) and sodium alginate was investigated to improve the process efficiency and biomass retention in the treatment system. The experiments were first carried out using 120 ml serum bottles containing 50 ml mineral salt media. Different concentrations of sodium alginate ranging from 1 to 3.5 % (w/v) and PVA concentration 8 - 12 % (w/v) was used for preparing the immobilized beads containing the anaerobic biomass. The immobilized bacteria with beads made of 10 % PVA showed best results in terms of sulfate reduction (84%), CO utilization (98%) and minimum weight loss (5%). Followed by the batch study PVA beads with 10 % concentration were selected for continuous column study. The effect of hydraulic retention time (HRT), sulfate loading rate and carbon monoxide loading rate on sulfate and CO removal was examined employing a 1L packed bed bioreactor containing the immobilized biomass. Initial sulfate concentration was 250 mg/l and initial CO flow rate was 0.5 liter per minute. The results showed that for 48 and 24 h HRT the sulfate removal was 94 % and 90 % respectively. The CO utilization was also more than 90 % during the study period. Further experiments with higher sulfate and CO loading rates are currently underway.

Keywords: Immobilized beads, Sodium alginate, polyvinyl alcohol, sulfate reduction, carbon monoxide conversion, Packed bed bioreactor.

***Corresponding author**: Prof. Kannan Pakshirajan, Departmentof Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India. E-mail: pakshi@iitg.ernet.in; Tel: +91-361-2582210; Fax: +91-361-2690762.

Investigating the effects of organometallic ions on *Clostridium acetobutylicum* ATCC 824 metabolism

Mayurketan Mukherjee [1±], Anwesha Purkayastha[1+], Saumya Ahlawat [1+],Mehak Kaushal [1+], Debasish Das [1+]
Department of Biosciences and Bioengineering[1]
DBT Pan-IIT Centre for Bioenergy[+]
E-mail:mayurketan.mukherjee@gmail.com

ABSTRACT

Butanol, a potential alternate to fossil fuels is challenged by severe bottlenecks in its road to commercialization; low solvent titer, product toxicity and selectivity to name a few. Inherent quality of *Clostridium acetobutylicum* ATCC 824, a gram positive, endospore forming, obligate anaerobe, is its biphasic fermentation enroute to butanol production. The phases characterized by initial growth synchronized acidogenesis followed by solventogenesis. The present study captures the effect of various metallic ions on butanol production and to successfully design a media strategy which would enhance butanol titer. This study encompasses a dual strategy wherein initially the media has been optimized on the basis of metallic ion starvation followed by a comprehensive study of addition of various metallic ions which would result in better solvent titer, productivity and elevated butanol tolerance. Starvation experiments include removal of commonly added metallic ions as trace elements to the media. To that end, Magnesium ion starvation was experimentally found to elevate butanol titer to 13.6 g L^{-1} from 11.76 g L^{-1} as found after initial media optimization. Another important finding from this study was the significantly early onset of butanol production. Hence, magnesium starved media was used for subsequent addition of metal ions experiment. Supplementation of Zinc at 0.01 g L^{-1} to the media resulted in an enhanced butanol titer of 19 g L^{-1} with 83.84% enhancement in productivity. Zinc supplementation resulted in such an elevated titer is testament to the fact that zinc addition to the media imparts cellular tolerance to butanol toxicity which has been experimentally validated.

High energy liquid biofuel production utilizing crude glycerol by *Clostridium sporogenes*

Mehak Kaushal[1,2], Saumya Ahlawat[1,2], Mayurketan Mukherjee[1,2], Muthusivaramapandian Muthuraj[1,2], Anwesha Purkayastha[1,2],Debasish Das[1,2]
[1]Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
[2]DBT-PAN IIT Centre for Bioenergy
Email id: mehak@iitg.ernet.in

ABSTRACT

There is an ever increasing global demand of petroleum deposits irrespective of its depletion at an alarming pace. Undiscerning fossil fuel combustion has resulted in a constant pressure of climatic change and has compelled the world to search for alternative renewable energy sources. Biomass is one such source of both liquid and gaseous fuels. Liquid biofuels like ethanol and butanol, when blended with gasoline, have the potential to reduce greenhouse emissions, besides ensuring fulfillment of energy demand. Acetone-butanol-ethanol (ABE) fermentation of carbohydrates is a well explored biological process using *Clostridium* sp. However, regardless of the above mentioned driving factors, ABE fermentation from *Clostridium* sp. faces various limitations, which include high feedstock cost, low yields, low productivity, low final product titer, low solvent tolerance of the bacteria and expensive product recovery. Present study reports a non-acetone producing *Clostridium sporogenes* strain as a potential producer of liquid biofuels. The culture was found to utilize glycerol as the sole carbon source for growth and butanol production. Among various dual substrate combinations, glucose-glycerol mixture in the ratio of 60:40 resulted in maximum butanol and ethanol titer (g L^{-1}) of 11.9 and 12.1 respectively with total alcohol productivity of 0.59 g L^{-1} h^{-1}. In the mixture, when pure glycerol was replaced with crude glycerol, butanol and ethanol titer (g L^{-1}) of 11.2 and 11.7 was achieved. Hence, the strain shows immense potential for biofuels production using crude glycerol as cheap substrate.

Quantum Confinement of Nanoassemblies withmolecules of organic and bio-organic origin

Mukesh Baskaran, Jahnu Saikia, Sajitha Sasidharan and Vibin Ramakrishnan*
Molecular Informatics and Design Laboratory,
Department of Biosciences and Bioengineering, IIT Guwahati, India.
E-mail: *mukesh.b@iitg.ernet.in*

ABSTRACT

Spatial confinement of excitons in nano-crystalline region of semiconducting nanostructures, results in changes in their optoelectronic properties thereby making them useful in plenty of engineering fields.[1] Formation of such excitons are reported in nano-assemblies of some organic and bioorganic molecules[2,3]. Quantum confinement effect in organic nano-assemblies is really an exciting phenomenon, since they can be an alternative of inorganic Quantum Dots (QD) and may find potential uses in nano and biomedical industries[4,5]. Nano-assemblies of certain organic and bioorganic compounds synthesized in our laboratory became our subject of interest because of their unique structure and functional variation. We here have reported preliminary experimental results of these compounds and how they can be optimized to be a potential candidate to show quantum confinement effects.

Biosynthesis of Gold Nanoparticles Using Leaf Extract of Heartleaf Moonseed: Characterization and Effect of pH on its Synthesis.

Nand Kishor Roy[a], *Javadi Monisha*[a], *Ganesan Padmavathi*[a], *Anusmita Das*[a], *Sudeshna Gupta*[a], *Elancheran Ramakrishnan*[b], *Jibon Kotoky*[b] *and Ajaikumar B Kunnumakkara*[a]*.
[a]*Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India*
[b]*Division of Life Sciences, Institute of Advanced Study in Science and Technology (IASST), Paschim Boragaon, Guwahati, Assam-781035, India.*
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Gold nanoparticles (GNPs) are of tremendous interest due to their wide application range in the field of therapeutics and diagnostics. However, its potential is limited by its mode of synthesis utilizing different chemicals which are costly, hazardous and often labor-intensive. Nevertheless, the GNPs synthesized through green methods by using plant extracts can overcome these limitations and have wider acceptance.In the present study synthesis and characterization of GNPs is achieved by exploiting the bioreducing properties of Heartleaf moonseed leaf extract (HMLE) with microwave heating assistance. The synthesis of GNPs was confirmed by UV-visible spectroscopy and characterized by Zeta potential measurement, Fourier Transform Infra-red Spectroscopy (FTIR), X- ray Diffraction studies (XRD) and Transmission Electron Microscopy (TEM). UV-visible spectroscopy confirmed the GNPs formation by giving a characteristic peak at 560 nm. Zeta potentiometer showed the charge of GNPs as -30.3mV. XRD studies established the face cubic center (fcc) unit cell structure of GNPs. FTIR analysis indicated the surface adsorption of biomolecules containing asymmetric and symmetric CH2 stretch bands. From TEM image analysis different sizes of GNPs with an average of 12 ± 3.7 nm and shape such as polygonal, cylindrical and prism-shaped GNPs were observed. This method avoids any use of toxic chemicals and thus possesses immense prospect in vivid biomedical applications.

Cancer is a Preventable Disease: The Lifestyle Matters

Nand Kishor Roy*, Amrita Devi Khwairakpam and Ajaikumar B Kunnumakkara**
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Despite the significant improvement in cancer diagnosis and treatment over the past years, cancer still remains a major cause of death all over the world. It is believed that merely 5–10% of different cancer cases are attributed to genetic defects, while the rest 90–95% are due to the environmental and lifestyle effect. In the present scenario cancer prevention by the healthy diet and lifestyle changes is gaining much importance, as the understanding of the potential of dietary patterns and single foods to shun carcinogenesis is expanding. The lifestyle factors comprise of cigarette smoking, diet (fried foods, red meat), alcohol, sun exposure, environmental pollutants, infections, stress, obesity, and physical inactivity. The different studies have suggested that the most of the cancer-related deaths occur due to tobacco usage which is about 25–30%, nearly 30–35% are related to diet, approximately15–20% have associations with infections, and the other factors such as radiation, stress, physical activity, environmental pollutants etc contributes for the remaining percentage. The present review highlights the available studies about the alliance of nutrition and cancer and outlines some of the recent findings from observational and interventional analysis on the potential of diet and specific nutritional components to eliminate or at least minimize the cancer risk.

Isoform-specificity of Akt kinase in Cancer: Does Static Sequence Embraces the Dynamism?

Nand Kishor Roy, *Bethsebie Lalduhsaki Sailo, and Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

The Akt kinase pathway is considered as the central node of the cell molecular pathway which regulates different processes such as cell growth and proliferation, apoptosis, transcription and translation of genes and glucose metabolism etc. required for normal functioning of the cell. Any alterations in this pathway are known to have profound impact on cancer. Akt kinase is one of the key components of this pathway which has three isoforms located in separate chromosomes. Though, these isoforms have some overlapping functions, several studies have also suggested their divergent roles especially in cancer where they even perform contrasting functions. Although, Akt isoforms share more than 80% sequence identity and a common architecture, consisting of a catalytic domain flanked by an amino-terminal Pleckstrin Homology (PH) domain and a regulatory carboxyl-terminal domain they do perform diverse roles. So, the question arises where the difference lies. In our present study we have focused on the non coding sequence of these isoforms that is the promoter region to find out the variation. *In silico* analysis have shown the three isoforms bears quite different promoter regions different from each other with different sets of core promoter elements such as TATA box and GC box. Moreover, the computational study have revealed that promoter sequences have some unique transcription factor binding sites (TFBS) which might participate in cancer development in a different way from each other. Also, the methylation patterns of the isoforms were dissimilar among themselves which might be responsible for different pattern of gene regulation thus providing isoform-specificity to Akt kinases in cancer. However, the *in vitro* studies must be undertaken to further confirm the result.

Natural Agents in Chronic Diseases Prevention and Treatment: An Emphasis on Boswellic acids

Nand Kishor Roy, *Krishan Kumar Thakur and Ajaikumar B. Kunnumakkara**
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

The recent era has observed a tremendous shift from synthetic chemical compounds to natural agents in the management of chronic diseases as it is devoid of any side effects and proved to be more effective. Boswellic acid (BA) is one such compound which is extracted from the gum resin of Frankincense and found to be a highly efficacious agent. It is a group of pentacyclic compounds which has immense prospects against various chronic diseases. Based on the available studies, the present review is an effort to highlight the established studies related to biological activities of BA against several chronic diseases such as arthritis, asthma, atherosclerosis, cancer, inflammatory bowel diseases (IBDs), diabetes and ischemia-reperfusion etc. Moreover, the molecular mechanisms underlying the targets of boswellic acid that are accountable for its biological activity are also discussed. Finally, the present review gives a comprehensive idea about the challenges of the pharmacokinetics of this compound and the methods to overcome those limitations for successfully developing it as an exceedingly efficacious drug.

Specific Targeting of Akt Kinase Isoforms for Effective Prevention and Treatment of Cancer

Nand Kishor Roy, *Devivasha Bordoloi, Javadi Monisha, Ganesan Padmavathi and Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Akt kinase belongs to serine threonine kinase family that subsists in three isoforms present in different chromosomes and has distinct sites of expression which coordinates diverse cellular processes required for normal functioning of the cell. Though, these Akt isoforms have some common characteristics however they also have specific roles and interestingly, sometimes they even perform distinct functions. There are several alterations such as amplification, overexpression, and mutation etc. associated with these isoforms that are known to have a profound impact on the cancer development and progression. In addition, these alterations can impart chemo and radioresistance in cancer cells that impede the existing treatment methods. Also, different studies have evidenced their role as efficient prognostic biomarkers in several cancers. Even though many reports have indicated the allegation of Akt kinase proteins in cancers but in-depth investigation of isoform-specific participation is least studied and hence requires more consideration. This review summarizes the distinct roles of Akt isoforms broadly in diverse cancers and scouting their enormous prospects as potential targets for cancer prevention and treatment.

Techniques to Identify Novel Fusion Genes and to Detect Known Fusion Genes

Nand Kishor Roy, *Ganesan Padmavathi, Devivasha Bordoloi and Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Cancer is known to be driven by genes which commonly have frequent tumor-specific DNA aberrations. As per the Cancer Gene Census of the Welcome Trust Sanger Institute, around 384 validated cancer genes are present which are beyond 1.5% of all transcribed human genes. Fusion oncogenes are familiar events of somatic DNA alteration identified in 282 from 384 validated cancer genes. A fusion gene term is used for a chimeric gene formed by the union of two different genes at the transcript or genomic level. For identification of fusion genes, many methodologies are available which can be mainly classified into traditional cytogenetic-based and non-cytogenetic-based methods. Conventionally, chromosomal alterations were identified by fluorescence *in situ* hybridization (FISH) or CGH techniques. In the later years, high-throughput array-CGH and SNP array were recognized to identify genomic copy number shift at 1 Kb resolution level. The development of next-generation sequencing (NGS) has fundamentally revolutionized the area by generating the data up to base-pair resolution that permitted the discovery and characterization of genomic variation with further detail. With the help of NGS fusion genes were identified by the means of genomic DNA sequencing (gDNA-seq) and transcriptome sequencing (RNA-seq) as well. Also, many computational tools such as Bellerophontes, ChimeraScan, deFuse, FusionFinder, FusionHunter, FusionMap, MapSplice and TopHat-fusion, etc. which are used for chimeras detection.

The Application of Nanotechnology in Cancer Diagnosis and Therapeutics

Nand Kishor Roy, *Choudhary Harsha, Kishore Banik and Ajaikumar B Kunnumakkara**
Cancer Biology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India
E-mail:kunnumakkara@iitg.ernet.in

ABSTRACT

Cancer has remained one of the most indomitable challenges faced by scientists over centuries due to its multifarious etiology. Although, advancements in the field of therapeutics and diagnostics have admirably improved the rate of survival of cancer patients, but still comprehensive elimination from the ailment is still implausible. Therefore, further explorations are required to explore the novel strategies for cancer therapy and diagnosis. Nanotechnology is one such field which can contribute immensely in combating this dreadful disease. Cancer nanotechnology is an emerging branch of science which deals with the application of both nanomaterials and nanotechnology approaches to the diagnosis and treatment of cancer. Nanoparticles are known to possess distinct biological properties due to their small size and large surface area-to-volume ratio which enables them to bind, absorb, and carry compounds such as small molecule drugs, DNA, RNA, proteins, and probes with high efficiency. Moreover, the tunable size, shape, and surface features of nanoparticles facilitate them to attain high stability, high carrier competence, capability to incorporate both hydrophilic and hydrophobic substances and applicable to different administration routes, thus making them an exciting contributor in many aspects of oncology. The prospect of nanotechnology in cancer research and clinical practice is expected to center on 'theranostic' nanoparticles that are capable of both diagnostic and therapeutic by design.

Development of *Plasmodium falciparum* glutamate dehydrogenase malaria sensor based on aptamer carbon dot fluorescent platform.

Naveen Kumar Singh, Phurpa D Thungon, Vinay B, Dr. Pranab Goswami*
Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India.

ABSTRACT

Malaria has been responsible for highest morbidity in most malaria endemic countries including India. Even after decades of malaria control campaigns, it still remains a threat to the masses due to resistance developed against malaria medications caused largely by indiscriminate and over prescription of drugs. The present scenario poses the challenge of designing feasible diagnostic tests for asymptomatic diseases and misleading symptoms. *Plasmodium falciparum* glutamate dehydrogenase is a protein observed to be present in the parasite, throughout its life cycle. Further, scientific reports evidence appreciable amount of this protein to be detected in human serum of malaria patient making it a potential biomarker for malaria diagnosis at all stages of the progression during infection. As an objective of the present research, we have developed an aptamer based sensor against *P. falciparum* glutamate dehydrogenase (PfGDHa) for malaria diagnosis. Aptamers viz.NG3 and NG51, against *P. falciparum* glutamate dehydrogenase were developed through SELEX process and have been measured to bind target molecule with very high sensitivity and specificity. The binding affinities of NG3 and NG51 against target molecule PfGDHa were investigated through circular dichroism and were observed to be 0.5μM and 1.1μM, respectively. NG3 and NG51 were used for designing aptamer tagged carbon dot for sensitive detection of *P. falciparum* glutamate dehydrogenase through fluorometric analysis. Nitrogen doped carbon dot was synthesized through pyrolysis approach using L-Glutamate as a substrate and its characterization was done through spectroscopy and TEM. Fluorescence of aptamer coupled carbon dot was observed to get quenched in the presence of *P. falciparum* glutamate dehydrogenase. A linear relationship has been observed between the decreased fluorescence intensity of aptamer conjugate C-dots and the concentration of *P. falciparum* glutamate dehydrogenase. The detection limit of PfGDHa was found to be as low as 1nM suggesting a promising assay for Malaria detection.

Analysis of organelle morphology and number under various growth conditions in yeast

N.M. Deori[1], R. Deb[1], S.S. Raju[1]and S. Nagotu[1]
[1]Department ofBiosciences&Bioengineering,IIT Guwahati,India
E-mail:*d.nayan@iitg.ernet.in*

ABSTRACT

A unique characteristic of eukaryotic cells is compartmentalization of metabolic pathways into various membrane-bound organelles. These organelles differ from one another in several aspects like their biogenesis, enzyme content and role in metabolism, thereby enabling the cells to carry out specialized functions. In order to optimise these cellular functions organelles must collaborate and communicate with surrounding organelles [1]. Several recent studies have highlighted the significance of organelle biogenesis and communication in human health and disease. For example, abnormal peroxisomal assembly leading to peroxisomal dysfunction may play a role in the early onset of many diseases like Type-II Diabetes, Neurodegenerative disorders like Alzheimers and Parkinsons, Cancer, etc [2]. In this study we aim to understand peroxisome biogenesis and its interaction with other organelles in yeast cells. Peroxisomes perform a plethora of diverse cellular functions of which their role in neutralising harmful reactive oxygen species (ROS) produced by the cell and β-oxidation of fatty acids are characterised in detail [3, 4]. We first analysed the growth of yeast cells in various media to determine exponential growth phase to carry out all experiments. A genomically tagged Pot1-GFP strain of *Saccharomyces cerevisiae* was used to analyse peroxisome morphology and number by fluorescence microscopy experiments. Peroxisome numbers were quantified on both glucose and peroxisome inducing oleic acid growth conditions in wildtype *S.cerevisiae* cells. Mitochondria and vacuole were visualized using mitotracker orange and FM4-64 dyes whereas nucleus morphology was analysed in cells transformed with GFP-Nup49/Esc1-GFP plasmids. In future experiments we aim to understand the biogenesis of peroxisomes and the communication between peroxisomes and other cell organelles under various growth and stress conditions.

D Dynamic Culture Systems for maturation of Tissue engineered Constructs

Omkar Majumder and Biman B. Mandal*
Biomaterial & Tissue Engineering Laboratory,
Department ofBiosciences&Bioengineering,IIT Guwahati,India
*E-mail:*biman.mandal@iitg.ernet.in; mandal.biman@gmail.com*

ABSTRACT

Tissue engineers have achieved incredible advances in making bioartificial tissue constructs for repairing/regenerating damaged tissues. However, few constraints like low cell density and media perfusion limits proper cell growth that inhibits the necessary tissue functionality. In native condition, cells continuously experience mechanically dynamic microenvironment that helps them maintain their functionality that the static cell culture methods fail to address. In this direction, specialized 3D dynamic culture systems have been designed for tissue reconstruction: skin, bone, cartilage, vascular grafts. In each case, the 3D dynamic culture system is custom designed in order to accommodate specific tissues. The prototypes developed as uniaxial strain bioreactor and vascular graft bioreactor enable to create physiological environment for bioartificial tissue constructs to provide dynamic loading (for bone, skin) and perfusion (for vascular grafts) respectively, as experienced by the native tissues inside the human body. These highly affordable bioreactors can provide a controlled environment for 3D cell cultivation through precise cyclic mechanical stimuli at the micro-level with customizable controls (percentage strain, strain rate, stretch time and pressure) to the 3D scaffolds that improves cell density and increases extra-cellular matrix secretion necessary for rapid tissue reconstruction and maturation.

Keywords: 3D Bioreactor, Dynamic culture, Mechanical Stimulation, Tissue Maturation.

Differential Expression of TNFAIP8 Family of Proteins In Oral Cancer Tissues

Ganesan Padmavathi, Javadi Monisha, Devivasha Bordoloi, Amrita Devi Khwairakpam and Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
*E-mail: kunnumakkara@iitg.ernet.in

ABSTRACT

Cancers of oral cavity, lip and pharynx usually denoted as oral cancers are the sixth most common cancers worldwide with more than 300,000 estimated new cases and 145,000 deaths. Despite the huge medical advancements in cancer therapy and the easy accessibility of tumor, the 5-year survival rate of oral cancer remains as low as 50–60% attributing to the late diagnosis of the disease, development of chemoresistance, radioresistance and tumor recurrence. Therefore, it is essential to develop novel biomarkers for the early diagnosis and treatment of this deadly disease. In the current study, tumor necrosis factor alpha induced protein 8 (TNFAIP8 or TIPE) family of proteins are explored for their potential as tumor biomarkers for oral cancer. Expression of TIPE proteins (TIPE, TIPE1, TIPE2 and TIPE3) in oral cancer tissues was analyzed using tissue microarrays (TMA). All the proteins are differentially expressed in oral cancer tissues. Immunohistochemical analysis of tissues from different developmental stages of oral cancer revealed the expression of TIPE to be nearly same in normal, inflammatory and hyperplasia tissues; and slightly downregulated in cancer tissues. Likewise, expression of TIPE1 was reduced in inflammation, hyperplasia and cancer tissues compare to the normal tissues. TIPE2 was overexpressed in hyperplasia and cancer tissues and downregulated in inflammatory tissues. TIPE3 was observed to be overexpressed in inflammation, hyperplasia and oral cancer tissues. The expression analysis of TIPE proteins suggests that downregulation of TIPE could be one of the additional molecular events required for malignant transformation; downregulation of TIPE1 could be responsible for evading the oral cancer cells from apoptosis; and increased expression of TIPE3 could be an important mediator of oral carcinogenesis.

Putative Post Translational Modifications (PTMs) of TNFAIP8 Family of Proteins

Ganesan Padmavathi, Javadi Monisha, Devivasha Bordoloi, Nand K. Roy, Bethsebie L. Sailo and Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
*E-mail: kunnumakkara@iitg.ernet.in

ABSTRACT

Tumor necrosis factor alpha induced protein 8 (TNFAIP8 or TIPE) family of proteins (TIPE, TIPE1, TIPE2 and TIPE3) were found to be differentially expressed in several cancers including chronic myelogenous leukemia, lymphoblastic leukemia, colon cancer, cervix carcinoma, lung carcinoma, primary and metastatic head and neck squamous cell carcinoma (HNSCC), breast cancer, renal cell carcinoma, ovarian carcinoma and melanoma etc. However, the exact function of these proteins in the regulation of cancer development remains to be elucidated. Post translational modification (PTM) in which proteins are added with phosphate, acetate, amide, or methyl functional groups at the amino acid side chains or at the protein's C- or N- termini is an indispensable phenomenon which extensively broadens the protein functions. In the current study, the post translational modifications (PTM) of tumor necrosis factor alpha induced protein 8 (TNFAIP8 or TIPE) family of proteins (TIPE, TIPE1, TIPE2 and TIPE3) are predicted using in silico methods. The NetPhos 3.1, NetAcet 1.0, NetNGlyc 1.0, NetOGlyc 4.0 and NetCGlyc 1.0 servers were used for the prediction of potential phosphorylation, glycosylation and acetylation sites of TIPE proteins. The results showed that all the four proteins have several potential phosphorylation sites. TIPE and TIPE2 have one potential acetylation site each whereas no acetylation site was detected in TIPE1 and TIPE3 proteins. Interestingly, none of the four TIPE proteins had a C-glycosylation site; only TIPE3 had an N-glycosylation site; and all four proteins had O-glycosylation sites (TIPE- 1 site, TIPE1-3 sites, TIPE2-2 sites and TIPE3-9 sites). In vitro validation of these PTMs would give new insights into the regulation of TIPE proteins and their downstream signaling cascades which in turn would help in deciphering the role of these proteins in the development of cancer.

Introduction to Fusion Genes and Their Classification

Ganesan Padmavathi, Nand K. Roy, Devivasha Bordoloi, K. K. Thakur, Javadi Monisha and Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
*E-mail: Kunnumakkara@iitg.ernet.in

ABSTRACT

The concept of genomic instability and rearrangements are considered as hallmarks of cancer. Fusion genes are the result of chromosomal structural rearrangements such as inversion, deletion, amplification and inter-chromosomal/intra-chromosomal translocation which in turn are the consequence of improper transcription or DNA double-strand breaks (DSBs). Identification of the Philadelphia chromosome with t(9;22) translocation is considered as a milestone in the field of fusion genes and cancer. The rate of occurrence of fusion genes varies considerably, from 0–100%, among different cancer types and the extent of gene fusion-positive cases is similar between both solid and liquid tumors. Different models have been proposed to explain the gene fusion. Initially, recombinase enzymes of immune system were thought to be the driving factor for the translocation. Later two more hypotheses namely "contact first" and "breakage first" were proposed for DSBs induced translocations. Further, the chromosomal rearrangements are broadly classified as balanced and imbalanced rearrangements former including inversions and translocations with no change in dosage of genetic materials; and later including deletions and duplications that alter the gene dosage. Inversions are further subclassified into paracentric and pericentric inversions depending on the involvement of centromere; and translocations are subclassified into reciprocal and nonreciprocal depending on the involvement of homologous and non-homologous chromosomes. At present, it becomes evident that these chromosomal aberrations can result in the formation of fusion genes which can have tumorigenic action either by gene overexpression in one of the breakpoints or through the formation of a hybrid gene during the fusion of two genes, one in each breakpoint. As a consequence of this cell starts functioning in an unregulated manner and develops into a cancer cell.

Fusion genes as target for cancer therapy

Nand K. Roy, Devivasha Bordoloi, Choudhary Harsha, Ganesan Padmavathi and Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.
*E-mail: kunnumakkara@iitg.ernet.in

ABSTRACT

Due to their specificity to cancer cells fusion genes are used potential target for cancer therapy. They are also highly ideal for diagnosis due to the strong association between gene fusion and cancer phenotype. It helps to classify the indistinguishable disease entities and aids in risk stratification. Moreover, these fusion genes encode for diverse fusion proteins and the discovery of these proteins helped in the development novel therapeutic strategies for the treatment of cancer. For instance, BCR/ABL, the first identified fusion gene is one of the most common genetic abnormalities detected in leukemia particularly in acute lymphoblastic leukemias (ALL) and chronic myelogenous leukemia (CML) and is successfully targeted by tyrosine kinase inhibitors (TKI). Imatinib is the first generation of TKIs which has revolutionized the targeted cancer therapy. Imatinib treatment in chronic phase led to durable remissions in majority of CML patients and resulted in better response in Ph+ ALL patients. However, BCR/ABL mutations such as G250E, Q252H, Y253H/F and E255K/V in the Gly-rich loop; T315I; H395P/R in the activation loop, M244V, F317L, M351T, E355G and F359V in other regions of kinase domain were found to result in imatinib resistance. To overcome this issue, several second- and third-generation TKIs were developed. Nilotinib, dasatinib and bosutinib are few of the second generation BCR/ABL TKIs. Such second generation TKIs are known to targets many other types of tyrosine kinases like Src, Tec, Csk and Eph families besides BCR/ABL. Similar to BCR/ABL, PML/RARA fusion gene was found to be successfully inhibited by arsenic trioxide (ATO) and all-trans-retinoic acid (ATRA) which are used in the treatment of acute promyelocytic leukemia. Likewise, administration of crizotinib in AML patients having RANBP2/ALK chromosomal rearrangement leads to the reduction in leukemia cell burden and restoration of normal hematopoiesis. Development of such inhibitors against the fusion genes ultimately contributes towards conspicuous improvement in patient responses.

Metabolic engineering of *Zymomonas mobilis* for efficient substrate utilization and enhanced ethanol production

Payel Sarkar[1,2],Debasish Das[1,2]
[1,]Department of Biosciences and Bioengineering,IIT Guwahati,India
[2]DBT Pan-IIT Center for Bioenergy
E-mail: *spayel@iitg.ernet.in,debasishd@iitg.ernet.in*

ABSTRACT

The alarming threats to global energy security and climate change, have highlighted the exigency to produce sustainable and renewable fuels that can reduce the demand of the conventional petroleum centric-transport fuels and coal which are estimated to be depleted soon [1, 2]. Conventionally the first-generation biofuels were produced from food crops, which in turn trigger economic vulnerability [1]. To overcome these problems, non-food feedstock e.g. lignocellulose and algal biomass is getting more importance in recent times. As model organisms, *Escherichia coli, Zymomonas mobilis* and *Saccharomyces cerevisiae* have been employed for the production of biofuels and chemicals by reconstituting certain metabolic pathways [3]. However, this approach has its own challenge in balancing activities of enzymes and their expressions to maximize metabolic flux [4]. Ethanol has emerged as the most promising cellulosic fuel that can meet the current demand for non-renewable energy sources [5]. *Saccharomyces cerevisiae, Zymomonas mobilis* and *Escherichia coli* are considered to be the most important ethanol producing microorganisms but they have their own limitations as well. Although, *S. cerevisiae* have been reported to produce large amounts of ethanol, over 30 years of extensive research have also proved *Z.mobilis* to be a promising ethanologenic organism for large scale ethanol production. Till date different genetic engineering techniques have been performed to generate improved *Zymomonas* strains for various industrial applications [6].

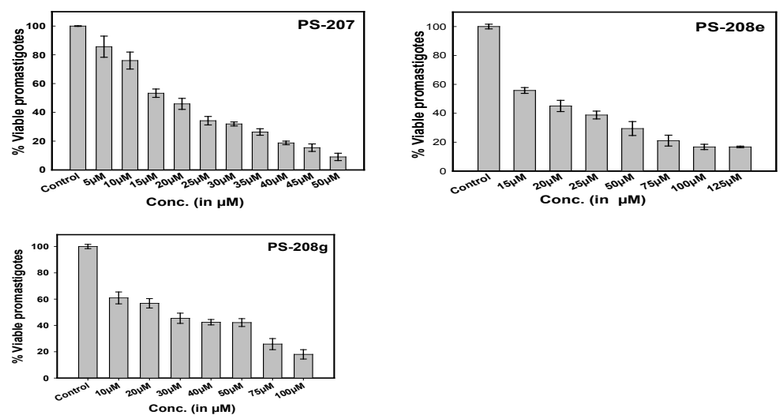


Figure 1. Cell viability assay on *Leishmania* parasite. (A) Effect of PS-207 (IC_{50}=18.39 ± 0.72 µM), (B) PS-208e (IC_{50}=18.91 ± 0.24 µM) and (C) PS-208g (IC_{50}= 26.01 ± 1.46 µM) on cell viability of *Leishmania donovani* promastigotes.

Synthesis of new oxabicyclic derivatives and its evaluation as antileishmanial

Prachi Bhalla[1], Anil Kumar Saikia[2] and Vikash Kumar Dubey*[1]
[1]Department of Biosciences and Bioengineering, IIT Guwahati, India
[2]Department of Chemistry, IIT Guwahati, India
*E-mail: vdubey@iitg.ernet.in

ABSTRACT

Leishmaniasis, caused by an intracellular parasite *Leishmania* is one of the most neglected tropical disease affecting millions of lives and thus been a major concern worldwide. Leishmaniasis ranges from self-healing Cutaneous leishmaniasis to life-threatening visceral leishmaniasis. *Leishmania donovani* is the causative agent of visceral leishmaniasis fatal disease if left untreated. Many current therapeutics exist to treat this deadly parasitic disease but it has come up with certain constraints including high toxicity, high cost, teratogenicity, longer duration of treatment and development of drug resistance. These shortcomings of the current therapeutics urge the necessity to develop novel drug candidates. Our lab has earlier reported PS-203, an oxabicyclic compound, as a potent antileishmanial compound acting through inhibition of Trypanothione reductase (TryR) and Trypanothione synthetase (TryS), key redox enzymes involved in thiol based metabolism in the parasite. We have hypothesized that the structure of PS-203 is not optimized and it may be possible to develop a better antileishmanial molecule using oxabicyclic chemical scaffold. Three derivatives of the parent compound were synthesized and antileishmanial effects were observed on the parasite through *in vitro* cell viability assay.The antileishmanial compounds were tested on human macrophage cell line for their toxic effects. The mode of death caused by the antileishmanial compounds was studied on *Leishmania donovani* promastigotes. In order to generate potent antileishmanial drug, the better antileishmanial oxabicyclic derivative (PS-207) will be chemically conjugated with Amphotericin B, a known antileishmanial drug and will be further evaluated for antileishmanial effect.

Design of antibiotic peptides employing peptido-mimetic approach.

Prakash Kishore Hazam,Gaurav Jerath and Vibin Ramakrishnan
Department ofBiosciences and Bioengineering,IIT Guwahati,India
E-mail: vibin@*iitg.ernet.in*

ABSTRACT

Peptide based therapeutics as antibiotics are assumed to be, potential alternatives of existing antibiotic drugs [1]. These peptides are indigenous, low toxic molecules which has been employed by innate immune system against invading pathogens since evolution [2]. Apart from these native molecules, various natural sources like bacteria, fungi, and many others have been reported to possess these molecules within their living systems [3]. Gramicidin D from Bacillus brevis (bacteria) was one such molecule, which exhibited high degree of efficiency against Gram positive bacterial species [4]. But it's activity was limited to topical use, due to high degree of mammalian cytotoxicity [5]. In this study we tried to mimic the therapeutic potential of this peptide with reduced cytotoxicity by redesigning the molecular construct. The peptide molecules were designed to be syndiotactic with alternate L and D amino acid in their peptide sequences. A pair of peptides with their acetylated version were tested against Gram positive and Gram negative bacterial species. These peptides showed high degree of efficiency towards Gram positive bacterial species, in comparison with Gram negative bacteria. The peptides were less toxic towards mammalian cells (<1-2% hemolysis). Hence the design approach in this study could be used to create newer molecules, in near future for therapeutic purpose.

Mimicking form and function of native small diameter vascular conduits using mulberry and non-mulberry patterned silk films

Prerak Gupta[1], Manishekhar Kumar[1], Nandana Bhardwaj[2], Jadi Praveen Kumar[1], C.S.Krishnamurthy[1], Samit Kumar Nandi[3] and Biman B.Mandal[1*]

[1]Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology, Guwahati, Guwahati-781039, Assam, India

[2] Life Science Division, Institute of Advanced Study in Science and Technology (IASST), Guwahati-781035, Assam, India.

[3] Department of Veterinary Surgery and Radiology, West Bengal University of Animal and Fishery Sciences, Kolkata-700037, West Bengal, India

*E-mail: biman.mandal@iitg.ernet.in, mandal.biman@gmail.com

ABSTRACT

Autologous graft replacement as a strategy to treat diseased peripheral small diameter (≤ 6mm) blood vessel is often challenged by prior vein harvesting. To address this issue, we fabricated native-tissue mimicking multilayered small diameter vascular graft (SDVG) using mulberry (Bombyx mori) and Indian endemic non-mulberry (Antheraea assama and Philosamia ricini) silk. Patterned silk films were fabricated on microgrooved PDMS mould, casted by soft lithography. The biodegradable patterned film templates with aligned cell sheets were rolled onto an inert mandrel to mimic vascular conduit. The hemocompatible and mechanically strong non-mulberry films with RGD motif supported ~1.2 folds greater proliferation of vascular cells with aligned anchorage. Elicitation of minimal immune response on subcutaneous implantation of the films in mice was complemented by ~45 % lower TNF-α secretion by in vitro macrophage culture post 7 days. Pattern induced alignment favoured functional contractile phenotype of smooth muscle cells (SMCs), expressing the signature markers- calponin, α-smooth muscle actin (α –SMA) and smooth muscle myosin heavy chain (SM-MHC). Endothelial cells (ECs) exhibited typical punctuated pattern of von Willebrand factor (vWF). Deposition of collagen and elastin by the SMCs substantiated the aptness of the graft with desired biomechanical attributes. Furthermore, burst strength of the fabricated conduit was in the range of ~915-1260 mmHg, a pre-requisite to withstand physiological pressure. This novel fabrication approach may eliminate the need of maturation in a pulsatile bioreactor for obtaining functional cellular phenotype. This work is thereby, an attestation to the immense prospects of exploring non-mulberry silk for bioengineering multilayered vascular conduit similar to native vessel in 'form and function', befitting for in vivo transplantation.

Keywords: silk, non-mulberry silk, vascular graft, biomaterials, tissue engineering

Expression, purification and biochemical characterization of xylanase of family 11 Glycoside Hydrolase (*Ct*Xyn11A) from C*lostridium thermocellum ATCC27405*

Abhijeet Thakur[1], Carlos M.G.A. Fontes[2]and Arun Goyal[1]

[1]Carbohydrate Enzyme Biotechnology Laboratory

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.

[2]CIISA-Faculdade de MedicinaVeterinária, Universidade de Lisboa, Avenida da UniversidadeTécnica, 1300-477 Lisbon, Portugal.

E-mail: abhijeet.thakur@iitg.ernet.in

ABSTRACT

Xylanases cleave β-1,4 linked xylose backbone ofcomplex plant cell wall polysaccharide, xylan. Xylan is a heteropolymer consisting of principally xylose and arabinose. Xylanases have wide applications in various industries. Xylanase are used in paper and pulp industry, in poultry as feed additives [1], in wheat flour for improving dough handling, for extraction of coffee, plant oils, starch, combination with pectinase and cellulose for clarification of fruit juices [2]. They are widely used for the production of xylitol and bioethanol [1]. *Ct*Xyn11A is an endo-1,4-β-xylanase (E.C. number 3.2.1.8) from *Clostridium thermocellum*. The recombinant plasmid was used for transformation of *E. coli* BL21 (DE3) cells for protein-expression. *Ct*Xyn11A expressed with His-6 tag as a soluble protein. *Ct*Xyn11A was purified by His GraviTrap and analysed by SDS-PAGE (12%,w/v). The molecular mass of protein was approximately, 24 kDa. . *Ct*Xyn11A hydrolysedxylans such as birchwoodxylan, arabinoxylan and beechwoodxylan. The optimum pH for enzyme activity was 7.5 and the optimum temperature was 65°C. *Ct*Xyn11A specific activity was measured to be 1280U/mg at 65°C and pH 7.5 against beechwoodxylan as substrate. K_m and V_{max} for *Ct*Xyn11A were 0.257mg/ml and 1324µmole/min/mg, respectively.

Inhibition of Migration of human Oral Cancer cells in presence of Newcastle Disease Virus

Nakul Yadav1 , Sudhir Morla2, Ajay Kumar2, Sachin Kumar2*

[1]Department of Physics, Indian Institute of Technology Guwahati

[2]Department of Biosciences and Bioengineering, Indian Institute of Technology, Guwahati

E-mail: y.nakul@*iitg.ernet.in*

ABSTRACT

Cancer, currently, is projected as one of the most fatal diseases to organism of the modern world, due to its rapid division rate, alterations in the shape and function of cells and high rate of metabolism. Despite the great progress in medical science and our understanding of the cancer biology , there are 32.6 million people living with cancer worldwide. Oral cancer, associated with genetic mutation due to exposure of tobacco, alcohol, bad oral hygiene and diet among other factors is the eighth most common cancer in the world. Prevention and early detection of oral cancer remain the goals of national efforts to reduce the impact of this disease on the public. Metastasis of oral cancer cells occurs through sequential approach, starting with proliferation, induction of angiogenesis, detachment, motility, invasion into circulation, aggregation and survival in the circulation, cell arrest in distant capillary beds, and extravasation into organ parenchyma. Oral cancer metastasis depends on the interplay between the host factors, and genetic regulation, which leads to cell migration and proliferation, and the metastatic lesion represents the events which only a few cells are able to survive.

The idea of using viruses and bacteria for medical purpose such as treatment of human malignancies rose from the initial observation of tumor regressions with natural infections since 1800's. Recently, a new class of cancer drugs, the oncolytic virus are complementing the surgery, chemotherapy, radiotherapy and antibodies in clinical oncology, implementing a unique mode of action, inhibiting cancer cell migration and proliferation, cell lysis and spread. Oncolytic virus fall majorly into two categories, the first one are those viruses which preferentially replicate in cancer cells and are non-pathogenic in humans often due to innate antiviral signalling, such as parvoviruses, myxoma virus(poxvirus) and Newcastle Disease Virus (paramyxovirus). Considering the virulence associated with human pathogens, animal viruses were tested as an alternative for oncolytic properties, with Newcastle Disease Virus (NDV) becoming a promising agent for the same. Newcastle Disease Virus is the causative agent for the contagious disease in the avian species, which is a serious problem for the poultry worldwide. Outbreaks of Newcastle Disease can be devastating, with mortality rate reaching as high as 100% in some case, leading to severe economic losses. NDV is a well characterized member of the family, Paramyxoviridae in the genus Avulavirus (APMV-1). The oncolytic properties of NDV were first described in 1965 , since then, a lot of promising research has gone into exploring the oncolytic potential in different forms of cancer. Currently, NDV therapeutics is being extensively studied in clinical and pre-clinical trials. NDV is an attractive oncolytic virus due its low recombination frequency. low pathogenicity in humans, and selective discrimination between cancer cells and a normal cells due to immune suppressive state of a cancer cells which aids NDV replication

ROLE OF MMP IN MIGRATION OF CANCER CELLS

Matrix metalloproteinases (MMPs) consist of a multigene family of zinc-dependent extracellular matrix (ECM) remodelling endopeptidases implicated in pathological processes, such as carcinogenesis. Activities of MMP's are crucial to cancer invasion and metastasis in normal tissues including degradation of extra cellular matrix, and alteration of cell cell and cell-ECM interactions. Activity of specific MMP's are regulated at different points in cancer progression stages, and hence, targeting MMP regulation is seen as a possible therapeutic measure. Particularly, MMP2, 7 and 9 have been implicated in the oral cancer proliferation, though other MMP's are regulated in the same

In silico analysis of carbon flux distribution in *Clostridium acetobutylicum* ATCC 824 through modelling approach

KVN Chary, Saumya Ahlawat, Basavaraj Palabhanvi, Mayurketan Mukherjee, Mehak Kaushal, Debasish Das*
Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

ABSTRACT

Systems level modelling and simulations of biological processes are proving to be highly valuable in obtaining a quantitative and dynamic perspective of various aspects of cellular function. In particular, constraint-based analyses of metabolic networks have gained considerable popularity for simulating cellular metabolism, of which, flux balance analysis (FBA),is most widely used. FBA is based on the principle of conservation of mass in a network, whichuses the stoichiometric matrix and a biologically relevant objective function to identify optimalreaction flux distributions. The metabolic network for *Clostridium acetobutylicum* was reconstructed through the use of existing databases like KEGG (Kyoto Encyclopedia of Genes and Genomes), Metacyc, and Biocyc and with the recently reported literature. The reconstructed model consists of 207 reactions and 153 metabolites. The stoichiometric matrix was generated and solved by linear programming method under the pseudo steady state assumption, defining objective function as *Maximization of Biomass (μ) during acidogenesis phase and Maximization of Butanol during solventogenesis phase.* Comparison of model predicted and experimentally determined specific growth rates exhibited a similarity of 97and 98 % respectively. Hence, the model was efficiently able to mimic the metabolism of *C.acetobutylicum* strain.

Assessment of genome content, chromosome number and cell phenotypic features in *Mesua ferrea* L.

Reshmi Das, Latha Rangan*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam.

ABSTRACT

Extensive knowledge about the genome structure of *Mesua ferrea* is essential to determine its potentiality as a sustainable source of feedstock for biodiesel industry. Since not many reports are available in this regard, this study is aimed at exploring the genomic structure and cell phenotypic characters of *M. ferrea.* Nuclear DNA content of *M. ferrea* was estimated with flow cytometry using propidium iodide (PI) to stain DNA and *Pongamia pinnata* was taken as standard. Root-tip cells were used to determine the somatic chromosome number of various ecotypes of *M. ferrea* collected from several geographical regions of Assam. The correlation between the genome size and phenotypic features were drawn from light microscopic studies. The results of study show the 2C DNA value of *M. ferrea* to be 1.40±0.02 pg and the diploid chromosome number to be 2n=30 (n=15). Genome size was found to have inverse correlation with epidermal cell length, guard cell length and stomatal pore size. Whereas, it showed a linear correlation with stomatal density and cell volume. These results form the basis for study of genome structure of *M. ferrea* and provides platform for further investigation that can validate the claim of *M. ferrea* as a valuable biodiesel crop.
Key words: *M. ferrea,* genome size, chromosome number, correlation, phenotypic features.

Identification and characterization of Ty3-gypsy and Long interspersed nuclear elements (LINEs) in *Ricinus communis*

Rahul G. Shelke and Latha Rangan*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam, India 781039
E-mail:-*r.shelke@iitg.ernet.in*

ABSTRACT

Retrotransposons constitute the significant portion of genome in many eukaryotes and are one of the important classes of genetic elements. These elements play major role in evolution and genome size variation. The present study is conducted in *Ricinus communis*, aimed at identifying and characterizing the Gypsy and LINE like retrotransposable elements in a view to understand the genome better. The highly conserved domain of *reverse transcriptase* (RT) of Gypsy and LINE retrotransposons was successfully amplified by degenerate primers indicating, they are the universal feature of plant genomes. The copy numbers of RT gene of Gypsy and LINE elements were determined by dot blot analysis. In order to assess the diversity of RT, phylogenetic analysis was performed to compare the existing sequences with previously isolated retrotransposons sequences. The copy number of Gypsy and LINEs in haploid genome of *Ricinus* was found to be 15% and 3% respectively. Higher heterogeneity was observed among Gypsy and LINE elements and a majority of elements were found to belong to different lineage group. Though RT highly sequences are conserved, no two sequences are identical. The characterization of Gypsy and LINEs in *Ricinus* genome would be helpful in designing molecular markers for useful trait. The results of the current study will be discussed during the presentation.
Keywords: Long interspersed nuclear elements (LINEs),*Reverse transcriptase* (RT), Retroelement, Ty3-gypsy.

Synthesis of *in situ* prebiotic isomalto-oligosaccharides in mango and pineapple juices using dextransucrase from *Weissella cibaria* RBA12

Rwivoo Baruah, Barsha Deka and Arun Goyal
Department ofBiosciences and Bioengineering,IIT Guwahati,India
E-mail: b.rwivoo@*iitg.ernet.in*

ABSTRACT

Glucansucrase catalyzes the transfer of glucosyl unit after the cleavage of sucrose to the growing α-glucan chain. Glucansucrases are named accordingly, based on the α-glucans they synthesize, such as dextransucrase and alternansucrase. α-Dextran are used as food additives owing to their hydrocolloid properties and the potential health benefits. In the presence of acceptor molecules such as maltose or iso-maltose, dextransucrase synthesizes isomalto-oligosaccharides. In the present study dextransucrase from *Weissella cibaria* RBA12 was purified using polyethylene glycol-400 fractionation followed by size exclusion chromatography. The *in-situ* production of isomalto-oligosaccharide was carried out using mango and pineapple juices. The native sugars (i.e. sucrose, glucose and fructose) present in both juices were confirmed by HPLC. The glucose and fructose present acted as acceptor molecules. In both juices, isomalto-oligosaccharides from DP3 to DP5 along with isomaltose (DP2) and leucrose (DP2) were synthesized *in situ* by dextransucrase reaction utilizing the native sucrose. Sucrose content of the juices was reduced resulting in low calorific value. Isomalto-oligosaccharides have immense applications in food industry as potent prebiotic compounds.

Molecular size and symmetry as design elements in directing self-organization of peptide nano- assemblies

Sajitha Sasidharan, Prakash Kishore Hazam, Jahnu Saikia and Vibin Ramakrishnan*
Department ofBiosciences and Bioengineering,IIT Guwahati,India
E-mail: s.sajitha@*iitg.ernet.in*

ABSTRACT

Peptide systems forming nano-assemblies are generally excellent building blocks among biomolecules, owing to their chemical diversity, flexibility, stability and biocompatibility. Peptide-based supramolecular structures have been designed and developed for their potential applications in different fields. Studies have reported that the size and electrostatics of individual basic building blocks determine nucleation, end to end association and geometry of the resulting nano-assemblies. Through this work, we make an attempt to direct the morphology of nano-assemblies by tuning the molecular size and symmetry of the fundamental building blocks that can potentially assemble to nano-micro level assemblies.

Six peptide model systems with aromatic side-chains were tested by differentially modulating the prominence of three design variables, namely aromatic p-p interactions, local electrostatics and overall symmetry of the basic building unit.We observed that model systems chosen with almost the same electrostatics, symmetry and geometry of phenyl embraces resulted in similar assembled architecture. Symmetry provides an important directive in deciding the morphology and crystallanity of peptide nano-assemblies. Also, peptide systems attune with the conceptual framework of aggregation models while they form nano-assemblies. Apart from its potential utility in designing nano assemblies of bio-molecular origin; the results may also complement the mechanistic investigations on the driving forces formulating protein and peptide aggregation.

Economical Rotary Evaporator

S. Sanjana, R. Swaminathan*and L. Rangan*
Department of Biosciences & Bioengineering, IIT Guwahati, Guwahati
E-mail: lrangan@iitg.ernet.in

ABSTRACT

Rotary Evaporator is a device used for removal of solvents by the principle of evaporation and condensation. It is one of the most essential equipment in laboratories for preparation of distillates and extracts. This equipment is highly rapid in solvent recovery as it works under high vacuum pressure. But due to cost constraints and accessibility, small scale laboratories need an alternative to this which can serve the same purpose. In this quest, a model was designed that works on the same basis as rotary evaporator without the need for any sophisticated resources. This setup can be built using simple labwares such as conical flasks, rubber corks, heating mantle, tubing, ice bath and vacuum source (large syringe/vacuum pump). The uniqueness of this model is that it can be customized as per the requirement of the user. Compared to commercial rotary evaporator, the efficiency is slightly compromised but it still serves the purpose. Easy dismantling and portability are added advantages of this setup. **Key words**: Rotary Evaporator, .vacuum pressure, cost effective, customisable.

Downstream processing of polyphenols from medicinal plants: A review

S. Sanjana, R. Swaminathan*and L. Rangan*
Department of Biosciences & Bioengineering, IIT Guwahati, Guwahati
E-mail: lrangan@iitg.ernet.in

ABSTRACT

Natural products are the upcoming sources of therapeutic agents due to their advantages over synthetic drugs molecules such as no harmful side effects, effectiveness to chronic conditions, low cost and easy availability. Polyphenols are secondary metabolites that are best known for their anti-oxidant property and scavenging of free radicals, reactive oxygen species and reactive nitrogen species. Due to these properties, it is being largely exploited for treatment of cardiovascular diseases, atherosclerosis, cancer, bacterial and viral infections. Most of these compounds have complex structure which makes it difficult to chemically synthesize them. Therefore, a number of industrially convenient and economically viable methods for extraction, isolation and purification of these compounds are being developed. Also, downstream processing technique varies for different compounds based on their physio-chemical properties like hydrophilicity and lipophilicity. This review explores various techniques for recovering and purifying different types of polyphenols for potential drug targets.
Key words: Natural products, medicinal plants, secondary metabolites, polyphenols, downstream processing.

Development of solvent tolerant *Clostridium* strains through combinatorial strategy of mutagenesis and serial enrichment

Saumya Ahlawat [1,2], Mehak Kaushal [1,2], Mayurketan Mukherjee [1,2], Basavaraj Palabhanvi [1,2], Anwesha Purkayastha [1,2], Debasish Das [1,2]
[1]Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
[2]DBT-PAN IIT Centre for Bioenergy
Email id: s.ahlawat@iitg.ernet.in

ABSTRACT

Increased energy demand coupled with depleting resources and environmental concerns has led the researchers to look for alternative fuels among which butanol finds a place as a replacement of gasoline. Butanol is natively produced by Clostridium species through acetone butanol ethanol (ABE) fermentation. However, the process suffers from some major shortcomings such as mixed end-products, product toxicity, high cost of organic carbon substrates and degeneration of strain due to loss of solventogenic plasmid which limits its success at commercial level. The present study targets alleviation of end product toxicity through strain level improvement of *Clostridium acetobutylicum*. During the statistical optimization of media components no substantial increase in butanol titer was observed and it was hypothesized that it may be due to butanol toxicity. Therefore, butanol challenge experiment was carried out to determine the butanol toxicity limit of the strain. Rapid decrease in biomass was observed in cells exposed to 14 % butanol (v/v), thus confirming that butanol production was limited due toxicity. To that end, a combinatorial strategy of chemical mutagenesis and serial adaptation to stepwise increased concentration of butanol is being developed followed by novel high throughput rationalized screening methodology to achieve improved solvent tolerance. UV, EMS and NTG were chosen as mutagens for random mutagenesis experiments for strain improvement. Different combinations of the selected mutagens treatments were carried out at optimized conditions. UV mutagenesis was unable to generate any probable solvent tolerant strains. Chemical mutagenesis yielded a number of tentative solvent tolerant strains which are under screening and characterization to obtain high butanol producer mutant strain.

Cellular role of a Zinc transporter in *Neurospora crassa*

Serena Ngiimei D andRanjan Tamuli
Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.
Email: serena@iitg.ernet.in

ABSTRACT

The Cation Diffusion Facillitator (CDF) family protein is a ubiquitous family, members of which are found in bacteria, archaea and eukaryotes. The key feature of this family is that they transport zinc and/or other metal ions from the cytoplasm into the lumen of intracellular organelles or to the outside of the cell. In the filamentous fungus *Neurospora crassa*, there are four CDF members, oxidative stress resistence protein (TRM-25, NCU03145), cation efflux system protein czcD (TRM-32, NCU07709), transport of metal-56 (TRM-5, NCU01254), and a hypothetical protein (TRM-29). Transport of metal-56 is also known as ZRG17 (Zinc regulated gene). MSC-2 (Mitotic sister chromatid) is required for the proper functioning of endoplasmic reticulum by supplying zinc to the organelle and ZRG-17and MSC-2 physically interact to form a heteromeric complex that transports zinc into the Endoplamic Reticulum.Here we have shown various morphological and phenotypical role of the *zrg17* knockout mutant. We found that the strain lacking *zrg17* exhibits various defects including reduced growth, stunted aerial hyphae. In addition, the *Dzrg-17* mutant showed early conidiation, indicating that the *zrg-17* gene plays a pivotal role in the pathways that regulate developmental processes such as conidiation. Future work is going on to determine the localization and molecular pathway

Enhanced urokinase production from HT1080 cells on silk based scaffolds

Shivanshi Kumar, Janani G and Biman B. Mandal*
Biomaterials and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati - 781 039, India.
*E-mail: *biman.mandal@iitg.ernet.in,mandal.biman@gmail.com*

ABSTRACT

Urokinase plasminogen activator, well known as thrombolytic drug has been extensively used in dissociation of blood clots in case of myocardial infarction, thromboembolism and ischemic brain stroke. Media optimization and high density perfusion culture are main factors that facilitate enhanced urokinase production with greater activity in culture medium. Several bioreactor configurations like batch culture, hollow fiber bioreactor and silk screen perfusion bioreactor system have already been investigated to increase urokinase productivity for large scale production. In this study, we are aiming for high density culture of HT1080, a human fibrosarcoma cell line in 3D matrix perfusion system by optimizing media to achieve high urokinase activity. Four scaffold variants: porous and fiber-reinforced were fabricated from *Bombyx mori* (BM) and *Antherea assamensis* (AA) silk fibroin using freeze drying method. These scaffolds were physically characterized for scaffold morphology, swelling pattern, integral stability, degradation behaviour and mechanical strength. AA scaffolds showed lower swelling ratio ($p \leq 0.05$) and degradation pattern ($p \leq 0.05$) as compared to BM scaffolds. FESEM studies revealed highly heterogeneous porous matrix with interconnected network in both porous and fiber-reinforced scaffolds supporting further cell culture studies. Further, ~2-fold increase in cell proliferation rate was observed in fiber-reinforced scaffolds in contrast to the freeze-dried scaffolds. Media optimization was performed by supplementing 2% (v/v) FBS and 0.5 g/L of glycine during stationary phase of cells for enhanced urokinase activity in the culture medium. Urokinase activity of ~3.7 U/L, ~4.25 U/L and ~1.9 U/L was observed from AA fiber-reinforced scaffolds on day-9 in media supplemented with 10% FBS, 2% FBS and 2% FBS along with glycine respectively. Reduced urokinase activity in glycine supplemented media may be due to shortened stationary phase observed from proliferation studies. Finally, fiber reinforced AA scaffolds with 2% (v/v) FBS supported higher cell-density with increased urokinase activity. Extensive studies on similar lines would further help in developing scale-up processes making affordable and accessible form of this life saving drug.

Keywords: Urokinase, fiber-reinforced scaffolds, non-mulberry silk fibroin and 3D scaffolds

Implementation of artificial gene networks that smell

Tasrin Shahnaz and Heena Kauser
Department of Bioengineering and Technology,Gauhati University, IST, Guwahati,India
E-mail: tasrind5@*gmail.com*

ABSTRACT

Till date there is no model device that can measure smell. The sense of smell is even more complicated than the sense of taste. The olfactory receptor family is among the largest known mammalian gene family with approximately 900 genes in human. Bioelectronics noses have been intended to mimic the signal processing of the sense of smell. But receptor materials of the conventional electronic noses are actually totally different from human olfactory receptors. However, the execution of programs that can rival natural biological systems, which have been fine-tuned by million years of evolution, has remained a challenge. In the past two decades, much has been learned about the smell sensing mechanism in biological systems. With each and every minute exploration of biological olfactory system and techniques for the expression of receptor proteins, researchers are able to utilize biological materials and systems to bio mimic the human nose. Bioengineers have designed synthetic olfactory system with consortium of human cells with an artificial sense of smell and thereby making the cells to detect, quantify, and also remember the presence of gaseous volatile compounds in their environment and are mainly used in distinguishing edible products adulterants.

Identification of promising functional residues capable of introducing endo-xylanase activity into an exo-acting arabinofuranosidase (*Ct*43Ara*f*) with enhanced activity: An *in silico* approach

Priyanka Nath, Arun Goyal Carbohydrate Enzyme Biotechnology Laboratory,
Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati, Assam, India
E-mail: priyanka.nath@iitg.ernet.in

ABSTRACT

Advances in protein engineering provide tools to modify the protein sequences for generation of better industrial catalysts. Such tailor-made rationalized variations in native enzyme makes it more stable, with enhanced specific activity and with higher tolerance towards physical and chemical environment making more favourable for industrial applications. This study will explore the amino acid residues participating in a) reaction mechanism and b) introducing endo- activity into an exo-acting α-L-arabinofuranosidase (*Ct*43Ara*f*) which is capable of releasing only L-arabinose after arabinoxylan hydrolysis [1]. *Ct*43Ara*f* of *Clostridium thermocellum* was cloned and biochemically characterized [1]. Homology modelling and structure displayed 5-bladed β propeller topology [2]. *Ct*43Ara*f* showed 25% sequence similarity with arabinofuranosidase from *Humicola insolens* (HiAXHd3) [3]. Structure superimposition and sequence alignment analysis of *Ct*43Ara*f* withHiAXHd3 displayed RMSD of 1.05Å. D166 and E215 of *Ct*43Ara*f* were identified as catalytic residues which were structurally and sequentially found to be conserved, respectively, with D144 and E216 of HiAXHd3. Y166, G183 and N184 residing near catalytic residues forming substrate binding region distal to the active site of HiAXHd3 were reported crucial for extended substrate specificity and enhanced enzyme activity by mutation study [3]. Similarly, corresponding F165, G183 and N185 identified as conserved residues in *Ct*43Ara*f*, were mutated to alanine and there models were generated and subsequently energy minimized. Comparative docking study using arabinosyl-xylotriose showed that mutants are displaying increase in release of free binding energy as compared with wild-type *Ct*43Ara*f* indicating higher stability of ligand bound structure of mutants. The analysis of ligand bound structure showed that the mutation of bulky side chain of phenylalanine to alanine (F165A) provides larger space to xylan backbone of substrate to reach the active site. This was evident by increased binding energy from -7.14 kcal/mol of wild-type to -7.72 kcal/mol of F165A. Furthermore, loss of polar contact of N184 with catalytic Glu215 of *Ct*43Ara*f* also helped in accessibility of ligand molecule to the active site and here the predicted binding energy for this double mutant (F165A/N184A) was increased to -8.75 kcal/mol. An attempt was made to introduce additional catalytic functions into an exo-acting arabinofuranosidase (*Ct*43Ara*f*) by enhancing the accessibility of catalytic apparatus to access the ligand to active site producing a multifunctional enzyme

Pectin polysaccharide Extraction and Characterization from the waste fruit peels of *Citrus preticulate, Malus domestica* and *Ananas comosus*

Vikky Rajulapati, Arun Dhillon and Arun Goyal
Carbohydrate Enzymes and Biotechnology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
E-mail: r.vikky@iitg.ernet.in

ABSTRACT

Pectin is a complex polysaccharide present in primary cell walls of terrestrial plants. More than 80% of the total pectin polysaccharide consists of galacturonic acid and rest is rhamnose, galactose and arabinose. Some of the carboxyl groups are methyl-esterified at C-6 or acetylated at C-2 or C-3 position depending on the source. The functional properties of pectin depend on the degree of esterification. Commercially, pectin is extracted from citrus and apple peels. Pectin is used as gelling agent or stabilizer in jam, jellies and other foods. Pectin is also used in healthcare and pharmaceutical industries [1]. In this study pectins were extracted from agro-waste fruit peels of *Citrus preticulate (sweet orange), Malus domestica (apple)* and *Ananas comosus (pine apple)*. Waste fruit peels were collected from local fruit juice shops at Guwahati. The fruit peel waste was washed and dried at 80°C for 2 to 3 days, followed by grinding. Pectin was extracted using the Ultrasound Assisted Extraction (UAE) process in two steps [2]. In the first step, 1 g of the dried fruit peel powder was treated with 40 ml ammonium oxalate-oxalic acid buffer, pH 3.6 for 24 h at 80°C. Second step involved ultrasound treatment (37 kHz) at 80°C for 90 min. After UAE, the mixture was filtered through filter paper. The filtrate was precipitated by adding 96% ethanol, followed by washing with ethanol and then acetone. Finally, the pectin was dried at 40°C in an oven. FESEM images of untreated and treated (sonicated) fruit peel powder samples showed that the treated fruit peel powder contains more porous structure than the untreated fruit peel powder. This indicated that UAE pretreatment was efficient in destabilizing complex polysaccharides thereby assisting the pectin extraction. FTIR spectroscopy revealed that extracted pectin (from sweet orange, apple and pineapple) contained esterified galacturonic residues. DSC, TGA analyses showed extracted pectin from sweet orange, apple and pineapple are amorphous and their thermal degradation was observed at 200°C, 210°C and 215°C, respectively. X-RD, Raman and NMR will perform further, structural characterization of extracted pectins.

Characterization of PF14_0660 , a prokaryote like enzyme from *Plasmodium Falciparum* and its prospects in anti-malarial drug development

Vimee Raturi, Suman Jyoti Deka, Rakesh Wary and Vishal Trived[1#]
Research Group, Department of Biosciences and Bioengineering, Indian Institute of Technology-Guwahati, Guwahati-781039, Assam, India.
[#]Address correspondence to: vtrivedi@iitg.ernet.in, Vishalash_1999@yahoo.com

ABSTRACT

Malaria is a lethal disease caused by human invading parasite *Plasmodium falciparum* whichkills around1 million people and cause disease in 400-500 million people annually across the globe. There are various drugs available to cure malaria which target one or the other stage in malaria parasite but the major cause of concern is growing level of resistance in parasite towards antimalarial. So the need of the hour is to develop new strategies against malaria parasite by exploring novel protein targets which plays a crucial role in regulatory mechanism of the parasite. We are targetting PF14_0660 which is a putative phosphatase present in plasmodium genome and is hypothesized to be a potent target of anti-malarials. Homology modelled 3D structure of PF14_0660 was generated using Modeller 9.16 followed by structure validation using verify-3D and RAMPAGE tools. The gene was amplified, cloned in *E.coli* and purified using Ni-NTA column.The activity of purified protein fractions was examined using pNPP assay. Also, screening of heterocyclic chemical compounds from the chemical libraries was performed for identifying various inhibitors of our protein which can later be tested in-vitro.

A robust silk fiber-reinforced composite for cartilage tissue engineering

Yogendra Pratap Singh[1],Mimi Adhikary[1], Nandana Bhardwaj[2], Bibhas Kumar Bhunia[1] and Biman B. Mandal[1*]
[1]Department ofBiosciences and Bioengineering,IIT Guwahati,India
[2]Biological and Chemical Sciences Section, Life Sciences Division, Institute of Advanced Study in Science and Technology, Guwahati-781035, Assam, India
E-mail:*biman.mandal@iitg.ernet.in , mandal.biman@gmail.com*

ABSTRACT

Osteoarthritis is a chronic degenerative disorder of the joint and represents one of the most common diseases worldwide. Its prevalence and severity are increasing owing to aging of the population, but treatment options remain largely limited to painkillers and anti-inflammatory drugs, which only provide symptomatic relief. Cartilage tissue engineering has achieved some success using agarose as a scaffolding material but some of its drawbacks such as non-degradability, poor tissue-scaffold integration and limited processing capability, have driven the search for an alternative biomaterial. The present study aims to investigate the potential of composites made from silk fibers and silk fibroin solution from mulberry (*Bombyx mori*) and non-mulberry (*Antheraea assamensis*) silk. The studies showed that the fiber-reinforced scaffolds supported better growth of chondrocytes in comparison to only silk fibroin control groups. The physical characterization studies revealed that the scaffolds were porous with interconnected pores, had swelling property for nutrient uptake and degradable. The non-mulberry silk degraded much slower (90% mass remaining after 28 days) than mulberry silk. The scaffolds supported proliferation of chondrocytes and maintained chondrogenic nature of the cells which was evident from alcian blue staining of GAG (sGAG) secreted by the cells. Biochemical analysis showed collagen, sGAG and DNA increased with time on culturing chondrocytes on the scaffold after 28 days. This was further confirmed by real time PCR studies that showed an upregulation (~2 fold) of cartilage-specific ECM gene markers- Collagen II, SOX9 and aggrecan (AGC), upon culturing chondrocytes for 28 days. This study demonstrates promising attributes of silk fibre reinforced scaffolds in the field of cartilage tissue engineering.

Green Synthesis and Characterization of Silver Nanoparticles using Bhimkol Peel Extracts and Study of Antimicrobial Activity

Anupama Bora[1], Animes Kr. Golder[1,3], SubhenduSekhar Bag[*,1,2]
[1] Centre for the Environment, IIT Guwahati, Assam, India-781039
[2]Department of Chemistry, IIT Guwahati, Assam, India-781039
[3]Department of Chemical Engineering, IIT Guwahati, Assam, Inida-781039

ABSTRACT

Silver nanoparticles (AgNPs) have attained a special focus among several noble metal nanoparticles. Conventionally silver nanoparticles are synthesized by chemical method using chemicals as reducing agents which later on become accountable for various biological risks. Green synthesis of metallic silver nanoparticles has now become an alternative to physical and chemical approaches. This study reports bio-inspired synthesis of silver nanoparticles (AgNPs) with the aid of a novel, non-toxic, cost effective and eco-friendly biological material namely, banana peel extract (BPE). Banana peel is a classic example of naturally available agricultural waste which can be potentially used for synthesis of nanoparticles. Bhimkol is a locally available banana variety of Assam. Many bioactive compounds such as flavonoids, tannins, phlobatannins, alkaloids, glycosides and terpenoids are present in banana peel showing pharmacological effect. So, these peels can prove to be an excellent precursor for many medicinal purposes. Crushed, boiled and then filtered banana peel extract (BPE) was used for reducing silver nitrate. Silver nanoparticles were prepared under various reaction conditions such as pH, reaction time, BPE content and varying concentration of silver nitrate. The colourless reaction mixtures turned yellowish-brown and displayed UV–visible spectra characteristic of silver nanoparticles. The formation of silver nanoparticles was tested by various spectroscopic techniques like UV–Vis, FTIR-spectroscopy and X-ray diffraction (XRD). The study of field emission scanning electron microscope (FESEM) revealed the formation of spherical in shape and mono-dispersed nanoparticles. The diameter and average size of the synthesized AgNPs were about 30-70 nm and 44.24 nm, respectively. The analysis of the image from transmission electron microscope (TEM) also confirmed the spherical in shape and the crystalline nature of nanoparticles. Energy dispersive X-ray spectroscopy analysis showed the peak corresponding to silver confirming the presence of elemental silver. The synthesized nanoparticles were found to show antimicrobial activity.

Floor Cleaning Products: Emissions and Resulting Concentration

Barbie Hazarikar[1],Sharad Gokhale[2]andRamGopal Upaluri[1]
[1]Centre for Environment,IIT Guwahati, Assam
[2]Department of Civil Engineering, IIT Guwahati, Assam
[3]Department of Chemical Engineering,IIT Guwahati, Assam
E-mail: barbie@iitg.ernet.in

ABSTRACT

Floor Cleaning is the common practice of residential buildings of India. In floor cleaning process, cleaning products are most commonly used, especially which has pleasant scent. While use of cleaning products improves the healthfulness of the indoor product, scented components can increase the Volatile Organic Carbon (VOC) concentration. Alpha pinene is an alkene which is commercially used as scent generator in household consumer products. Three alpha pinene containing cleaning products were applied in dilute solution to quantify emission and concentration of alpha pinene in a closed room. It was found that concentration of alpha pinene increases immediately after applying. The concentration and emission rate also shows strong relationship with Relative Humidity. From the monitored concentration, emission rate and emission factor are calculated. It was found that the emission rate of alpha pinene was highest for a herbal labelled floor cleaning product.
Keywords: Floor cleaning, Volatile Organic Carbon, Alpha pinene, Relative Humidity, Emission rate

Temporal trend analysis of rainfall analysis of Northeatern,India

ABSTARCT

The rainfall received in an area is an important factor in determining the amount of water available to meet various demands, such as agricultural, industrial, domestic water supply and for hydroelectric power generation. Global climate changes may influence long-term rainfall patterns impacting the availability of water, along with the danger of increasing occurrences of droughts and floods. In order to manage, planning the water resource, there is a need of analysis of the trends of rainfall distributed across the Northeastern India. The most commonly used method Mann Kendall test gives high power of trend when the serial correlation was present in the series; therefore pre whitening or Block boot strapping was used to remove the effect of serial correlation. So trend can't be detected by a single test, hence many tests are used to detect the trend of rainfall data. The selected method Least square linear regression method (LR Test), Mann kendall test (MK Test) and Sen's slope (SS).The data were analyzed for a period of 142 years from 1842-2012. In this region, maximum rainfall observed in monsoon season with rainfall as 4568.250 mm and the minimum value was observed in winter season with 3.5 mm of rainfall. Moreover, it concluded that predict significant decreasing trend during monsoon season with a slope of 1.875 mm per season remaining seasons predict insignificant decreasing trend except post monsoon season. Linear regression also predicts the same results.

Gel forming, drug conjugated chitosan polymer for controlled delivery.

Himali Horo, Dr Lal Mohan Kundu*

ABSTRACT

Every year, cancer claims more than half a million lives and has become second leading cause of death after heart diseases. Cancer is the uncontrolled growth of cells and can spread to other parts of the body. Current treatment for cancer comprises of surgery, chemo and radiation therapies. The usual system for chemotherapy may lead to fatal damage to normal cells due to its less specificity. In order to eradicate this problem, targeted and controlled drug release systems are introduced for releasing the drugs at the specific site with pre determined rate and thereby avoiding interaction with the healthy tissues.
In our present research we have developed a drug delivery system of 5-Fluorouracil covalently conjugated to chitosan, a well known non toxic biopolymer. The drug conjugated polymer was attached via a unique linker that could be cleaved in a controlled fashion to release 5-Fluorouracil. The synthesized conjugate was characterized by various techniques which showed unique and interesting properties such as gel formation in DMSO. Its release kinetics was studied to monitor specific cleavage of the photolinker to release 5- Fluorouracil.

Adsorption of Chromium from aqueous solutions using pond mud

Sayanti Ghosh[1], Jinat Aktar[1]
Centre for Environment IIT, Guwathati,-781039, India
E-mail:*g.sayanti@iitg.ernet.in , jinat@iitg.ernet.in*

ABSTRACT

Chromium pollution is a major environmental concern today. Chromium is largely used in electroplating, steel production, leather tanning, mining and textile dyeing industries. Hexavalent chromium is highly toxic and it can cause diseases like dermatitis, damage to liver, kidney circulation, lung cancer and even death. World Health Organization (WHO) recommended maximum allowable concentration in drinking water for Cr(VI) is 0.05 mg L^{-1}. Various Chemical and biological processes are used for the removal of Chorimium. But they are costly and sometimes not environment friendly. In this study, we used pond mud as a cost effective and environment friendly adsorbent. It was collected from a pond of IIT Guwahati campus. Batch processes were carried out with various pH, dose, concentration and time variation. Batch experiment also revealed the adsorption kinetics. Adsorption isotherm and characterization of mud was also done.

Could Urban Forests save our world?

Jinat Aktar[1], Anupama Bora[1], Himali Horo[1] and Anirudha Mahagaonkar[1]
[1]Centre for the Environment, IIT Guwahati,India
E-mail: anupama.bora@iitg.ernet.in

ABSTRACT

With racing competitions for developments and economic growth, we have indeed forgotten to conserve and preserve the natural elements of our world. With fast degrading health of our ecosystems, is development worth all this loss? We trust it is not! Urban forests are one of the strategies that permit us to urbanize while retaining a concern for forests, one of the natural elements. And wonderfully, these forests are synergistic with many more natural elements!
Guwahati is one of the 109 cities chosen by the Government of India for the ambitious smart city project. The urban renewal retrofitting programme plans to make these cities citizen friendly and sustainable. And among the major elements of sustainability is coexistence. With this model of ours, we try to educate and encourage people with benefits of urban forests in Smart Cities as Guwahati. Urban forestry advocates the role of trees as a critical part of the urban infrastructure. Best strategies to ensure enhanced survival rates of the forests and intelligent ways to make them blossom will be discussed during the presentation. *For we belong to the nature as much as the other 84 million species on the planet earth. Let's help them live too!*

Exploring the role of azoreductase enzyme from *Chromobacterium violaceum* in degradation of effluent dyes from textile industries

Kamalesh Verma[1], Lal Mohan Kundu [2], Vikash Kumar Dubey*[3]
[1,2,3]Centre for Environment, IIT Guwahati, India
[2]Department of Chemistry, IIT Guwahati, India
[3]Department of Bioscience and Bioengineering, IIT Guwahati, India
E-mail: vdubey@iitg.ernet.in

ABSTRACT

Environmental pollution has always been a major concern affecting numerous lives on our planet. Among all those pollution sources, water pollution is the most critical issue due to uses of huge amount of chemical substances. All textile industries plays pivotal role in contamination of water, mainly uses of different types of dye. Dyes are extremely hazardous for living beings, mainly those contains the azo groups (R-N=N-R1) in there structure. Azo dyes can be degraded by the enzyme azoreductase, present inside various micro-organisms. For our studies, we have chosen *Chromobacterium violaceum* (MTCC No-2656) eco-friendly bacteria for the production of azoreductase enzyme. This strain is known to be non-pathogenic and responsible for higher expression of azoreductase enzymes. The gene responsible for azoreductase enzyme was cloned into pET-28a(+) expression vector and recombinant plasmid was transformed into BL21 (DE3) *E.coli* for its soluble expression. The recombinant enzyme containing His-tag at its N-terminal was purified by Ni-NTA affinity chromatography and biochemical characterization was done using the different substrates as dyes and NAD(P)H. Furthermore, the recombinant enzyme is being attempt for immobilization on the solid surface coated on a column. The waste containing Azo dyes will be passed slowly from this column to check the enzymatic-degradation of dyes. In addition, the enzymatic-degraded product will also be analyzed by various high throughput techniques i.e. NMR, FT-IR and HPLC to check the degraded products so that we can identify the pathway for the degradation of different types of dye.

Keyword: Azo dye, azoreductase, *Chromobacterium violaceum*, affinity chromatography etc.

Molecular Dynamic Simulations of Phosphonium-Based Deep Eutectic Solvents

Papu Kumar Naik[1], Sandip Paul[2]andTamal Banerjee[3]
[1]Centre for the Environment,IIT Guwahati, Assam, India
[2]Department of Chemistry, IIT Guwahati, Assam, India
[3]Department of Chemical Engineering, IIT Guwahati, Assam, India
E-maihl:*papu.naik@iitg.ernet.in*

ABSTACT

Deep eutectic solvents (DES) also considered as Ionic Liquid (IL) analogues has been used for several different applications such as seperations, electrochemistry, and purifications related to the field of material science and engineering applications. They are readily available and relatively inexpensive when compared to conventional green solvents such as IL. In this work, phosphonium based deep eutectic solvent consisting of methyltriphenyl phosphonium bromide (MTPB) salt with ethylene glycol as hydrogen bond donor (HBD) was studied at a molar ratio of 1:4 respectively. The DES was simulated using molecular dynamics (NAMD) to study the pure component properties of these novel solvents. The simulations ware validated by comparing simulated and experimental properties such as density. Good agreement with experimental values ware obtained for simulated density. A relatively higher percent of hydrogen bonding was observed for the interactions between anions and the HBD. Interaction energies, coordination number and radial distribution functions (RDF) is discussed in order to understand the atomistic interactions involved in this eutectic mixture. The results from molecular simulations support the idea that key interactions between the moieties in the eutectic mixture interrupt the main interactions within the parent substances and are responsible for the decrease in freezing point.

Adsorption of Chromium from aqueous solutions using pond mud

Sayanti Ghosh[1], Jinat Aktar[1]
Centre for Environment IIT, Guwathati, Guwahati-781039, India
E-mail:*g.sayanti@iitg.ernet.in , jinat@iitg.ernet.in*

ABSTRACT

Chromium pollution is a major environmental concern today. Chromium is largely used in electroplating, steel production, leather tanning, mining and textile dyeing industries. Hexavalent chromium is highly toxic and it can cause diseases like dermatitis, damage to liver, kidney circulation, lung cancer and even death. World Health Organization (WHO) recommended maximum allowable concentration in drinking water for Cr(VI) is 0.05 mg L^{-1}. Various Chemical and biological processes are used for the removal of Chorimium. But they are costly and sometimes not environment friendly. In this study, we used pond mud as a cost effective and environment friendly adsorbent. It was collected from a pond of IIT Guwahati campus. Batch processes were carried out with various pH, dose, concentration and time variation. Batch experiment also revealed the adsorption kinetics. Adsorption isotherm and characterization of mud was also done.

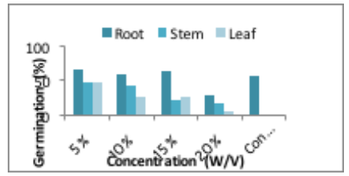
ALLELOPATHIC EFFECT OF COLOCASIA (*Colocasia esculanta* Schott) ON OKRA (*Abelmoschus esculentus)* AND CUCUMBER (*Cucumis sativus)*

Sukanya Sarma 1,Kaushik Das 2
Department Of Botany, Handique Girls' College, Guwahati.
Department Of Crop Physiology, Assam Agricultural University, Jorhat.

ABSTRACT

A laboratory experiments was carried out during July, 2016 in the Department of Crop Physiology, Assam Agricultural University, Jorhat-13, to determine the possible allelopathic effect of *Colocasia esculenta* Schotton okra (*Abelmoschus esculentus)* and cucumber (*Cucumis sativus).* Aqueous extract of root, stem and leaf of colocasia at 5%, 10%, 15%, and 20% (W/V) concentrations were bio-assayed separately against germination and seedling growth of okra and cucumber. In both the crops, germination percentage, germination index, shoot and root length, fresh and dry weights of root and shoot were appreciably reduced by leaf extract whereas root and stem extract of colocasia failed to produce such pronounced inhibitory effects. Germination of okra seed was found to be more sensitive to colocasia leaf extract then the cucumber seeds.

Fig 4.1: Effect of different concentrations of different plant parts of*Colocasia esculenta* on germination percentage (%) of okra



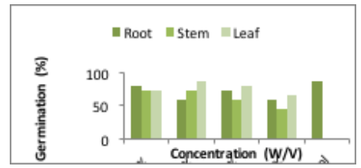


Fig 4.2: Effect of different concentrations of different plant parts of*Colocasia esculenta* on germination percentage (%) of cucumber.

Research activities in Solar Energy Lab

Asha Yadav[1], Pilik Basumatary[1], Juhi kumari[1], Vivek Ghritlahre[1], Shubhangi Bhardwaj[1]
and Pratima Agarwal[1,2*]
[1]Center for Energy, Indian Institute of Technology Guwahati, Guwahati 781039, India
[2]*Department of Physics, Indian Institute of Technology Guwahati, Guwahati 781039, India*
*Corresponding author: E-mail address: pratima@iitg.ernet.in

ABSTRACT

Our group has been working on preparation and characterisation of semiconductor materials such as Silicon (amorphous and nanocrystalline), Graphene, Diamond like Carbon, Silicon Carbide thin films prepared by Hot Chemical vapour Deposition technique (HWCVD) and rf- Plasma Enhanced Chemical Vapour deposition (rf-PECVD) technique. These materials find important applications in various device fabrications such as solar cells, thin film transistors etc. We have recently started fabricating pin structure based silicon (amorphous) solar cells and achieved around 6-7% efficiency on glass substrate. Figure 1 shows the I-V curve of one of the pin based amorphous silicon solar cell on ITO coated glass substrate. We also work on some compound semiconductors such as CdSe, CdTe, ZnSe etc. prepared by chemical root method for device applications. Recently we have started working on Perovskite Solar Cells (PSC), which has broken the record of silicon based solar cells in terms of the recent advances in the cell efficiency that it has achieved within 5-6 years. Most of our research activities will be discussed during the conference.

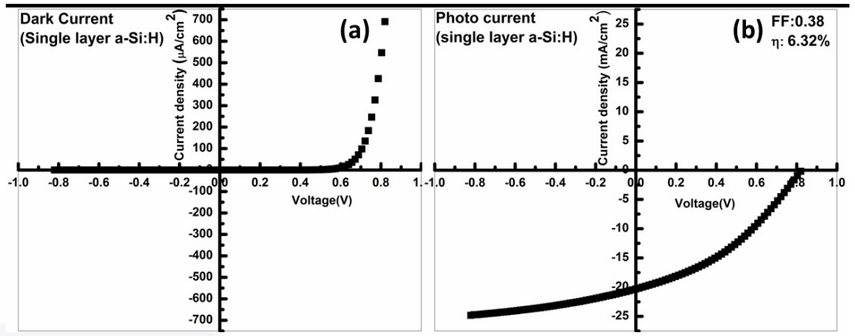


Fig 1: a) Dark and b) Photo IV across a-Si:H based solar cell

Efficacy of botanical and chemical elicitors in triggering Induced Resistance in Carica papaya against Papaya ringspot virus and their Effect on Defence Metabolites in Planta

Anurag Kashyap1*, T. Das2 , S.T. Nizam2 and P.D. Nath1
1Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam(785013), India, 2Department of Botany, Handique Girls' College, Guwahati, Assam (781001), India

ABSTRACT

To study the effect of certain botanical and chemical compounds in triggering induced resistance in plants against virus infection, an experiment was carried out for evaluating their efficacy, utilizing Papaya ringspot virus (PRSV) in papaya as a model system. The test plants were subjected to treatment by these elicitors singly and together in combination. On challenge inoculation with PRSV, it was observed that papaya plants treated with Vitex negundoL. leaf extract alone or its combination with Salicylic acid (SA) could ignite defence responses in plants through development of chlorotic local lesions which functioned as necrotic local lesions preventing disease development by subsequent suppression of systemic symptoms. Foliar spray of V. negundoL. leaf extract showed high disease suppression efficiency (60 %) which was further enhanced when V. negundoL. leaf extract was combined with foliar spray of SA (86.67 %). These elicitors also had a marked influence on in planta defence metabolites such as Phenolic content, Polyphenol oxidase (PPO) and peroxidase (PO) enzyme activity leading to disease suppression on challenge inoculation with PRSV. Total phenolic content, PPO and PO activity was found to be significantly higher in V. negundo L. leaf extract treatment or when it is used in combination with SA on challenge inoculation of PRSV as compared to control. Current findings prove that leaf extracts of V.negundoL. plant contain biologically active constituents which can trigger induced resistance against PRSV. Its efficacy is further enhanced when used in combination with chemical elicitors like SA.

Geographical Range of White-bellied Heron Ardea insignis in Namdapha N.P., Arunachal Pradesh

Based on the field study conducted by the Major students of Geography Department
Tinsukia College, Assam
Manash Pratim Medhi, Aruj MoranMajor in Geography,VI Semester, Tinsukia College
Dr. Ranjan Kumar Das, Associate Professor (Teacher-in-charge & Guide)
Department of Geography, Tinsukia College

ABSTRACT

White-bellied Heron Ardea insignis (127cm) also known as Imperial / Great White-bellied Heron is the Second largest heron in the world. In Latin Ardea means heron and insignis means notable, extraordinary or remarkable. It is indeed an extraordinary bird which is listed as Critically Endangered (BirdLife International, 2011). This species was first described by A.O. Hume in 1870 as Ardea insignis. The White-bellied has a small declining population all over its small range of distribution. It was reported from Nepal and Sikkim Terai , northern Bihar, Bhutan duars to northeast India,Bangaladesh and Myanmar (Ali & Ripley 1987, BirdLife International 2001). There is no recent confirmed record from Bihar, Sikkim and Nepal and the species could be extinct there. As it is reported from Arunachal Pradesh and Assam in recent years, India has to play a major role in its conservation (Rahmani A.R. 2012).It is estimated that there are only 250 White-bellied Heron Ardea insignis left in the world and only about 50 left in India and Bhutan.

So, this poster presentation is on the study of Geographical range of the distribution of White-bellied Heron Ardea insignis in Namdapha National Park of Arunachal Pradesh where recently for the first time in India a nesting site has been recorded by Gopinathan Maheswaran a scientist from Zoological Survey of India, Kolkata. Field studies have been carried out since January-2016 as a part of the compulsory project work by the major students of Geography department, Tinsukia College. Till date three field surveys have been made of which two were covered during winter season and one in summer to see the distribution pattern of White-bellied Heron Ardea insignis in Namdapha National Park. All together 21 days had been spent in different camp sites to conduct the surveys.

Biological Management of Common Tea Pests using Entomopathogens: an *in vitro* Approach

Submitted by Sudeshna Saikia
Clerissa Handique
Under the guidance of Mrs. Liza Handique Bhattacharya
Dept. of Botany, J. B. College, Jorhat

ABSTRACT

Tea [*Camellia sinensis* (L.) O. Kuntze], belongs to the family Theaceae, is one of the economically important non-alcoholic beverage yielding perennial crop, extensively cultivated in Northeast India. About 80% of the tea crop loss is associated with tea pests and pathogens that are responsible for extensive damage of this plantation crop and thereby cause emerging threat to the larger industry in the country. Exploitation of a few entomopathogens such as *Beauveria bassiana* (MTCC 984), *Metarhizium anisopliae* and *Verticilliumlecanii* (MTCC 956) were tried in the present investigation to control tea pests such as *Hyposidra talaca* and *Buzura suppressaria*. Pre-pupa, pupa and late pupa were the three different stages of growth of the tea pests against which the activity of the entomopathogenic fungi were tested. Infections in pre-pupa stage of each pest by entomopathogens are more in comparison to other tested stages. Spore load of 21.8± 1.1 X10^6 spores/ml caused maximum mortality up to 70% at pre-pupa stage for the tested pests whereas the mortality in late pupa stage is relatively low. However, the percentmortality varied with species. As chemical pesticides are creating enomorous damage to soil health and caused lethal and sub-lethal effects to human beings besides creating residue problems in made tea, pest resussarence etc., the present approach of exploiting bioagents (entomopathogen) in management of common tea pests would be a cost effective alternative approach to bring sustainable tea cultivation.

Keywords: Tea pest, chemical pesticides, entomopathogens, sustainable tea cultivation.

VALUE ADDITION OF ERI SILK WITH DATURA STRAMONIUM (DATURA)-A NATURAL COLOURANT

Smita Bhuyan , Nabaneeta Gogoi
Dept –Textile and apparel designing,Assam Agricultural University,Jorhat 13
Email Id-bhuyansmita.gohpur@gmail.com

ABSTRACT

Silk has been the most colourful part of the world's caravan and consider as an inseparable part of Indian culture. The rebirth of natural dyes as an alternative to the hazardous synthetic dyes has received a worldwide attention. This is virtually a worldwide hunt for eco friendly dyes as they are non- hazardous and safe. In India about 500 varieties of plants are available that can yield natural colour (Mahela *et al.,* 2006). Gohain (2012) also stated that datura is used for extraction of Aropine (ayurvedic medicine).Dye obtained from leaves of *Datura stramonium* applied on bleached eri silk yarns has been subjected to pre, post and simultaneous mordanting with selected mordants namely alum, copper sulphate, ferrous sulphate and stannous chloride. Various optimized conditions were recorded such as wavelength (545 nm), 75 min extraction time, alkali concentration of 2.5%/100 g of yarn, 45 min dyeing time, 5% dye material concentration, mordant concentration of 6% alum, 3% copper sulphate, 2% ferrous sulphate and 2% stannous chloride and 30 min mordanting time for all mordants. Colourfastness to washing, sunlight,perspiration, pressing was also studied on four different colour shade.Hence, *datura stramonium* (datura) leaves being eco friendly can be effectively used for dyeing eri silk yarns. Dyeing of eri silk yarns with natural dyes also enhanced its marketability. Moreover, these dye sources are easily available and grown abundantly in North-Eastern region.

An Estimation of Extreme VOC Concentration in Urban Atmosphere Of Delhi

S. Hazarika[1], P. Borah[1] and A. Prakash[1]
[1]Department of Environmental Science, Tezpur University, India
E-mail: ap*@tezu.ernet.in*

ABSTRACT

Introduction: Volatile Organic Carbon (VOC)s are ubiquitous in nature and one of the main sources of photochemical reaction in the atmosphere leading to various environmental and health hazards. In recent years, there is increasing evidence in the literature displaying statistical evaluation of VOCs effects on human health (Song-mei et al.,2012). Forecasting extreme events in urban area could support decision makers to plan effective abatement measures on time, preventing air pollution episodes while avoiding useless restrictions of economic activities. In the present study the daily maximums of VOC compounds (Benzene, MP Xylene and Toluene) are modelled by Generalized Extreme Value (GEV)
Distribution for Delhi City.
Methodology:
Data collection: Hourly data for Benzene, MP Xylene, Toluene concentration are acquired from Central Pollution Control Board, India (http://www.cpcb.gov.in/CAAQM/frmUserAvgReportCriteria.aspx) for a period of 58 months i.e. from Octtober-2010 to July 2015.
Extreme Value Analysis: Maximum daily concentrations of VOC compounds have been sampled by blockmaxima method and GEV distribution has been fitted to the blockmaximas. Parameters (Location, shape and Scale) are estimated by Maximum Likelihood estimation and return levels are estimated for return period of 7, 15, 30, 180 days.
Results:

Return Period	Benzene	MP Xylene	Toluene
7 day	67.32 (65.19, 69.45)	48.83 (46.20, 51.46)	256.56 (245.63, 267.49)
15 day	85.16 (81.95, 88.38)	73.69 (68.31, 79.08)	351.11 (329.77, 372.45)
30 day	101.56 (96.87, 106.24)	104.09 (94.30, 113.89)	451.21 (413.69, 488.73)
180 day	146.03 (135.22, 156.84)	239.69 (201.95, 277.42)	797.05 (674.91, 919.20)

Table 1: Return levels for different selection period and 95% confidence intervals (in brackets)

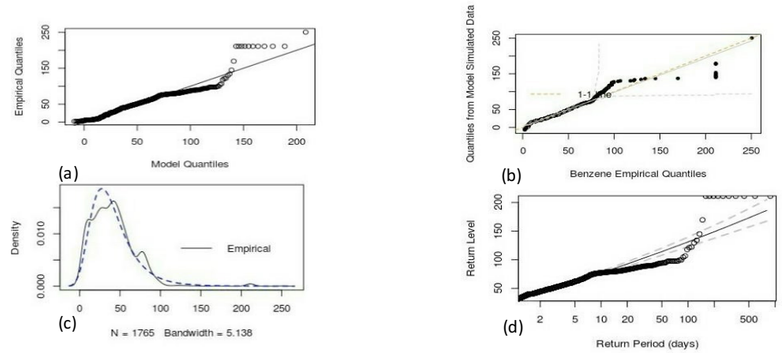


Fig 1 (a-d): Model diagnostics for daily maximum Benzene concentration of Delhi city

Conclusion: The highest daily concentration for the 58 months observation period is 250.66µg/m3, 89.96µg/m3 and 908.05 µg/m3 for Benzene, MP-Xylene and Toluene respectively. The results revealed that the concentrations which exceeds the maximum concentration of the observation period starts to appear in the confidence interval of 30 day period for MP-Xylene. But for Benzene and Toluene, period for the concentration which exceeds the maximum is predicted to be more than 180 day. Model diagnostics (fig 1) shows that the quantile plot maintains linearity till 70th quantile and the return level plot shows linearity till 10 day period

Soilless Culture- An Alternative to Increasing Production of Vegetables

Luna Baruah* Supriya Bordoloi* Sutrishna Bordoloi*
*M.Sc. (Agri) Student Department of Horticulture
Assam Agricultural University, Jorhat-13
supriabordoloi@gmail.com

ABSTRACT

Vegetables constitute a major part of horticultural crops where they play an important role in the human diet. Soil being the most available media for growing crops has been facing problems regarding the per capita availability due to increasing urbanization and industrialization. Moreover, reduction in soil fertility also has been a major problem arising at the advent of increased use of chemical fertilizers. Soil alone will not be able to supplement the increasing population in the future. So, the peak time has reached to think of an alternative. And here the development of soilless cultivation (hydroponics and aeroponics) has given a new hope. Though there has been much technology developed for the commercial soilless cultivation of vegetables, but it has not been popularised as well as commercialized in India. As per 2010-2011 data the productivity of vegetables in India (17.3 t/ha) is less than the world average productivity (18.8 t/ ha). Overall vegetable production of Assam is only 2% of country's total production according to NHB (2013) data. This present status can surely be improved by the adoption of soilless cultivation supplementing the traditional cultivation. Soilless culture system (SSC), the most intensive production method in today's horticulture industry, is based on environment friendly technology ,which can result in high yield, even in areas with adverse growing conditions. It also enable growers to produce vegetables without quality losses compared to soil cultivation. **Keywords:** Hydroponics, Soilless Culture System

Morphological and biochemical characterization of tea (Camellia sinensis (L.) O. Kuntze) shoots of few industry clones of Upper Assam

Aditi Smith Gogoi1, P.K. Borua2
[1]Assistant Professor, Department of Tea Husbandry & Technology, Assam Agricultural University, Jorhat, Assam
[2]Professor, Department of Life Sciences, Dibrugarh University, Dibrugarh, Assam
Email- aditi.smith@yahoo.com

ABSTRACTS

Tea is receiving increased interest for its antioxidant properties and nutraceutical values in a well brewed tea. Along with various planting materials, more than 100 numbers of industry tea clones are under commercial cultivation which is yet to be explored and are verse of extinctionleading to the narrowing down of the genetic base of the crop (Konwar, 1999).
Fourteen industry tea clones of Upper Assam were profiled based on morphological and biochemical characters by field survey and laboratory investigation using physical methods, dimensional methods and morphological descriptor. Post hoc analysis was used to test the significance level and correlation similarity co-efficient matrix to analyze the genetic relationship among clones. Significant variation was observed in shoot and biochemical characters. Clone S3A3 showed highest shoot dry weight and plucking point density while clone P126 exhibited maximum shoot pubescence. The phenolic compounds present in tea shoots plays important role in determining the made tea quality (Hara et. al., 1995).The highest total polyphenol and caffeine was found in clone S3A3 (25.79 %) and L807 (2.49%) respectively. Chlorophyll gives blackness to tea liquor which is an important factors in commercial evaluation of tea (Liyanage et al., 1993). Total chlorophyll was highest in clone P126 (1.20mg/g) and lowest in clone S3A3 (1.01mg/g). Pigment profiles can be applied for fingerprinting of clones for selection of breeding material (Bajaj, 1975). Correlation similarity coefficient matrix ranged from 0.000 to 1.000 indicating a high degree of variation amongst the clones. Dendogram based clusters indicated that clones S3A3, P126, Keyhang and N325 formed a discriminated cluster and may be selected in future breeding programmes. Clones with low polyphenol and caffeine with high chlorophyll may be selected to produce quality green teas whereas clones with high polyphenol, high caffeine and low carotinoid may be preferred for quality black tea production.
Key words: Tea, Industry clone,Descriptors, Total polyphenol, Caffeine

A review on comparison of microalgal biomass harvesting strategies

Madonna Roy1 and Kaustubha Mohanty1,2*
1Centre for Energy, IIT Guwahati, India
2Department of Chemical Engineering, IIT Guwahati, India
Email: madonna.roy@iitg.ernet.in

ABSTRACT

Due to the growing awareness concerning exhaustion of fossil fuels and surge in harmful emissions, efforts are being made to develop renewable green fuels viz. biodiesel from different waste/natural resources. Microalgae have the ability of CO2 sequestration by using solar energy and transforming it into organic molecules such as lipids (i.e. feedstock for biodiesel production). One of the crucial bottlenecks for the economically viable production of biofuel from microalgae is the harvesting of algal biomass from the culture medium. Harvesting of microalgal biomass uses various strategies like sedimentation, flocculation, flotation, centrifugation and filtration or a combination of these. This paper reviews the different harvesting strategies mentioned above. Development of harvesting technologies like flocculation using magnetic micro-particles and biopolymer as well as electrical approach have also been discussed. Overall, this review offers general ideas to improve these harvesting methods and the production of renewable energy for future development.

Recent advancement in 2D Transition Metal Dichalcogenides (MoSe2, MoS2, and WS2)

A.Juhi Kumari1,B.Vivek Ghritlahre1 , C. Shubhangi Bhardwaj1andD. Pratima Agrawal1,2 *
1Centre for Energy,IIT Guwahati,India
2Department ofPhysics,IIT Guwahati,India
E-mail:pratima@iitg.ernet.in

ABSTRACT

2D/Transition Metal Dichalcogenides materials have been attracting researcher's attention due to its outstanding semiconducting properties and chemical stability which helps to withstand electrical stresses, and thus the overall performance, reliability and lifetime of the optoelectronic devices. These are basically an N-type semiconductor with direct band gap of 1.8 eV (MoS2 monolayer), 1.48eV (MoSe2), and 1.9eV (WS2). These are also emerging class of stable inorganic graphene analogs having finite band gap making it complement to graphene in electronics and optoelectronics devices. These are also well known for its lubrication property, petroleum desulfurization, catalytic applications and as a host for formation of intercalation compounds with these interesting features, 2D MoS2, MoSe2, and WS2 find applications in various fields, including flexible electronics, energy storage, electrochemical catalysis, photo semiconductor devices and as a solid lubricant. These materials may be synthesized using CVD, HWCVD, Magnetron Sputtering, Solvo-thermal, Pulse electrode deposition etc., out of which Solvo-thermal is more convenient and less complex process. A literature review on different methods of synthesis and the properties of these materials will be presented.

BANDITA KALITA & Gautomi Gogoi
banditakalita.kalita@gmail.com
IASST Guwahati

ABSTRACT

A very simple and cost-effective detection of nitroaromatic compounds is accomplished by developing two biobased conjugates Riboflavin-Tryptophan (RT) and Riboflavin-Cysteine (RC), which undergo efficient fluorescence turn off toward nitroaromatic compounds in aqueous media. The compound has been characterized using FTIR, TGA, DSC, XRD, UV. The PL spectra has been recorded. For the compound RC, we have also carried out theoretical studies to compare with the experimental results. This study is done in Gaussian 09 programme with B3LYP functional and 6-31G(d,p) basis set for calculation of the theoretical parameters : IR,UV spectra, HOMO, LUMO, band gap values. These results show in good agreement with the experimental ones.

Polyaniline-coated Filter papers: Cost Effective Hybrid Materials for Adsorption of Dyes

Sibani Majumdar, Debajyoti Mahanta*
Department of Chemistry, Gauhati University, Guwahati, Assam, India, 781014
sibanimazumder@gmail.com

ABSTRACT

In this study, Polyaniline coated filter papers PANI (ES)-FP and PANI (EB)-FP have been synthesized by chemical oxidation polymerization. This is a cost effective and simple method of preparing PANI film on an inexpensive filter paper. The PANI coated filter papers were characterized by UV/Vis, IR, TGA and SEM analysis. These composite materials have been effectively used for adsorption of 7 different dyes from aqueous medium. It has been observed that these are good adsorbents for anionic and cationic dye adsorption. Detail equilibrium and kinetic studies have been reported here by taking Eosin yellow and Methylene blue as anionic and cationic model dyes. The experimental data for Eosin yellow and Methylene blue adsorption were best fitted in Freundlich and Langmuir adsorption models respectively. The Langmuir adsorption capacity of Eosin yellow and Methylene blue on PANI (ES)-FP and PANI (EB)-FP were 4.3 and 1.3 mgg-1 respectively at neutral pH. Adsorption of both dyes follows 2nd order kinetic model.

Indian Institute of Technology Kharagpur
Subhajit Ghosh

We have studied the interaction between bovine serum albumin (BSA) and sodium N-lauroylsarcosinate (SL-Sar), a widely used surfactant in cosmetics, shampoos by use of a number of techniques, including fluorescence and circular dichroism spectroscopy, and isothermal titration calorimetry. The binding strength of SL-Sar is stronger than the structurally similar surfactant sodium N-lauroylglycinate (SL-Gly), which differ only by the absence of methyl group in the amide nitrogen atom. Also these two surfactants exhibit different binding patterns with the BSA protein. The results of fluorescence measurements suggest that the surfactant molecules bind simultaneously to the drug binding site I and II of the protein subdomain IIA and IIIA, respectively. The fluorescence as well as CD spectra suggest that the conformation of BSA goes to a more structured state upon surfactant binding at low concentrations. The role of amide bond and hence the surfactant head-group in the binding mechanism can-not be ignored. It was observed that while SL-Sar destabilized, SL-Gly stabilized the protein structure even at concentrations less than the critical micelle concentration (CMC) value. The thermodynamics of surfactant binding to BSA was studied by use of ITC. From the ITC results, it is concluded that both SL-Sar and SL-Gly bind to BSA in one set of binding sites.

Synthesis, Characterization and in vitro Cellular Uptake of Two Different Superparamagnetic Nanocomposites of Fe3O4 Nanoparticles Functionalized with Porphyrin Photosensitizers.

Devashish Sengupta, Saran Chattopadhyaya, Zeaul Hoque Mazumdar, Subhojit Das, Debdulal Sharma, and Subrata Bannerjee.
Department of Chemistry, Assam University; Silchar, Assam-788011, India.
Chemical Science division, Saha Institute of Nuclear Physics, Kolkata, West Bengal–700 064, India.
Department of Chemistry, Barjala, Jirania, West Tripura, Tripura 799055, India.

ABSTRACT

Two different, superparamagnetic, water-soluble nanocomposites of Fe3O4 NPs functionalized with porphyrin photosensitizers (PSs) having different types of carboxyl linkers are reported. The PSs are covalently bonded to the surface of Fe3O4 NPs. The compounds [5,10,15-tris(4-pyridyl)-20-mono(4-carboxyphenyl)porphyrin] and [5,10,15-tris(4-pyridyl)-20-mono(4-phenylaminoacetic acid)porphyrin] were synthesized successfully. The presence of terminal carboxyl linkers facilitated the easy formation of the nanocomposites. Microstructure, magnetic, photophysical, and in vitro cellular uptake were investigated through High Resolution Transmission Electron Microscopy (HRTEM), Vibrating sample magnetometer (VSM) measurements, Time-Resolved spectroscopic studies and Fluorescence Confocal Imaging. The NPs formed were spherical and monodisperse with an average diameter of 8 nm and having a saturation magnetization of 48.5 emu. g-1, at 10000 Oe. The photofunctional Fe3O4 nanocomposites exhibited high solubility and stability in water. Fluorescence Confocal Microscopy with spectral imaging showed high uptake of Fe3O4-Porphyrin in AGS cell line. The results are indicative of development of supermagnetic nanocomposites that would serve as cancer PDT agents in the presence of light and molecular oxygen to facilitate apoptosis.
Keywords: Porphyrins, Superparamagnetic Nanoparticles, Fe3O4 Nanocomposites, Photosensitizers.

Three Hydrophilic, Biologically Active Pyrimidine Derivatives: Synthesis, Characterization, Evaluation as Agents with Anti-HIV1, ROS Quenching, or Immunomodulatory Properties

Devashish Sengupta,Ranjan K. Das, Bijoy Debnath, Indrajit Das, Gautam Bhattacharjee, Shahid Jameel, Nawab Tahil Khan, Mahuya Sengupta, Yasmin Chowdhury
Address: Department of Chemistry, Assam University, Silchar-788011
Department of Virology, ICGEB, Aruna Asaf Ali Marg, JNU, New Delhi-110067
[3]Department of Biotechnology, Assam University, Silchar-788011

ABSTRACT

By adopting either a green method involving a one pot multi-component reaction (MCR) or conventional multistep synthetic pathways three hydrophilic pyrimidine derivatives, a urea derivative of quinazoline (1), a tetra-hydro pyrimidine (2), and a di-pyridyl derivative of pyrimidione (3), obtained by cycloaddition of a heterodyne and a ketene, were synthesized. Hydrophilicity of these pyrimidines was enhanced by incorporating strong polar groups that support H-bonding or by alkylation of a pyridyl group to generate a nitronium salt. The compounds were characterized and their purity established through 1H NMR spectroscopy and other techniques. The biological activities of the three water-soluble pyrimidine derivatives reveled interesting results. Compound 1 showed anti-HIV-1 activity against the retrovirus by inhibiting the metabolism of the virus at a concentration of 8 mg/mL. Compound (2) showed anti-oxidizing property indicating the ability to suppress reactive oxygen species (ROS) production of human blood. At low concentrations compound (3) induced cell cytotoxicity by imparting membrane damage of cells of innate immune system (macrophages). This qualifies the pyrimidine derivative (3) as an immune modulator mediated by oxidative stress/damage. Compound (3) is well suited for targeted cancer therapy and such compounds can be further developed in cancer therapy by binding the pyrimidine derivative to cancer markers like epidermal growth factor receptor (EGFR). All three of these biologically potent water-soluble pyrimidines indicate promising applications in medicinal chemistry.
Key words: Hydrophilic Pyrimidines, Anti-HIV1 activity, Suppression of ROS, Cytotoxicity, immune modulator.

Adsorptive interaction of 90Y and 90Sr with diglycolamide based resin: A Density functional theory.

Swastika Gogoi, Monali Dutta Saikia*
monalisaikia@hotmail.com
Arya Vidyapeeth college, Gauhati University, Guwahati-781016

ABSTRACT

Because of favourable nuclear and chemical properties, radiopharmaceuticals based on 90Y are widely used for therapeutic purposes. High specific activity 90Y can be obtained from 90Sr, which is a fission product and is available in spent nuclear fuel. Several experimental studies have been reported on adsorptive separation processes for recovery of 90Y, however there has been relatively less theoretical study on adsorption mechanism of 90Sr-90Y group. In this work, we have carried out theoretical studies on adsorption complexes of Y(III) and Sr(II) with N,N, N' ,N'¬- tetraoctyldiglycolamide (TODGA) by using density functional theory. Mulliken and Natural bond orbital methods were used to analyse of the distribution of electron density over the atoms, bonds and molecular orbitals. Adsorption energies are strongly dependent on the charge transfer from TODGA to empty valence orbitals of the metal ion. This work might provide further insight into understanding the origin of the rare earth element selectivity and a theoretical basis for designing highly effective adsorbent for rare earth elements separation. Keywords: TODGA adsorbent, rare earth elements, 90Y, Covalent

Analysis of ethylene biosynthesis and perception during post-harvest storage of Khasi mandarin (Citrus reticulata Blanco) fruits

K. Kashyap and S. Banu*
Department of Bioengineering and Technology, Gauhati University, Guwahati, India
E-mail: sofiabanu2@gmail.com

ABSTRACT

Background: Citrus is a widely cultivated fruit crop in the tropical and sub-tropical areas of the world. Khasi mandarin (Citrus reticulata Blanco) is a commercially important late season cultivar in North-east region of India. Although citrus is non-climacteric, modulation of ethylene has an effect on ripening-related post-harvest stress response. The role of ethylene in the response of citrus fruits to low temperature or shelf life storage is still controversial and whether the hormone is a defense response to cope with the cold-induced damage or potentiate chilling injury development in citrus is not fully understood. Moreover, our understanding about how ethylene biosynthesis is regulated by post-harvest stress and how these changes are synchronized with ethylene biosynthesis, perception and responses to these post-harvest conditions in citrus fruits are still unknown. Therefore, the aim of this work was to study the transcriptional regulation of ethylene biosynthesis, perception and response during post-harvest at cold storage (4°C) and for shelf life at 20°C in the pulp of Khasi mandarin fruits. The effect of the ethylene action retardant, GA3 (gibberellic acid), was also investigated to determine the involvement of ethylene in the regulation of the genes of its biosynthesis and perception.
Results and discussion: The result indicates that cold storage (4°C) markedly stimulates the expression of ethylene biosynthetic genes; ACS1 (1-amino-cyclopropane-1-carboxylate synthase-1) and 2, ACS2 and to a lesser extent in ACO (1-amino-cyclopropane-1-carboxylate oxidase) gene but did not stimulate expression during shelf-life at 20°C in the pulp of Khasi mandarin supporting the auto inhibitory regulation of ethylene in citrus fruits. Expression of ACS1, ACS2 and ACO were over stimulated in the pulp of GA3 treated fruit, indicating a negative feedback control of ethylene on the process. Moreover, ethylene appears to be implicated in the transcriptional regulation of ethylene receptors, ETR1 (ethylene response-1) and ERS1 (ethylene response sensor-1), both under cold storage and shelf-life while no clear role of GA3 was observed in the induction of ethylene receptors. Expression of regulator genes of the signalling pathway such as CTR1 (constitutive triple response-1), EIN2 (ethylene insensitive-2) and EIL1 (ethylene insensitive 3-like-1) was neither cold induced nor stimulated by GA3 treatment suggesting their low temperature susceptibility and that they are positively regulated by ethylene and are unrelated to the molecular mechanism of augmentation of ethylene efficiency under low temperature. By contrast, expression of CTR1, EIN2 and EIL1 was highly stimulated during shelf-life at 20°C.
Conclusion: The genes are differentially responsive to post-harvest storage treatments thus suggesting alternative regulation and the possible role of ethylene and ripening in non-climacteric Khasi mandarin fruits

Dr. Bipul Nath
Girijananda Chowdhury Institute of Pharmaceutical Science

ABSTRACT
Objective: To prepare and evaluate a herbal anti-ageing face cream which is made by the ethanol extract of Coriandrum sativum collected from local market of Kamrup, Assam
Methods:
Antioxidant activity of ethanol extract of coriander was assessed by previously reported 2, 2 diphenyl-1-picrylhydrazyl method. Several face creams were prepared incorporating different concentrations of stearic acid and acetyl alcohol. The evaluations of all formulations has been done by the analysis of different parameters like pH, viscosity, spreadability and stability.
Results: An ethanol fraction analyzed from a sample of Coriandrum sativum showed significant anti-oxidant activity with an IC50 value of 34.25µg/ml, while for ascorbic acid the IC50 value was 46.68 µg/ml. Among different formulations F5 showed good spreadability, good consistency, homogeneity, appearance, pH. There is no signs of phase separation and ease of removal. All the formulations showed no redness or oedema or erythema and irritation during irritation studies.
Conclusions: These formulations can be safely used on the skin and turn out to be one of the cost effective choices for compliment their existing product running in the market.

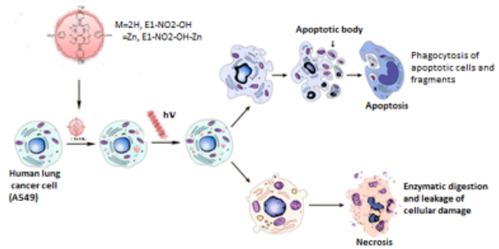
Dr. Dipankar Saha
Girijananda Chowdhury Institute of Pharmaceutical Science

ABSTRACT
The alleged anti-diabetic potential of ethanolic extract of Clerodendrum serratum(Verbenaceae) leaves, on fasting blood sugar levels and serum biochemical analysis in alloxan induced diabetic rats were investigated. Ethanolic Extract of Clerodendrum serratum produced a significant anti-diabetic activity at dose levels of 200 mg/kg b.w and 500 mg/kg b.w.The activity was found comparable with standard drug Glibenclamide.
KEY WORDS: Clerodendrum serratum, Alloxan (AXN), Antidiabetic effect.

Synthesis, Isolation, Characterization and Application as Cancer Photodynamic Therapy (PDT) Agent of meso-5, 10, 15-tris-(p-hydroxyphenyl)-20-mono-(p-nitrophenyl)porphyrin and its Zinc Complex

Devashish Sengupta,1*Jayanta S. Boruah1, Zeaul H. Mazumder,1Monjur H. Barbhuiya,1 Bishal Das,1 Mahuya Sengupta2
Address:1Department of Chemistry, Assam University; Silchar-788011
2Department of Biotechnology, Assam University; Silchar-788011

ABSTRACT
Porphyrin derivatives of tetra-substituted meso-phenolic groups have been commercially popularized as photodynamic therapy agents (PDT) due to the phenolic OH that impart hydrophilicity. An attempt to further enhance the polarlity and efficacy of such porphyrins by replacing one of the phenolic groups with a para-nitro phenyl group is reported. A combination of both a free-base and its corresponding zinc incorporated hydrophilic meso-substituted porphyrin derivatives containing a p-nitrophenyl group along with three phenolic groups have been synthesized through a multi-step synthetic process. The characterization of the porphyrins has been achieved through various spectroscopicmethods. The ground state and excited state electronic properties of the porphyrin derivatives have been assessed by UV-Vis, Steady state spectrophotometric techniques. The photosensitization ability and roleofthe porphyrin derivatives as possible cancer photodynamic therapy agent was investigated by cell proliferation assays with A549 lung cancer cells. A strong cell viability at concentrations lower than 10 M has been indicated by the zinc incorporated porphyrin derivative. Cellular uptake and sub-cellular localization properties were shown to be crucial to its photodynamic efficacy.



These photosensitizers can be developed through further functionalization to enhance their efficacy under very low dosages.
Key Word: Meso substituted porphyrin, photodynamic therapy, cell viability Assays

Rupa kumari
Guwahati University

ABSTRACT
The primary objective of this study is to present a database on indigenous knowledge on medicinal plants used for reproductive disease among the local traditional healer of morigoan district, Assam. A survey on the plants used for reproductive disease was carried out during the period 2011-2012 and information regarding the different types of plants used, parts of the plants, mode of administration were collected from 16 village of the district. The present study reveals that the rural tribal people are well versed with the nature and natural resources around them. In the traditionally by the people of the study area. It is concluded that even though the accessibility of the modern system of medicine for simple and complicated disease is available, many people in the studied area still continue to depends on medicinal plants, for the treatment of different types of disease. The need of the hour is to harness this traditional knowledge and preserve this knowledge for the betterment of future mankind

Three Hydrophilic, Biologically Active Pyrimidine Derivatives: Synthesis, Characterization, Evaluation as Agents with Anti-HIV1, ROS Quenching, or Immunomodulatory Properties

Devashish Sengupta,1 Ranjan K. Das,1 Bijoy Debnath,1 Indrajit Das,1 Gautam Bhattacharjee,1 Shahid Jameel,2 Nawab Tahil Khan,2 Mahuya Sengupta,3 Yasmin Chowdhury3
Address:[1]Department of Chemistry, Assam University, Silchar-788011
[2]Department of Virology, ICGEB, Aruna Asaf Ali Marg, JNU, New Delhi-110067
[3]Department of Biotechnology, Assam University, Silchar-788011

ABSTRACT

By adopting either a green method involving a one pot multi-component reaction (MCR) or conventional multistep synthetic pathways three hydrophilic pyrimidine derivatives, a urea derivative of quinazoline (1), a tetra-hydro pyrimidine (2), and a di-pyridyl derivative of pyrimidione (3), obtained by cycloaddition of a heterodyne and a ketene, were synthesized. Hydrophilicity of these pyrimidines was enhanced by incorporating strong polar groups that support H-bonding or by alkylation of a pyridyl group to generate a nitronium salt. The compounds were characterized and their purity established through 1H NMR spectroscopy and other techniques. The biological activities of the three water-soluble pyrimidine derivatives reveled interesting results. Compound 1 showed anti-HIV-1 activity against the retrovirus by inhibiting the metabolism of the virus at a concentration of 8 mg/mL. Compound (2) showed anti-oxidizing property indicating the ability to suppress reactive oxygen species (ROS) production of human blood. At low concentrations compound (3) induced cell cytotoxicity by imparting membrane damage of cells of innate immune system (macrophages). This qualifies the pyrimidine derivative (3) as an immune modulator mediated by oxidative stress/damage. Compound (3) is well suited for targeted cancer therapy and such compounds can be further developed in cancer therapy by binding the pyrimidine derivative to cancer markers like epidermal growth factor receptor (EGFR). All three of these biologically potent water-soluble pyrimidines indicate promising applications in medicinal chemistry.

Key words: Hydrophilic Pyrimidines, Anti-HIV1 activity, Suppression of ROS, Cytotoxicity, immune modulator.

Swelling Studies Of Coal Using Deep Eutectic Solvents (Des's)

Tooba Fatma, Sanjukta Bhoi, Tamal Banerjee
Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, India
Email: tooba.fatma@iitg.ernet.in

ABSTRACT

There has been tremendous research on the interactions of coal with various solvents which are used for the structural investigations and the solvent extractions. This work includes the interactions between three Indian coals from the mineral rich eastern part and three different Deep Eutectic Solvents (DES's) namely Choline chloride Ethylene glycol [ChCl][EtGl], Choline Chloride Glycerol [ChCl][Gl], Choline Chloride Urea [ChCl][Urea] is studied. The interactions studies of coal/DESs are mainly observed using Fourier Transfer Infrared Spectroscopy (FTIR) for the untreated and DES-treated coal. It was observed that there was a reduction of functional groups for the DES's treated coals compared to untreated one. A comparison of the proximate and ultimate analysis of the untreated and DES's treated coal samples was also investigated. DES's treated coals show an increase in the fixed carbon content. Among the various DES's [ChCl][Gl] is found to have the highest swelling ratio. An extract yield of 25 % was also found for the [ChCl][Gl] treated coal-2.

Optimization of astaxanthin production from yeast malt media by Phaffia rhodozyma MTCC-7536

Batghare A. H.1, Singh N.2 and Moholkar V. S.3*
1 Department of Chemical Engineering, Indian Institute of Technology, Guwahati, India
2 Center for Energy, Indian Institute of Technology, Guwahati, India
3 Department of Chemical Engineering, Indian Institute of Technology, Guwahati, India
* Corresponding author. Tel: + 91 361 2582258, Fax: + 91 361 2582291, E-mail: vmoholkar@iitg.ernet.in

ABSTRACT

Astaxanthin is a naturally occurring carotenoid found in marine organisms including microalgae, crustaceans, salmon, and trout. Astaxanthin is a potent and safe anti-oxidant/anti-inflammatory that can improve the health and vitality of both humans and animals. It may also reduce oxidative stress in the nervous system, reducing the risk of neurodegenerative diseases. On commercial scale, astaxanthin is currently produced through chemical synthesis which may cause hazardous effects on human health and hence it is necessary to produce it in a greener way i.e. through the fermentation using microorganism such as Phaffia rhodozyma yeast.

The aim of this paper is to investigate the effect of medium components (YM media) and environmental factors (Initial pH and temperature) on astaxanthin production in Phaffia rhodozyma. The environmental factors were optimized using Central Composite Design and the optimum initial pH and temperature for astaxanthin production were 4.94 and 19.840C respectively with total astaxanthin yield of 147.293 µg/g of yeast. Subsequently the optimum medium components (glucose 8.93 g/L, peptone 3.45 g/L, yeast extract 3.07 g/L and malt extract 2.31 g/L) were determined with Box-Behnken Design method. After 120 hr fermentation under the optimal incubation conditions, the maximum astaxanthin yield was 158.146 µg/g of yeast. A statistical method of RSM for evaluating process optimization was proposed for astaxanthin production from Phaffia rhodozyma. Keywords- Phaffia rhodozyma, astaxanthin, medium components, environmental factors, optimization

Dhirendra Misra, Debashis Kundu, G.Pugazhenthi, Tamal Banerjee
Department of Chemical Engineering, IIT Guwahati, India
E-mail: dhirendra.m@iitg.ernet.in

ABSTRACT

Hydrogen1is considered globally as an alternative fuel to fossil fuels1 has attracted attentions in consideration of the most highlighted energy crisis and environment pollution problems. Ammonia borane1(AB) hydrogen storage material having high hydrogen content of 19.6 wt% is simplest compound of amine borane family and an intense subject of research in recent years for hydrogen storage. Tert-butylamine-borane (TBAB) is been used in our recent work as it has no induction period1, 2 and no formation of volatile compounds has been reported such as ammonia or borazine. Our current work projects about the Quantum Chemical Calculation2 of TBAB-ILs system which helps to calculate the binding energies of the system and presents a perfect picture of dehydrogenation. The initial structure of TBAB-IL were drawn using GaussView3 5.0 4 followed by the Geometry optimization which was carried out in Gaussian 09 .Various structures of complexes were drawn to perform geometry optimization using Hartree-Fock4 (HF) method with the basis set 6-31G(d).The Geometry optimization of TBAB and ILs were carried in Gaussian 09 quantum chemical package by density functional theory (DFT) with least negative energy using B3LYP/6- 311+G(d) followed by the NBO analysis of our system.

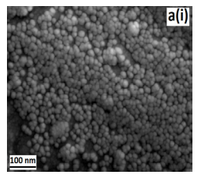
Keywords: Amine boranes, TBAB, Gaussview 5.04, Gaussian 09, DFT, NBO

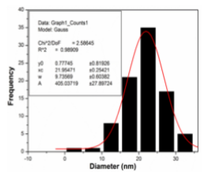
Green synthesis of Iron oxide nanoparticles for effective removal of fluoride and pH responsive character

Piyal Mondal, Mihir K Purkait

ABSTRACT

Clove has been a well known aromatic plant flower bud which has huge medicinal uses. It contains huge number of poly-phenolic compounds. The extract of clove not only reduces the iron salt to zero-valent nanoparticles, but also provides a biomolecule coating which prevents agglomeration between nanoparticles. The pH of clove extract played a vital role for smaller-sized NPs generation. Size was found stable after 7 days at particular pH. 20-25 nm spherical shaped iron nanoparticle (NPs) were prepared. The NPs formed has a biomolecule coating mainly of flavonoids (quercetin and rutin). Zero-valent iron NPs formed known to be a potential reducing agent and was used for reducing nitrobenzene (NB) to aniline in wastewater. Production of aniline as well as NB reduction was optimized with respect to NPs content, time and temperature. The minor uncontrollable oxidation produces iron oxide NPs which provides to be a good adsorbent (surface area 57.8 m2/gm) used for dye removal. Finally the prepared NPs acts as pH indicator. The NPs coating comprises of flavonoids, when NPs exposed to different pH solutions the colour of the solution changed. At higher pH the colour changes to red due to the production of anthocyanidine from flavonoids (addition of -OH to quercetin), whereas at lower pH colour changes to pale yellow due to formation of flavones from flavonoids (catechin forms). Finally the release of rutin and quercetin as well as formation of catechin with respect to pH and time was analyzed and optimized.





Waste to wealth: Biopolymer for clean-up oil spills

Machhindra S. Bhalerao, Pravin G. Suryawanshi, and Geetanjali Bhati
Department of Chemical Engineering, IIT Guwahati, India
E-mail: pgsuryawanshi@iitg.ernet.in

ABSTRACT

Since ancient days it is observed that almost all nations are involved in the huge quantity of oil import and export business which is usually carried out through water bodies. As a consequence every year, the modern era faces the miserable problems due to the release of oil into water bodies as oil spills affects number of subsurface organism that are linked in a complex food chain including human food sources. Oil wastes that enter the water bodies appear from many reasons like accidental leakage during transportation or construction, drainage from cities and unprocessed waste from industries and household sectors. The most environment friendly approach of cleaning up nature after an oil spill disaster is to absorb and its recovery. To overcome this problem, the synthesis of new materials that can sequester and remove pollutants is essential. Oil booms and oil skimmer vessels have been used but often are not so efficient. Generally these conventional materials have low oil loading capacity and absorption performance. In order to overcome this problem, we have come up with the designing and preparation of an efficient and novel biomaterial. Our biopolymer has been prepared by utilization of waste cooking oil and nanomaterial. Modified waste cooking oil provides this infinite feedstock, as they stand for one of the cheapest, and widely available. Biopolymer absorbs oil and other hazardous solvents due to its micro porous nature, large specific surface area and hydrophobicity. Additional advantage of our process is that it helps in utilization of WCO in a proper manner and thus eliminating the environmental impacts caused by the harmful disposal of these oils into a drainage system. After absorption of oil the recovery of oil was done by simple pressing the biopolymer only. Nanomaterials are known to show properties that are different from their bulk equivalents, thus necessitating their synthesis. Copper based nanomaterials have great potential due to their extraordinary physicochemical properties as well as easy availability of relatively inexpensive and versatile metal in several applications. Bio-based nanomaterial is a new emerging category of materials receiving much attention in recent years. Therefore, the developments of new approaches towards offers that chance. The biopolymer was synthesized and characterized with different techniques. In this bionanomaterial, NPs homogeneously anchored onto modified waste cooking oil. The morphology and elemental compositions of the bionanomaterial were characterized with the help of scanning electron microscopy, energy dispersive X-ray spectroscopy, and FTIR spectroscopy analysis. For applicability of biopolymer we have studied various oil absorption experiments involving tests with marine water as well as fresh water, as shown in fig. 1.

TiO2-AMPS nanocomposite based PSF mixed matrix ultrafiltration membranes with better flux and rejection profiles

Randeep Singh1 and Mihir Kumar Purkait1
1 Department of Chemical Engineering, IIT Guwahati, India
E-mail: mihir@iitg.ernet.in

ABSTRACT

In this study a titanium dioxide (TiO2) and poly(2-acrylamido-2-methyl-1-propanesulfonic acid) (AMPS) based nanocomposite is prepared and used to modify polysulfone membranes for better flux and rejection profiles. Phase inversion technique is used to prepare the membranes. TiO2 and AMPS were taken in three different ratios so as to make three different nanocomposites. These three nanocomposites in different wt% along with poly(ethylene glycol) were blended with polysulfone by using N-methylpyrrolidone as a solvent. The prepared membranes were characterized and analysed by techniques like Field emission scanning electron microscopy (FESEM), and FESEMEnergy dispersive X-ray spectroscopy (FESEM-EDX). The permeation tests were carried out to analyse the membranes for pure water flux and hydraulic permeability. FESEM-EDX spectroscopy was used to confirm the presence of nanocomposite in the membranes. The antifouling studies were carried out with humic acid (HA) solution of 10 ppm. The hydrophilicity and antifouling nature is high for the membranes containing higher amount of the nanocomposite. There is an increase of 23.5% in the hydrophilicity of the prepared membranes due to the presence of the nanocomposite. The rejection of HA is 100% in case of neat membrane and 88% in case of the membrane containing highest amount of the nanocomposite.

Materials and Methods:

Table 1. CONTENTS OF THE NANOCOMPOSITE

S. No.	TiO_2-AMPS Nanocomposite	TiO_2 to AMPS Ratio	TiO_2 (Wt %)	VCL (Wt %)
1	R1	1:1	1	1
2	R2	1:2	1	2
3	R3	2:1	2	1

Physicochemical characterization of lignocellulosic biomass and effect of extractive contents on pyrolysis

Ranjeet Kumar Mishra, Kaustubha Mohanty
Department of Chemical Engineering,IIT Guwahati,India
E-mail: m.ranjeet@iitg.ernet.in

ABSTRACT

The aim of current study is to identify best possible way to utilize lignocellulosic (nonedible and waste) biomass for production of fuel and chemicals. In India, availability of biomass is much easier in terms of economic and abundant amount which comes from various sources like agricultures and forest residues [1]. In the present study, different types of biomass has been taken which cover nonedible seed and waste woody dusts for production of fuel and chemicals. Characterization of biomass have been done on the basis of their degradation profile, amount of cellulose, hemicellulose, lignin content, oil percentage and amount of mineral contents [2-3]. Thermogravimetric analysis (TGA) is used to identify thermal stability of biomass and its confirmed that maximum degradation occurs in the temperature range of 250-550 °C for all biomass. Biomass comprises slightly higher percentage of extractives (7-62 %). XRD analysis confirms amorphous nature of biomass. Physical analysis confirm that these biomass are suitable for pyrolysis process due to having lower amount of sulpher, nitrogen, moisture content, ash content and higher volatile matter content. Furthermore, FTIR analysis confirms presence of useful functional groups. EDX analysis confirms presence of mineral matter that provides positive effect during pyrolysis. In addition it has been observed that extractive contents broadly affect the degradation temperature of biomass. Further, without extractive content biomass required higher activation energy as compared with extractive content biomass to initiate reaction or process due to high thermal stability. XRF analysis of residual biomass confirms presence of inorganic elements which will leads formation of molten salts. Combined together these properties of biomass, pointed that these biomass are potential candidates for fuel and chemicals production.

Keywords: Biomass, Characterization, Extractive contents, Activation Energy, kinetics, Reactivity of biofuel.

Ion specific effect: The role of monovalent salts in stabilizing foams and emulsions

S. Varade1,P. Ghosh1
1Department ofChemicalEngineering,IIT Guwahati,India
E-mail: s.varade@iitg.ernet.in

ABSTRACT

Foams and emulsions have important industrial and household applications, and it is crucial to understand their underlying physical mechanism. Current theories of colloid science do not account for specific ion effects as described by Hofmeister effect, micelles binding, double layer interactions, and surface tension of electrolyte tion of Academia, Industry & Startsolution interfaces. Ion specific effect is prominent at the interfaces, therefore, foams and emulsions forms suitable objects to explore the specificity of ions. Ions behaving as point-like entities play a significant role in the complex soft matter system with high electrolyte concentration. The aim of this work was to investigate the stability of emulsions and foams in presence of monovalent salts. This work contains the study of foam and emulsions generated from the aqueous solutions of zwitterionic surfactant, N-Dodecyl-N,N-dimethyl-3-ammonio-1-propanesulfonate (DDAPS) in the presence of NaCl, CsCl, and LiCl. n-hexane was used as oil phase for the formation of emulsion. The surface and interfacial tensions were measured. The effects of salts containing monovalent cations (viz. Na+, Cs+, and Li+) were systematically studied. The surface and interfacial tensions, and the decrease in CMC with the addition of salt, signified enhanced adsorption of surfactant molecules at the interface. Generally, the addition of salt improved the stability of the foam films and eventually foams. They caused the reduction on initial foam volume. The effectiveness of the salts in reducing the foam stability followed the sequence: CsCl > NaCl > LiCl. However, the foam collapse rate was reduced in the presence of salts. Salt had a significant effect on the zeta potential. In case of emulsions the size of the oil droplets is also influenced the properties of the interface.

Elucidating the H Bonding Environment of Coumarin 102 in a Phenol–Cyclohexane Mixture by Molecular Dynamics Simulation: Implications for H Bond-Guided Photoinduced Electron Transfer

Tousif Hossen[1]andKalyanasis Sahu[1]
Department of Chemistry, IIT Guwahati, India
E-mail:ksahu@iitg.ernet.in

ABSTRACT

Recently, we have experimentally demonstrated that the fluorescence intensity of coumarin 102 (C102) modulates anomalously upon hydrogen bonding to phenol in a non-polar solvent cyclohexane; fluorescence intensity first quenches gradually up to a particular mole fraction (XPH ~ 0.013), but thereafter increases with further increase of phenol mole fraction (see fig 1). These studies speculate about the importance of C102-phenol H-bonding to induce photo-induced electron transfer (PET) and proposed a competition between the C102-phenol and phenol-phenol H-bonding to account for the anomalous fluorescence modulation. In this work, we investigate the exact H-bonding environment around the acceptor C102 at various compositions by molecular dynamics simulation and correlate the H-bonding environment to the observed fluorescence quenching. In addition to the 1:1 C102-phenol complex, 1:2 C102-(phenol)2 complexes with two different types of geometries were also found. Furthermore, density functional theory (DFT) and time dependent density functional theory (TDDFT) calculations were carried out to understand the H-bonding in these complexes in the ground and in the excited state and their possible contribution towards the observed fluorescence quenching.

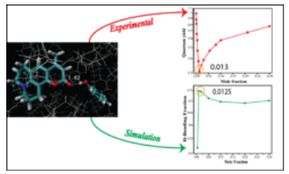


Fig 1: Correlation between experimental and MD simulation at same mole fraction.

Fabrication of Tunable and Durable Bulk-Superhydrophobic Material from Amine "Reactive" Formable Polymeric Gel.

Adil Majeed Rather, Dr. Uttam Manna
Department of Chemistry, Indian Institute of Technology-Guwahati, Kamrup, Assam 781039, India.
adil.rather@iitg.ernet.in

ABSTRACT

Bio-inspired superhyrophobic materials having extreme liquid water repelling property are efficaciously used in various applications starting from self-cleaning, oil water separation, anti-corrosive, guided water transport, anti-biofouling to sustaining and slow drug release etc.[1-3] Various experimental and theoretical studies have revealed that this anti-wetting property arises from hierarchical roughness in combination with low surface energy coating on the materials. However, most of the conventional thin superhyrophobic coating inherently suffer from the poor physical and chemical durability—which eventually restricts the prospective several applications of this anti-wetting property at practical settings. So, there is serious need of durable superhyrophobic material—which can withstand regular harsh chemical and physical abrasions. To achieve such material, few attempts are introduced in literature including mechanically durable coatings [4], repairable [5] and self-healable superhyrophobic surface coating. [6] Durability of such material improved significantly compared to conventional superhyrophobic coating, however, the limited sustainability of such designs still raised some unavoidable concern related to durability. Addition to this, the concept of bulk superhyrophobic material where anti-wetting property exists both at the surface and the interior of the material, is being introduced recently in literature.[7-9] In such design, essential hierarchical structures and appropriate chemical functionality is uniformly exist all throughout the material—which is hard to achieve. In past, some complex and tedious approaches are introduced to achieve such bulk-superhyrophobic material. Here, a chemically "reactive" polymeric gel is introduced by taking an advantage of robust and facile 1,4- Michael addition reaction between acrylate and primary amine groups, to develop a chemically cross-linked and bulk (including interior and surface) superhyrophobic material.[10] Mixture of dipentaerythritol pentaacrylate and branched poly (ethyleneimine) (BPEI) can rapidly form self-standing gel network. On removal of solvent molecules, the synthesized gel network provides a highly porous and reactive polymeric matrix that can be further post modified with variety of small molecules to tailor the liquid water wettability on the synthesized material. This approach provides a facile and rapid process to fabricate a bulk (internally) superhyrophobic material with complex shapes and arbitrary size. The property of the material remains intact even after imposing various standard chemical and physical insults. This synthetic strategy could be useful in developing advanced and multifunctional materials for further broadening the advance applications of this anti-wetting property including oil/water separation, self-cleaning, sustaining and sluggish drug release etc.

Metal Free Sequential C(sp2)-H and C(sp3)-H Functionalization: A Facile Access of Fused Benzimidazole

Anisha Purkait , Subhra Kanti Roy and Chandan K. Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India
Email.id: (ckjana@iitg.ernet.in)

ABSTRACT

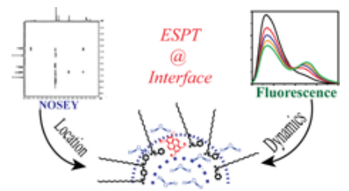
Fused and substituted benzimidazole derivatives are very important specially in medicinal chemistry as these molecules possess important biological activity including anti-bacterial, antivirus, anticancer, antiulcer, antihypertensive activities.1 A very few methods has been developed for synthesis of fused benzimidazole. Most of the methods involve metallic reagents, toxic oxidants producing unwanted chemical waste. A novel method for synthesis these important pharmacophores from nitrosoarenes under metal and oxidant free condition will be presented sequential functionalization of nitrosoarenes followed by C(sp3)-H-functionalization of saturated N-heterocycles like pyrrolidines, piperidine, 4-methylpiperidine, azepane occurred to provide the desired compounds.2 This method was found to be applicable in gram scale synthesis. The synthesised molecules can also be further derivatized easily.

Excited State Proton Transfer (ESPT) of a Localized Probe in Revealing Interface of Benzylhexadecyldimethylammonium Chloride Reverse Micelle

Aparajita Phukon, Dillip Kumar Sahu and Kalyansis Sahu*
k.sahu@iitg.ernet.in
Indian Institute of Technology, Guwahati, Assam- 781039

ABSTRACT

The ESPT behavior of an anionic photoacid 8-hydroxypyrene-1,3,6-trisulfonic acid (HPTS or pyranine) is studied inside a cationic reverse micelle (RM), water/benzylhexadecyldimethylammonium chloride (BHDC)/benzene, using steady-state and time-resolved fluorescence spectroscopy [1]. We observed remarkably different moderate w0-dependent ESPT signature from the known ESPT trend of HPTS inside anionic AOT and cationic CTAB RMs; the ESPT dynamics approaches that of bulk water at higher w0 (≥10) inside AOT RM while no ESPT was observed for CTAB reverse micelle [2]. The ESPT dynamics inside BHDC RM is remarkably slower compared to that of water at all w0 (= [water]/[surfactant]) values and relatively much less sensitive to w0 variation compared to AOT RM. 2D NOESY and fluorescence anisotropy measurements reveal that the probe (HPTS) is embedded inside the positive interface of BHDC RM. Despite its trapped location, HPTS is able to undergo ESPT due to significant penetration of water molecules into the interface. Furthermore, facile ESPT at higher w0 is consistent with higher degree of interface hydration as predicted by a recent MD simulation [3]. The study shows that ESPT dynamics inside RM varies not only with the interface charge but also on the nature of the headgroup and solvation.



Development of Sensors Based on π-Conjugated System for Highly Sensitive and Selective Detection of Nitroexplosive-Picric Acid

Arvin Sain Tanwar1, Laxmi Raman Adil1, Akhtar Hussain Malik1 and Parameswar Krishnan Iyer1,2
1Department of Chemistry,IIT Guwahati,India
2Centre for Nanotechnology,IIT Guwahati,India
E-mail: pki@iitg.ernet.in

ABSTRACT

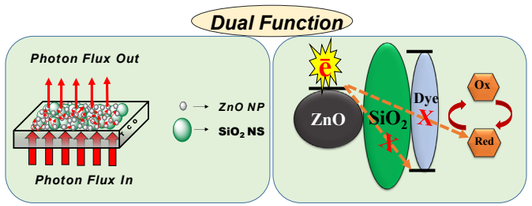
We have designed and synthesised four different types of π-conjugated polymers and utilized them in attaining simple, low cost and portable optical/electrical sensors capable of monitoring nitroexplosive-Picric acid (PA) at ultra-trace level. The cationic conjugated polymer PMI displayed substantial fluorescence quenching for PA in solution as well as solid state based on ground state charge transfer mechanism. The cationic conjugated polymer nanoparticle PFMI displayed remarkable fluorescence response towards PA in solution and vapour phase via two terminal electronic device based on RET/PET mechanism. The conjugated polymer PFAM showed rapid and specific recognition toward PA on solid support and in solution based on IFE/PET mechanism. The AIEE active conjugated polymer PFTP displayed highly selective and specific detection of PA via PET mechanism.

Dual Function of Submicron Sized SiO2 Nanospheres in Enhancing the Photovoltaic Performance of ZnO Based Solar Cells

Avishek Banik, a Mohammad Shaad Ansari, a Adit Kumar Shah a Mohammad Qureshi*a
aMaterial Science laboratory, Department of Chemistry, IIT Guwahati, Assam 781039, India
E-mail id: a.banik@iitg.ernet.in

ABSTRACT

Photovoltaic device is considered as one of the most feasible alternate energy source to meet the ever increasing global energy demand. Among all the photovoltaic devices, dye sensitized solar cells (DSSCs) have gained considerable interest due to cost effectiveness, easy fabrication tools and high photon-to-current conversion efficiencies. [1-2] In DSSCs, optical loses in the devices [3-4] along with the severe charge recombination at the semiconductor/dye/electrolyte interface, [5] are the major bottlenecks in getting higher efficiencies. Herein, a facile and practical strategy is demonstrated to boost the light harnessing ability of ZnO based DSSC by introducing a low cost and easily synthesizable, submicron sized SiO2 nanospheres (SiO2 NS) in the photoanodic segment. A systematic investigation revealed the dual function of the silica nanospheres in enhancing the device efficacy compared to the bare ZnO NP based device. UV-vis diffused reflectance studies unveiled that sub-micron sized SiO2 NS can boost the light harvesting efficiency of the photoanode by optical confinement, resulting in increased path length of the incident light by multiple internal reflections. Electrochemical Impedance Spectroscopic (EIS) analysis showed SiO2 NS serves as a partial energy barrier layer to retard the interfacial recombination (back transfer) of photo-generated electrons at the working electrode/electrolyte interface, increasing the device efficiency. [6] Enhancement of ~22% in power conversion efficiency (PCE, ~3.08% was observed for the device fabricated with a binary hybrid composite of 1wt% SiO2 NS and ZnO NP as compared to the pristine ZnO NP device with PCE, ~ 2.53%.

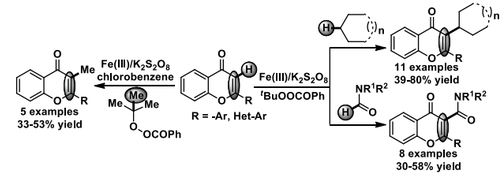


Iron(III) Catalyzed Peroxide Mediated C-3 Functionalizations of Flavones

Bilal Ahmad Mir,Arghya Banerjee,Sourav Kumar Santra,Suresh Rajamanickam, and Bhisma K. Patel*
Department of Chemistry, Indian Institute of Technology Guwahati, North Guwahati 781 039, Assam, India
Fax: (+91)361-26909762.
E-mail: bilal@iitg.ernet.in

ABSTRACT

Transition metal catalyzed C H functionalization via cross-dehydrogenative coupling (CDC) protocols has emerged as a promising and powerful tool towards the formation of Csp Csp, Csp Csp2 Csp2 Csp2 and Csp3 C bonds. In this context cycloalkanes have been employed for CDC reactions (Csp3 H functionalization) in the absence or presence of transition metal catalysts albeit with limited examples. Aliphatic Csp3 H bonds are the most available natural resource. Thus, methodologies for the direct functionalization of aliphatic Csp3 H bonds will expand the synthetic toolbox, allowing access to value-added products with various important applications. Herein, an iron(III) catalyzed C-3 functionalizations of flavones have been achieved using tert-butyl peroxybenzoate (TBPB)/potassium persulfate (K2S2O8) oxidant combinations with a suitable solvent. In the presence of iron(III)/tert-butyl peroxybenzoate/K2S2O8, reaction of flavones in cycloalkanes afforded exclusive C-3 cycloalkylation via Csp2 Csp3 coupling, whereas solvent N,N-dialkylformamide provided C-3 amidation via Csp2 Csp2 coupling. Under an identical reaction condition just by switching the solvent to chlorobenzene, C-3 methylated flavones were obtained where tert-butyl peroxybenzoate (TBPB) served as the source of the methyl group.



Thermally Activated Delayed Fluorescence Organic Noble Metal-free Molecules and Towards the Breakthrough of Organic-Electronics

Debasish Barman1andParameswar K. Iyer1, 2
1Department ofChemistry,IIT Guwahati,India.
2Centre for Nanotechnology, IIT Guwahati, India.
E-mail: pki@iitg.ernet.in

ABSTRACT

In fluorescence materials an exciton formation under electrical excitation typically results in 25% singlet excitons and 75% triplet excitons. However, 75% of the electrically generated energy is dissipated as heat by triplet excitons, leading to the theoretically highest external quantum efficiency (EQE) of 5%. To harvests light from both triplet and singlet excitons, allowing the internal quantum efficiency of the device to reach nearly 100%. Many efforts to utilize the non-emissive triplet excitons have been devoted to breaking through the 5% limitation. The most successful one is by incorporating heavy metals into the organic aromatic frameworks to increase spin–orbit interactions. However, used heavy metals for phosphorescence are confined to Iridium (Ir) and Platinum (Pt), which are very expensive. In order to avoid the use of expensive metals in practical applications, several other strategies such as triplet–triplet annihilation (TTA), hybridized local and charge transfer (HLCT) and thermally activated delayed fluorescence (TADF) have also been proposed to harvest the 75% triplet excitons.

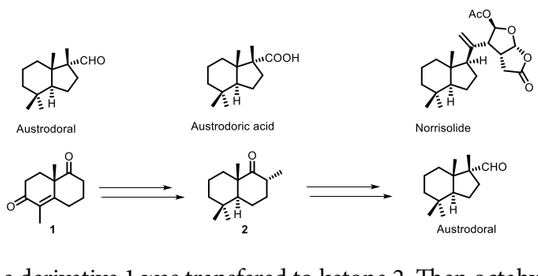
Among them, TADF materials have drawn tremendous attention in the field of OLEDs, with their state-of-the-art performance in terms of EQEs, turn-on voltages, and color coordinates. Noble metal-free TADF molecules having small singlet–triplet energy gap offer to harvest triplet excitons for fluorescence through facilitated reverse intersystem crossing “RISC” (T1→S1). Moreover, these materials are purely organic and thus not costly. Therefore, the TADF approach provides the best alternative to conventional fluorescent and phosphorescent OLEDs, regarding device efficiency and cost. The success in the breakthrough of the theoretical and technical challenges that arise in developing high-performance TADF materials may pave the way to shape the future of organoelectronics.

Studies Towards The Asymmetric Total Synthesis of Austrodoral

Md Ashraful Haque and Chandan K. Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
E-mail: ckjana@iitg.ernet.in

ABSTRACT

There are varieties of bicyclic nor-sesquiterpene natural products have been isolated from marine organisms. They have wide range of chemical diversities and biological activities which are very important for the discovery in synthetic chemistry as well as medicinal chemistry. For example Austrodoral and Austrodoric acid were isolated from the skin of the marine opisthobranch mollusc Austrodoris kerguelenensis.The important biological activity and synthetically challenging highly funtionalized bicyclic structure attracted synthetic chemist to work on their synthesis. Different synthetic strategies have been developed. Synthesis mainly relay on chiral pool strategy using Sclareolide1,2 as the starting material. We will present our efforts on enantioselective synthesis of Austrodoral.



Wieland-Miescher ketone derivative 1 was transfered to ketone 2. Then octahydro-naphthalen-1-one derivative 2 was extended to olefin via Shapiro reaction. Epoxidation followed by intra-molecular rearrangement gave bicylic of nor-sesquiterpene Austrodoral natural product.

A modular approach for molecular recognition by zinc dipicolinate complexes

Krapa Shankar, Munendra Pal Singh and Jubaraj B. Baruah*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039
e-mail: juba@iitg.ernet.in

ABSTRACT

A series of zinc dipicolinate complexe [H2bpy][Zn(pdc)2]•6H2O (1) [H2tmbpy][Zn(pdc)2]•5H2O (2) were synthesized.1 Depending upon the packing pattern and π-stacking ability of cations with dipicolinate unit, 4-nitrophenol selectively disrupt the π-π stacking interaction between dipicolinate unit and bipyridinium cation in complex 1, leading to the formation of host-guest system for molecular recognition of 4-nitrophenol.Whereas recognition does not occur on similar treatment of 4-nitrophenol with complex 2 due to the non-planer geometry of cation.

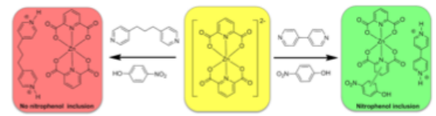


Figure 1: Recognition of 4-nitrophenol guest molecules by stacking and H-bonding interactions with 4,4 -bipyridinium zinc dipicolinate host was found and investigated in detail.

Host-guest interactions of pyrogallol, 2,6-dihydroxynaphthalene, and 2,7-dihydroxynaphthalene with the parent complexes1and 2 were studied, resulting in the crystallization of a series of complexes. The structural study revealed that guest organic molecules accommodated in the layers of zinc dipicolinate anions.

Rational design of hierarchical ZnO superstructures for efficient charge transfer: mechanistic and photovoltaic studies of hollow, mesoporous, cage-like nanostructures with compacted 1D building blocks

Mohammad Shaad Ansari,a Avishek Banik,a Tridip Ranjan Chetia,a Suhaib Alam,a Mohammad Qureshi*a,
aMaterial Science laboratory, Department of Chemistry, IIT Guwahati, Assam 781039, India
e-mail id: mohammad.ansari@iitg.ernet.in

ABSTRACT

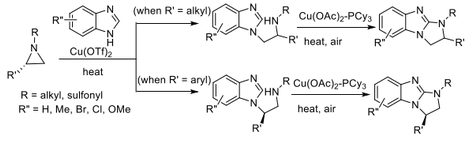
Recent advances in the rational design and development of inorganic semiconductor nanomaterials having excellent charge transport and optical properties have received considerable attention among the scientific community.[1–3] Among these synthetic methodologies, bio-inspired synthetic approaches utilize naturally abundant chemicals as structure directing agents and allow us to achieve control over morphology of materials to offer exotic electrical, optical, as well as magnetic properties.[4-5] Herein, Mesoporous and hollow zinc oxide (ZnO) hierarchical superstructures assembled with compact 1D building blocks that provide an efficient and faster transport pathway for photo-generated charge carriers have been synthesized using a biomass derived polysaccharide “alginic acid”. To understand the interactions between the organic bio-template and inorganic growth units of ZnO in aqueous medium, the effects of additives such as the alginate ion (ALGI) and ammonium hydroxide (NH4OH), along with the controlled reaction conditions, are investigated by using various analytical instrumental techniques. Dynamic and steady-state photoluminescence measurements are carried out to understand the charge transfer processes in the compact 1D superstructures. Experimental analyses reveal that the alginate ions, under hydrothermal reaction conditions, act as a structure directing agent and assemble 1D ZnO nanorods (NRs) hierarchically while NH4OH assists the formation of ZnO growth units. A plausible mechanism for ZnO cage formation is proposed based on the experimental observations. Morphology dependent photovoltaic properties of ZnO heterostructures, i.e., for ZnO cages, ZnO NRs and ZnO PNPs, have been studied along with electrochemical impedance spectroscopy (EIS).[6] Enhancement of ~ 60% and ~ 35% in power conversion efficiency (PCE) is observed in ZnO cage based devices as compared to ZnO NR- and ZnO PNP-based devices, respectively.

Stereo-invertive Copper-Catalyzed Cross-Coupling of Aziridines with Benzimidazoles via Nucleophilic Ring Opening and C(sp2)-H Functionalization

Pinaki Bhusan De, Sourav Pradhan and Tharmalingam Punniyamurthy*
Department ofChemistry,IIT Guwahati,India
E-mail: pinaki.de@iitg.ernet.in

ABSTRACT

Transition-metal-catalyzed oxidative C-H functionalization has become a powerful synthetic tool for the construction of pharmaceutical scaffolds via regioselective C-C and C-N bond formation using air as the oxidant.1 In addition, imidazo-fused heterocyclic fragments are privileged structural scaffolds found in natural products and pharmaceuticles.2 In particular, tricyclic benzimidazole derivatives exhibit antimycobacterial, anticancer, antiarrhythmic, neuropsychiatric disorders and selective enzyme inhibitory activities.3 Herein, we report an elegant and facile route for the preparation of benzo[d]imidazo[1,2-a]imidazole from aziridines and benzimidazoles via copper-catalyzed regioselective ring opening of aziridines with benzimidazole followed by the intramolecular oxidative C-H amination.4 (Fig. 1) This newly discovered reaction is simple and uses inexpensive copper catalyst, and converts readily available substrates into important benzo[d] imidazo[1,2-a]imidazole core structures that tolerate an array of various functional groups.

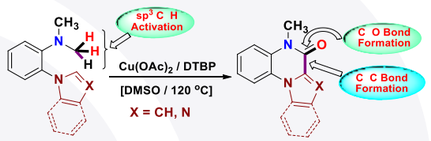


Copper (II) Catalyzed Synthesis of Indoloquinoxalin-6-ones via Oxidative Mannich Reaction

Prasenjit Sau, Anupal Gogoi, Wajid Ali, Srimanta Guin and Bhisma K. Patel*
Department of Chemistry, Indian Institute of Technology Guwahati, North Guwahati 781 039
Fax: (+91)361-26909762.
E-mail: patel@iitg.ernet.in

ABSTRACT

A Cu catalyzed synthesis of indoloquinoxalin-6-one has been developed starting from o-indolyl-N,N-dialkylamines via sp3 C H bond activation to nitrogen atom using DTBP as the oxidant. Besides indoles, other heterocycles such as pyrrole, imidazole and benzimidazole have been successfully used which gave their respective fused quinoxalin-6-one derivatives. In this process one of the methyl group is transformed into a carbonyl functionality

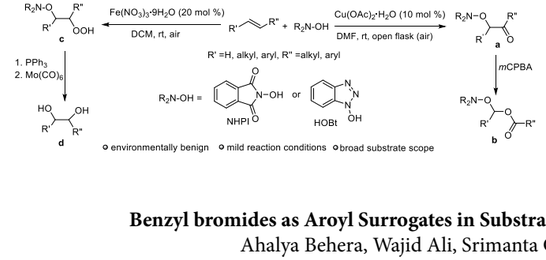


Aerobic Dioxygenation of Alkenes with N-Hydroxyphthalimide (NHPI) and N-Hydroxybenzotriazole (HOBt)

Raghunath Bag, Dinabandhu Sar and Tharmalingam Punniyamurthy*
Department ofChemistry,IIT Guwahati,India
E-mail: b.raghunath@iitg.ernet.in

ABSTRACT

Aerobic dioxygenation of alkenes is an important tool in organic synthesis and finds wide applications in pharmaceutical and agro-chemical industries.1 The use of molecular oxygen from air as the terminal oxidant would be attractive, as it is cheap and environmentally benign.2 In this regard, several studies are reported on the aerobic oxidation of organic substrates during the past several decades, the direct incorporation of molecular oxygen from air into substrates is still synthetically challenging process.3 Herein, we present a room-temperature Cu-catalyzed aerobic dioxygenation of alkenes with N-hydroxyphthalimide (NHPI) to produce β-keto-N-hydroxyphthalimides4 (a) which on treatment with mCPBA converts into esters (b) that can lead to widespread utilities in medicinal and biological sciences. Furthermore, Fe-catalyzed synthesis of N-(-hydroperoxyalkoxy) amines (c) is described using air as oxidant from the reaction of alkenes with N-hydroxyphthalimide and N-hydroxybenzotriazole (HOBt) at room-temperature (Figure 1). The products N-(-hydroperoxyalkoxy) amines5 are transformed into 1,2-diols (d) using PPh3/Mo(CO)6 which are useful in synthetic chemistry. The mild reaction conditions, greater reactivity, several functional group tolerances and the use of the relatively cheap catalyst are the significant practical features.

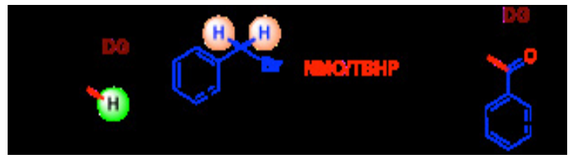


Benzyl bromides as Aroyl Surrogates in Substrate Directed Pd-Catalyzed o-Aroylation

Ahalya Behera, Wajid Ali, Srimanta Guin, and Bhisma K. Patel*
Department of Chemistry, IIT Guwahati, India
Email: ahalya@iitg.ernet.in

ABSTRACT

Metal catalyzed direct transformation of C–H bonds into C–C or C–heteroatom bonds is one of the reliable and facile tools in current organic chemistry. It renders a step and atom economic strategy compared to traditional cross-coupling reactions via circuitous use of pre-functionalized starting materials. Herein, an oxidative cross-coupling between directing substrates and benzyl bromides has been developed via the combined effect of oxidants TBHP and NMO, catalyzed by Pd(II). Benzyl bromides served as an efficient aroyl surrogate in this substrate directed C –H functionalization. A variety of functional groups were tolerated for both on directing substrate and benzyl bromide. A radical pathway has been proposed for the transformation based on reaction carried out with radical scavenger TEMPO. The in situ generated benzaldehyde and the respective benzoyl radical originating from benzyl bromide are the active intermediates of this aroylating process. This is the first report where benzyl bromide has been utilized as the new aroyl (ArCO) surrogate for the o-aroylation of substrate directed C H activation.

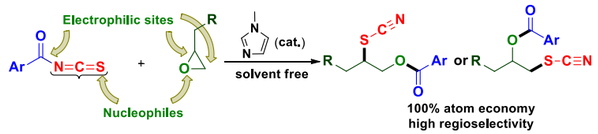


Organocatalytic Regioselective Concomitant Thiocyanation and Acylation of Oxiranes Using Aroyl Isothiocyanates

Anju Modi, Wajid Ali, and Bhisma K. Patel*
Department of Chemistry, IIT Guwahati, India
E-mail: anju.modi@iitg.ernet.in

ABSTRACT

A regioselective and concomitant transfer of thiocyanate (−SCN) and aroyl/acyl (−COR) groups from aroyl/acyl isothiocyanates onto oxiranes has been achieved, giving thiocyanato benzoates in 100% atom economy. In this biomimetic organocatalytic process, one part (−SCN) of aroyl/acyl isothiocyanates acts as the nucleophile whereas the other half (−COR) serves as an electrophilic partner. This metal-free bis-functionalization of oxirane from aroyl/acyl isothiocyanate in the presence of N-methylimidazole (NMI) results in the simultaneous construction of C–S and C–O bonds under solvent-free conditions.

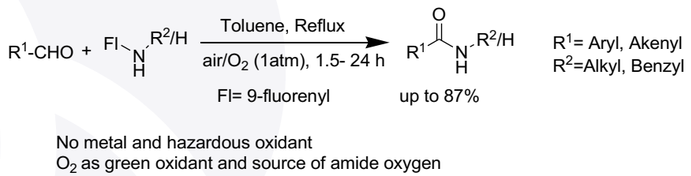


Aminofluorene Mediated Biomimetic Domino Amination-Oxygenation of Aldehydes to Amides

Santanu Ghosh and Chandan K. Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India
(ckjana@iitg.ernet.in)

ABSTRACT

Amide is a ubiquitous functionality of organic molecules present in natural products, medicinal drugs and functional materials.[1] Most of the known metods for direct amidation from aldehyde involves metallic reagents, hazardous oxidants or sensitive reaction conditions.[2] A conceptually novel biommetic strategy based on a domino amination-oxygenation reaction was developed for direct amidation of aldehyde under metal free conditions.[3] This environmentally benign method used triplet molecular oxygen as the oxidant without aid of other hazardous oxidants. 9-Aminofluorene derivatives acted as pyridoxamine-5 -phosphate equivalents for efficient, chemoselective and operationally simple amine-transfer oxygenation reaction. Unprecedented RNH- transfer involving secondary amine to produce secondary amide was achieved. Different aryl, heteroaryl and alkenyl aldehydes reacted smoothly producing amide with good to excellent yields. Aditioanally, the reaction was found to be effective in gram scale synthesis, which indicated its potential for practical application. 18O-amide can be prepared easily by performing this reaction in presence of 18O2 with excellent (93%) isotopic purity.



A Single Molecule of Fatty Acid Amide Amphiphiles Binds to Bovine Serum Albumin in Two Domains: An Investigation over Role of Surfactant Head-Group

S.Ghosh1andJ.Dey*1
1Department ofChemistry,IIT Kharagpur,India
Email:subhajit1986@iitg.ernet.in

ABSTRACT

Protein-surfactant interaction draws tremendous attention because of the wide spread use of surfactants in industry, medicine and pharmaceutical fields. We have studied the interaction between bovine serum albumin (BSA) and sodium N-lauroylsarcosinate (SL-Sar), a widely used surfactant in cosmetics, shampoos by use of a number of techniques, including fluorescence and circular dichroism spectroscopy, and isothermal titration calorimetry. The binding strength of SL-Sar is stronger than the structurally similar surfactant sodium N-lauroylglycinate (SL-Gly), which differ only by the absence of methyl group in the amide nitrogen atom. Also these two surfactants exhibit different binding patterns with the BSA protein. The results of fluorescence measurements suggest that the surfactant molecules bind simultaneously to the drug binding site I and II of the protein subdomain IIA and IIIA, respectively (as shown in figure 1). The fluorescence as well as CD spectra suggest that the conformation of BSA goes to a more structured state upon surfactant binding at low concentrations. The role of amide bond and hence the surfactant head-group in the binding mechanism can-not be ignored. It was observed that while SL-Sar destabilized, SL-Gly stabilized the protein structure even at concentrations less than the critical micelle concentration (CMC) value. The thermodynamics of surfactant binding to BSA was studied by use of ITC. From the ITC results, it is concluded that both SL-Sar and SL-Gly bind to BSA in one set of binding sites

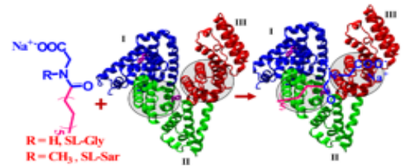


Figure 1. Cartoon representation of simultaneous binding by a single surfactant molecule into two subdomain of BSA.

Metal And Oxidant Free α-C–H Functionalization Of Aliphatic N-Heterocycles : A Simple and Efficient Route To Fused Naphtho-Imidazoles

Subhra Kanti Roy, Anisha Purkait and Chandan Kumar Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, Assam, 781039
e-mail id: ckjana@iitg.ernet.in

ABSTRACT

The imidazole core is one of the most common moiety present in a large number of natural products, particularly in bioactive molecules targeted as pharmaceuticals. Several strategies have been developed so far by various research groups to produce this moiety synthetically. , , Thus, the development of new methodologies for imidazole derivatives remains an active area of research. However, the existing methods using metals and oxidants have their own limitations due to their sensitive reaction conditions and production of toxic by-products. We have developed an efficient and simple method for direct C–H functionalization of saturated N-heterocycles for the synthesis of imidazole derivatives without using metal or external oxidant. Nucleophilic substitution reaction of a wide range of various substituted nitroso-naphthols on reaction with secondary amines in presence of acid afforded fused imidazole derivatives in good yields. Moreover, the same reaction conditions were observed to be effective for the primary amines also. Apart from the nitroso-naphthols, the reaction also proceeded well with other nitroso-derivatives of Phenanthrene, Dimedone and Coumarin.

Polymer-polymer scaffold tweaks pathological amyloid

Subrata Mondal1,Sayan Roy Chowdhury 2andParameswar Krishnan Iyer*
1Department ofChemistry,IIT Guwahati,India
E-mail: pki@iitg.ernet.in

ABSTRACT

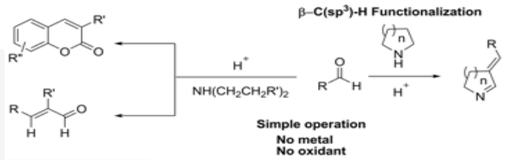
Alzheimer's disease (AD) is pathologically highlighted by the aggregation of intracellular neurofibrillary tangles shaped by tau proteins and extracellular feeble torment by amyloid β-proteins (Aβ) in the patient brain. Numerous studies have demonstrated that the aggregation of Aβ into amyloid fibrils containing trademark cross-β-sheet structure in the mind of AD patients is firmly connected to the pathogenesis of AD and dissolvable Aβ oligomers and/or protofibrils are the most poisonous species, in charge of neuron brokenness and death. Here, in this work, nontoxic, biocompatible water soluble polymeric conjugate have been used to modulate toxic amyloid aggregates in human CSF and as well as in preformed amyloid aggregates from commercial Aβ1-40. This modulation strategy leads to the formation of polymer-protein co-aggregates instead of toxic amyloid aggregates which is responsible for plaque formation and is related to disease progression. The intriguing prospect of amyloid fibrils using luminescent conjugate materials technique as a scaffold for polymer-protein hybrid materials is well delineated as this technique provides a direct link between spectral signal and protein conformation and can further be used to gain more information concerning the morphology of the protein deposits and facilitate a greater understanding of the conformational phenotype encoded in the native protein aggregates.

Direct β-C(sp3)-H Functionalization of Aliphatic Amines to α,β-Unsaturated Imines, Aldehydes and Chromenes

Sumana Mandal, Sujit Mahato and Chandan K. Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, 781039, Assam, India.
*ckjana@iitg.ernet.in

ABSTRACT

β-Functionalized aliphatic amines are known as one of the important structural moiety that appears in various set of natural products and biologically active molecules [1]. A large number of examples on α-C–H functionalization of amines has been developed during recent years, but examples of more challenging β-C(sp3)–H functionalization are very few[2].



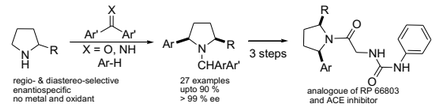
We have developed a simple, metal and oxidant free novel method for direct β (–sp3) C-H bond functionalization of secondary amines. The method is based on a reaction that yields enamine directly from corresponding aliphatic amine without metallic reagent or external oxidant [3]. In this method α,β-unsaturated imines were obtained in a reaction of aldehyde with pyrrolidine in the presence of 3,5-dinitrobenzoic acid (DNBA) in refluxing xylene. Acyclic amines provided 2-alkyl cinnamaldehyde with excellent E/Z-selectivity while salicyldehyde gave chromene derivative [4].

Regio- and Diastereoselective and Enantiospecific Metal Free C(sp3)-H Arylation : Faciel Acess to optically active 5-aryl 2,5- Disubstituted Pyrrolidines

Surajit Haldar,Subhra kanti Roy, Bholanath Maity, Debasis Koley *and Chandan K. Jana*
Department of Chemistry, Indian Institute of Technology Guwahati, 781039-Guwahati, Assam, India
E-mail: ckjana@iitg.ernet.in

ABSTRACT

Arylated aliphatic N-heterocycles, particularly, optically active 5-aryl 2,5- disubstituted pyrrolidines are the principal structural moiety of many bioactive compounds including natural products and catalyst for asymmetric synthesis.1 Chemical synthesis of these functional compounds mainly relied on metal and oxidant mediated reaction producing unwanted toxic waste.2 We have developed the first example of Regio- and Diastereoselective and Enantiospecific metal and oxidant free method for direct sp3 C-H- arylation of pyrrolidine to get optically active 5-aryl 2,5- disubstituted pyrrolidines via a highly atom economic three component reaction.[3] Furthermore, the complex analogue structures of CCK antagonist RP 66803 and angiotension-converting enzyme inhibitors were formed using the synthesized optically active pyrrrolidine derivatives. DFT calculations were also performed to show the mechanism and high level of stereocontrol in this reaction.

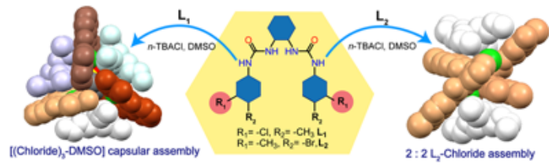


An unprecedented dual guest encapsulated solvent-host-salt trimeric assembly: Meta-substituent driven anion binding of isomeric scaffolds

Utsab Manna, Gopal Das*
Department of Chemistry, Indian Institute of Technology Guwahati, Assam-781039, India
utsab.manna@iitg.ernet.in, gdas@iitg.ernet.in

ABSTRACT

The synthetic design of suitable receptors capable of strong and discriminating recognition behavior toward different dimensions of anions is an area of challenging and ever increasing interest to the supramolecular community due to their critical roles in living organisms and in a range of environmental, biological, and medical purposes.1 A rationally designed electron withdrawing as well as donating groups containing chloro-methyl disubstituted neutral organic bis-urea receptor L1 synthesized from ortho-phenylenediamine core construct an unusual triangular [(chloride)3-DMSO] paddle-wheel shaped host-guest capsular assembly (complex 1a) via formation of extraordinary DMSO + host + salt cocrystals with the aid of three symmetry-independent host units sealed by three n-TBA cations. Although L1 exhibits diverse binding behavior with oxyanions along with the chloride complex of its isomeric bromo-methyl disubstituted bis-urea receptor L2. Both the ligands produce a similar kind of noncapsular 2:2 host-guest assembly with chloride (complex 2a) and acetate (complex 1b) respectively by noncooperative H-bonding interactions of urea groups which are attributed to the effect of meta-functionalization with respect to the adjacent N–H part of the urea moiety, while in contrast another planar oxyanion carbonate is doubly encapsulated within the tetrameric capsular cavity of L1 in the solid state (complex 1c). Furthermore, receptor L2 conforms a cation sealed 2:1 host-guest pseudocapsular complex with larger coordinating anions such as tetrahedral sulfate (complex 2b) and both L1 and L2 produce similar kind of octahedral hexafluorosilicate (complex 1d and 2c) complexes. The results of diverse halide and oxyanion binding of the two receptor systems are reliable to interpret the data in solid state which are corroborated by solution state studies and consistent to justify the variation.2

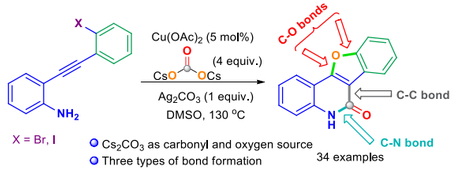


Cs2CO3 as a Source of Carbonyl and Ethereal Oxygen in a Cu-Catalyzed Cascade Synthesis of Benzofuran [3,2-c] quinolin-6[5-H]ones

Wajid Ali and Bhisma K Patel
Department ofChemistry,IIT Guwahati,India
E-mail:wajid@iitg.ernet.in

ABSTRACT

Formation of multiple C–C and C–heteroatom bonds for rapid access to fused and complex polycyclic skeletons is an attractive feature of any domino reaction. Recently, the strategy has emerged as a powerful “synthetic avenue” for the conversion of internal alkynes into biologically interesting polycycles or spiro heterocycles. Among heterocycles benzofuro[3,2-c]quinolin-6(5H)-one derivatives are reported to show activity against osteoporosis and malaria. Some derivatives of benzofuro[3,2-c]quinolin-6(5H)-one that have potential antimalarial activity. Herein, we develop a protocol for the simultaneous construction of C C, C O, and C N bonds utilizing Cs2CO3 as a source of both carbonyl (CO) and ethereal oxygen and a cascade synthesis of benzofuro[3,2-c]quinolin-6(5H)-one have been achieved using a combination of Cu(OAc)2 and Ag2CO3. A plausible isocyanate intermediated mechanism has been proposed for this unprecedented transformation. Control experiments show that both carbonyl and ethereal oxygen originated from Cs2CO3. This protocol demonstrates new synthetic path for the insertion of carbonyl functionality using greener approach.



Impact of DEM resolution, sources & resampling techniques on performance of SWAT model in Upper Narmada catchment

Venkatesh Panchariya
IIT Guwahati

ABSTRACT

Ease of availability of GIS software and readily available spatial data makes hydrological modelling simpler, but without appropriate knowledge of the resampling and resolution of digital data, model outcomes can be of minimal importance. The principle purpose of this study is to investigate the uncertainty of Soil & Water Assessment Tool (SWAT) model in simulating outputs of runoff and sediment yield due to changes in Digital Elevation Model (DEM) resolution, sources and resampling methods. In regional watershed studies, the resolution of the most precise DEMs is too fine to run hydrological model, thus these DEMs are needed to be resampled to coarser resolution, which in turn affects the terrain representation and model predictions. The Upper Narmada catchment was selected as the study area. DEM scenarios were generated based on DEMs differing in resolution (30m to 300m), sources (ASTER GDEM2, CartoDEM & SRTM 1-Arc Global DEM) and resampling technique (Nearest Neighbour, Bilinear Interpolation, Cubic Convolution & Majority). Various DEM scenarios were generated in ArcGIS software package. Performance of models under various DEM scenarios was assessed based on a few selected statistical measures (R2, NSE & RMSE). The key findings of this study are: 1) model simulated monthly output of runoff was found to be insensitive towards changes in DEM resolution and choice of resampling method; 2) in simulating monthly sediment yield, DEMs having resolution in between 80m and 300m were found to be inefficient; 3) in simulating runoff and sediment yield, models based on SRTM DEM performed well compared with other two sources; 4) nearest neighbour method of resampling was found to be a suitable choice in simulating monthly outputs of sediment yield at coarser resolutions.

Temporal trend analysis of rainfall analysis of Northeastern, India

ABSTRACT

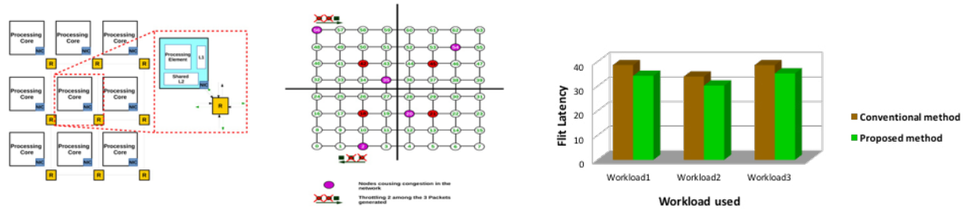
The rainfall received in an area is an important factor in determining the amount of water available to meet various demands, such as agricultural, industrial, domestic water supply and for hydroelectric power generation. Global climate changes may influence long-term rainfall patterns impacting the availability of water, along with the danger of increasing occurrences of droughts and floods. In order to manage, planning the water resource, there is a need of analysis of the trends of rainfall distributed across the Northeastern India. The most commonly used method Mann Kendall test gives high power of trend when the serial correlation was present in the series; therefore pre whitening or Block boot strapping was used to remove the effect of serial correlation. So trend can’t be detected by a single test, hence many tests are used to detect the trend of rainfall data. The selected method Least square linear regression method (LR Test), Mann kendall test (MK Test) and Sen’s slope (SS).The data were analyzed for a period of 142 years from 1842-2012. In this region, maximum rainfall observed in monsoon season with rainfall as 4568.250 mm and the minimum value was observed in winter season with 3.5 mm of rainfall. Moreover, it concluded that predict significant decreasing trend during monsoon season with a slope of 1.875 mm per season remaining seasons predict insignificant decreasing trend except post monsoon season. Linear regression also predicts the same results.

Congestion Management in Mesh NoC by Packet Throttling

Reshma Raj R.S, Aswathy N S, and John Jose
Government Engineering College, Bartonhill, Trivandrum, Kerala
nsaswathy1993@gmail.com

ABSTRACT

Chip Multi-core Processors (CMP) is one of the modern and exclusive approach to build high- performance microprocessors. Network on Chip (NoC) is a communication fabric which connects the multiple cores via physical routers in CMP. Each of the processing cores in NoC contain a processing element, a private L1 cache and a slice of shared L2 cache. The communication between the cores in NoC is performed through packet transmission and the packets are generated when an L1 cache miss occurs in any of the cores. As the number of cores and workload continue to increase, a network congestion issue arises in the network. To handle this, we use source throttling, which is an efficient technique for congestion management. Throttling helps us to limit the rate at which new traffic enters the network. The principal idea behind throttling is about temporarily delaying or suppressing the packet injection into the network. It should also be decided that which core to be throttled and at what rate the throttling has to be done. Prior throttling techniques have shortcomings that degrade the performance either because of the inefficiency due to the local throttling decision or because of the single central controller bottleneck. The previous methods which relied on local throttling were inefficient due to the over-throttling and under-throttling problems. Here, we propose an efficient source throttling technique, which overcomes these drawbacks by making use of multiple zonal controllers which will determine which core to be throttled and at what rate the throttling has to be done. Our approach controls the packet injection rate into the network which leads to a reduced overall latency towards the improvement of congestion management in NoC systems.



Comparison of flit latency of conventional and proposed method

Design development of sustainable amphibian ambulance for riverine areas

D. Boruah and A. K. Das
Department of Design,IIT Guwahati,India
E-mail: b.dipanka@iitg.ernet.in

ABSTRACT

Designing for the underprivileged section of the society is one of the basic requirements for inclusive design in a developing country like India. With a spurt in development in the country, the gap between the haves and the haves not are increasing and this disparity is creating social unrest in the country. Designing in this context is being propagated in design schools but may not be always attractive for the young designers to inculcate this value since the remuneration for this type of design is not very attractive. A case in hand is rural health service in rural areas of India; the government has launched National Rural Health Mission (NRHM) to make health services available to the rural population. But many places in North Eastern India are totally inaccessible by road. Thus the issue remained in spite of expanding rural road networks under Pradhan Mantir Gram Swarak Yojana (Prime Minister' Rural Road Plan). This problem is specifically prominent in Assam, where the remote rural areas have not been linked with convenient transportation for road communication. Despite rapid urbanization vast portions of the population of Assam inhabit the remote rural areas, and out of this population, 2.5 million people live in the riverine island (popularly known as char- chapari areas in the local language). These riverine islands and many other areas are affected by the floods in monsoons created by the river Brahmaputra and its tributaries. As a result, the health services of the people living in these areas are badly affected. Although the government has introduced a boat clinic, people cannot reach these in emergencies, since patients cannot be carried by road to these. The most common practice is that a patient is wrapped up with clothes. The practice followed is wrapping up a patient particularly from the remote rural and in given to be carried by a strong person to the health centres. On several occasions, they are transported in a hand cart. Even in this case, where there are small bodies of water, without a bridge it becomes impossible to cross these and hence patients, in many cases, never reach the health centers in time. In light of this, the present study has been carried out. The scope of the research work is to provide the emergency medical transportation services to marginalized people of the society in rural areas. It is an attempt towards developing the current practice for meeting the local transportation needs of the poor population of a remote area. The solution of this type of problem can lead to a better health care system for the rural area and can stop migration of the rural population to urban and semi urban areas, in search of livelihood and better opportunities.

Keywords: Rural Ambulance, Sustainable Development, Medical, Transportation Device

Figure 1. (a-d) Simulation results.	Punch nose radius(mm)		Die edge radius(mm)	Thickness reduction (%)		Thickness distribution(mm)		Effective stress (Gpa)
Figure 2. Experimental results Cases								
Min.		Max.		Min.	Max.		Min.	Max.
Case-1	3	3	-0.532	54.503	0.227	0.5026	0.117	0.173004
Case-2	4	4	-0.359	12.026	0.879	1.003	0.0212	0.173
Case-3	5	5	-0.055	7.729	0.922	1.000	0.0261	0.173
Case-4	3	5	-1.096	9.104	0.908	1.01	0.00702	0.173
Case-5	2	1	-0.6807	74.1746	0.258	1.0067	0.0147	0.173007
Case-6	8	8	-2.327	7.594	0.924	1.0231	0.0889	0.173

Numerical Simulation, Analysis, and experimental validation of Drawing Die for Manufacturing ThrustCollar of the Sniper K.Seid.

K.Anantheram.2 1Department of Design, IIT Guwahati, India 2 Department of Design, College of Defence Engineering, Ethiopia.
E-mail: kelifa.sm@iitg.ernet.in

ABSTRACT

This paper presents the "Numerical Simulation, Analysis, and experimental validation of Drawing Die for Manufacturing Thrust Collar of the Sniper". Sniper is one of the most important rifles used by ground military defence forces. The thrust collar which is part of the sniper is taken as a case study in local armament part manufacturing industry and this part is usually manufactured by a single stage drawing process. Various data are collected from the industry and peer researchers. Modeling, simulation, and analysis of the deep drawing process is performed by applying catia V5 and the ANSYS LS DYNA simulation software. Simulations are carried out for the different punch nose radii and die edge radii keeping the clearance between the punch and the die same. Fabrication of the punch and the die is also done for the appropriate drawing tool geometry obtained through the simulations and finally experiments are carried out in the industry. Both the simulation and experimental results revealed that:- a) insufficient blank holding force or performing a drawing process without blank holder force leads to an earring problem near to the flange wall. b) as the draw depth increases for smaller punch nose and die edge radius, the blank is more likely to experience the wrinkling and cracks. c) the increased punch nose radius will result in reduced contact area between the punch and the blank affecting the shape of the formed part. d) the use of small draw radii will over stain the blank at the mid-wall of the blank resulting in considerable percentage reduction in thickness of the finished blank. An optimum punch nose radius and the die edge radius are observed to be 5 mm.

DESIGN AND DEVELOPMENT OF 3D PRINTED HUMAN HAND/FINGER EXOSKELETON MECHANISM FOR REHABILITATION

K.Seid.1 ,A. K.Das.2 1,2 Department of Design, IIT Guwahati, India E-mail: kelifa.sm@iitg.ernet.in

ABSTRACT

This paper presents the product design study and preliminary mechanism synthesis of exoskeleton before actual product or prototype is designed. Human Posture Analysis permits users to quantitatively and qualitatively analyse all aspects of manikin posture. In this paper, a post stroke therapeutic prototype has been designed and developed for hand motor function rehabilitation that a stroke survivor can use for unilateral or bilateral movement practice if an EMG is implemented. A prototype of the device was fabricated that has the ability to fully flex and extend metatarsophalangeal (MCP), proximal interphalangeal (PIP) and distal interphalangeal (DIP) joints of the fingers, although appropriate items for actuation are not obtained and the thumb were not functional due to manufacturing error. Out of 21 degrees of freedom (DOFs) of hand fingers, the prototype of the hand exoskeleton allowed 12 degrees of freedom (DOFs), with three degrees of freedom (DOFs) for each finger. In addition to this kinematic simulation is performed on the device prior to fabrication to validate the design requirements.

A framework proposal for evaluating innovation criteria of a design process output through case studies

Ravi Lingannavar1, Sai Prasad Ojha1, Pradeep Yammiyavar 1
1UE-HCI Lab ,Department ofDesign,IIT Guwahati,India
E-mail:{r.lingannavar, s.ojha, pradeep}@iitg.ernet.in

ABSTRACT

The study contributes to the existing Design thinking process by integrating the concept of "Design Matrix" into it. Design matrix focuses more on the measurement of innovation. The positive effects of introducing design matrix are validated through the final prototypes of the three design solutions. The first one involves users who are making different envelopes of various sizes. The second case study involves making of paper bags of standard size. The third case study involves the same set of users making office files. The paper attempts to validate the applicability of Design Matrix to three product case studies. At first glance the problems chosen are very simple but when seen from User's point of view and by using a matrix – innovation is attempted to be measured. The authors contend that Innovation need not necessarily mean complex thinking or solving complex problems. The study concludes with proposing future application of processes Design Matrix for complex products.

Introduction

Design is an activity to convert an undesired situation into a desired situation [1]. 'Design Thinking' is a methodology used by designers to solve complex problems, and find desirable solutions for clients. Design Thinking draws upon rationale, creative energy, instinct, and systemic thinking, to investigate conceivable outcomes of what could be, and to make fancied results that advantage the end customer.Some of the basic questions that motivated during this study were

- How to recognize innovation during product conceptualization by means of design thinking?
- Can there be heuristics of designing innovative products as against simply designing products?
- Can there be a method of quantification of innovation in products?

Adoption of proposed metrics

From the literature studied two broad factors have been identified in this study that could assist measurement of innovation. They are (i) Novelty (ii) User-centred specifications that become criteria for design evaluation.

The equation (1) below is used for the estimation of Sheer Innovation Prospect which is adopted from the [2]

Sheer Innovation Prospect= {∑(Particulars-Concept relationship)*Criterion Weights}*Degree of newness

Case Studies

Based on the proposed framework the final, from all designs the collaborative design outcome was ranked higher and rated with higher Innovation potential. It was chosen for the final solution. The final Designs for the three cases are shown in Fig 1 below.

a. b. c.

Conclusion: Conceptualization of design based on creative ideas and selection of ideas is very important in the product design phase. Currently absence of well-defined techniques for selecting product concepts based on innovation criteria has lead us propose a Design matrix based metrics with which we can assess the 'innovation prospect'.

Proposed frame work for innovation for the use by SMEs

Ravi Lingannavar1 , Pradeep Yammiyavar2
Department of Design, IIT Guwahati, India
E-mail:{ r.lingannavar

ABSTRACT

SMEs contribute to the economic growth to a large extent both in developed and developing countries. However, SMEs are slower to adopt innovation practices. An informal analysis after visiting a few SMEs it would become evident that the methods, practices and tools being used by SME's are outdated. Having enormous potential and capability to enhance the quality of products in terms of cost, material, ergonomics, aesthetics, functionality etc. SMEs are not focusing on the need for innovation in line with the India's strategy for 'make in India' thrust.There is need of tailor made method/ tools which can be best suited for SMEs that are in need of design as practicing tool. Our current study is the first step towards understanding of the available tools and techniques in product design with a frame work. The proposed frame work is expected to aid SME's to quickly adopt new Design Thinking paradigm.

Introduction:However, SMEs are far slower to adopt innovation practices. An informal analysis after visiting a few SMEs it would become evident that the methods, practices and tools being used by SME's are outdated. Having enormous potential and capability to enhance the quality of products in terms of cost, material, ergonomics, aesthetics, functionality etc. SMEs are not focusing on the need for innovation in line with the India's strategy for 'make in India' thrust.

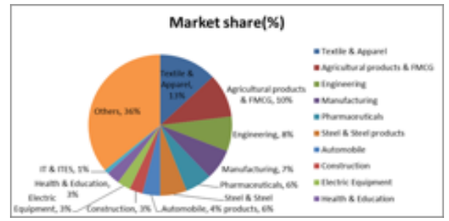


Fig1: Shows total market share of SMEs and their sectors in India

Inferences: It is observed that all aspects that influence innovation are not present in single tool. Therefore, there is a need for a combinatory approach if one has to come up with a frame work for innovation specific to MSME's.

We propose a model (Figure 3) which will help SMEs to bring innovation in product design. In which we have the innovation influencing parameters followed by filter. Which acts as the indicator for considering, need, capacity of SMEs, their capabilities and design consideration. Plan and action will lead to the multiple solutions. Concept selection matrix will lead to final design for manufacturing of products.

Fig2: Shows the proposed conceptual model for product design tool for MSMEs

Indian Textiles as wearables – An exploration of their potential in the IOT space

Deepshikha, Pradeep Yammiyavar, Nanki Nath

ABSTRACT

Traditional textiles of India have been widely known for their colors, textures and indigeneity since centuries. Traditions have merged with modernity and have provided designers with the opportunity to explore traditional textiles and transform into fashion and contemporary clothing in the present. The possibilities of smart clothing merged with the traditional methods of hand-worked textiles provide designers a base to use creativity with the available technology for designing intelligent traditional textiles of the future. Conductive yarns, Conductive ink, Light Emitting Diodes, Electro-luminescent wires coupled with variety of sensors, such as temperature, pressure, touch, etc. thrust the working of textiles beyond their usual role and are making their presence felt in design research. It calls upon designers to identify appropriate needs for particular user scenarios evaluated for specific user behavior to augment the smooth functioning of daily life without increasing the cognitive load. In this study, we discuss the results of a study conducted to know the power of emotional expression of textiles in the present so as to be able to harness emotions as a variable in the future design of traditional textiles of India. This paper addresses the issue of designing intelligent and yet traditional textile for the oncoming Internet of Things future. We also discuss example of a traditional Lambani costume, its contemporary usage and envisage the future look, functionality, wear-ability, usability and other possibilities that an equivalent digitised type of smart Lambani costume of the future may offer.

Understanding tacit components of artifacts by Ethnography and protocol analysis-Case Studies

Sai Prasad Ojha[1], Pradeep Yammiyavar[2]
[1, 2]UE-HCI Lab, Department ofDesign,IIT Guwahati,India
E-mail: {s.ojha1, pradeep} @iitg.ernet.in

ABSTRACT

Traditional products were made by hand and it took hours to get them to perfection. Modern machines have helped us to similar product with ease on a mass scale. The study presents initial attempts towards preserving traditional knowledge embedded in crafts which otherwise is likely to be lost due to technological and other evolutions. Though such knowledge is being preserved in the museum and libraries in the form of samples of artifacts, photographs etc. there is a large part of implicit knowledge behind such objects that is not evident or documented. For example, the process of manufacture, aesthetic decisions, local nuances which a crafts person embeds into the object - cannot be deciphered merely by analyzing existing objects from the past. Such knowledge which is hidden knowledge or 'tacit knowledge' of the craftsman is often lost in time. It gets transmitted from one human being to another and as has existed in some traditional crafts practices. This oral tradition has disappeared as fewer craftsman pursue their professions - handed down from generation to generation. Such tacit knowledge is an important component of the product's knowledge which helps us to understand the product in its cultural context apart from being embedded with process knowledge. In this paper questions such as how to identify and isolate such tacit knowledge are raised and attempted to be answered? How can one capture, transform and reproduce such knowledge is being addressed by taking a few examples. In design, objects play an important role in continuation of culture. This study tries to highlight some of the approaches and methodologies that can be used to capture this tacit knowledge of the craftsman.

Introduction Preservation of knowledge helps us to gain access to the past history and culture. This knowledge is available in the museums, libraries and now through the modern technologies like internet. With the advancement of the search engines and ubiquitous devices the access of knowledge has been in the fingertips of people. So Knowledge-on demand has been one of the accomplished facts of the modern advancements. Two of the questions which needed to be answered through the study are:

1. What are the ways in which the tacit knowledge is transferred from the craftsman to the novice learners during the making of the craft items?
2. How to identify and isolate this tacit component of knowledge which comes mixed with all the knowledge during the ethnographic study?

Experiment and Case Studies

Research has shown that structured as well as unstructured interviews are both effective in the capturing the tacit knowledge [6]. Also researchers have shown that ethnography study has also helped them to understand and study the process very nicely. So ethnography and protocol analysis were the methods which were used in this paper to capture the tacit knowledge of the craftsman.

Ethnography for this paper is defined as in the book 'Ethnography for Designers'[6] which can be broadly stated as 'how to actively listen to the knowledge people have their own culture. By listening to the vocabulary terms underlying structure of thought that people use to describe accepts of their culture. By responding to the underlying cognitive structure or pattern the designer can respond to the user and interpret creatively.'

Protocol analysis as defined by Herbert Simons classic [7] is a method in ethnography that relies on collecting thinking patterns as expressed by words by the respondent as he she performs the assigned task by the experimenter. These patterns are latter coded and analyzed in the form of Content Analysis.

Case Study-1 and 2

The ethnography studies were carried for the pottery works which involves skills of the potter. Two case studies involving commonly found pottery items like 'Diya' was studied

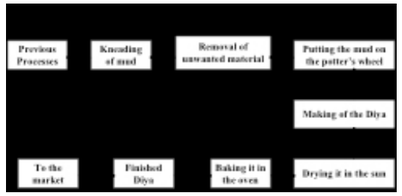


Fig.1:Process map of Diya making

The possibility of using a combination of tools such as ethnography and protocol analysis combined with traditional human factor 'task' analysis to capture, analyze and document non obvious knowledge components behind an artifact is one of the feasible methods in design research. It has potential to be developed further such that its output can be used to form rules for developing digital based machine learning which can be useful aid in Heritage conservation efforts by Design research.

Visualizing Sound in Comics

Subir Dey[1] , Prasad Bokil[2]
[1] Department of Design, IIT Guwahati, India

ABSTRACT

Sound effect is a significant part of action comics. However, unlike in movies, sound effects in comics are rather read than heard. While digital (motion) comics have the advantage of making the sound audible, the printed comics still have to rely on the reader's perception to convey the sound. In a broader term the sound effects are categorized under Sound Symbolic Words (SSW). This paper argues that the invisible sounds have visual shapes and when properly represented they signify the sound created. Considering the visual form of a sound primarily consists of lines, we show that different types of lines have an inherent quality of signifying some emotions. This paper also aims to understand the correlation of sound and its visual form. We propose that there are forms that are able to generate certain effects when used in proper context. Thus, if the character and nature of the line is understood, then it can be molded to generate certain intended forms. The forms in turn will create specified meanings. The comments and discussions in this paper are presented in an experimental format by combining images and text creating a sequential narrative.

Synthesis of MgAl2O4 from commercial grade oxides by solid oxide reaction sintering: Effect of zinc oxide and zirconia dioxide

Sanjay Krishna Mohan ,Pankaj Biswas ,Ritwik Sarkar

Department of mechanical engineering,
Indian Institute of Technology, Guwahati, Assam, India,
Department of ceramic engineering
National Institute of technology, Raurkela, Odisha, India.
Corresponding author's E-mail: 1sanjaykmohan11@gmail.com

ABSTRACT

Magnesium aluminate spinel occupies a very promising material in refractory industry owing to its excellent thermo-mechanical and chemical properties. Magnesium aluminate spinel is an advanced ceramic material. It is an important industrial material because of its excellent corrosion and thermal shock resistance. It is the only compound that forms in MgO-Al2O3 system that has desirable characteristics for high-temperature applications along with environment friendliness. The commercial synthesis of MgAl2O4 by solid oxide reaction sintering is difficult because of the volumetric expansion associated with spinel formation which hinders in obtaining dense spinel in a single step firing process.In the present work, stoichiometric dense magnesium aluminate spinel was synthesized from commercially available fused magnesia and sintered alumina sources.The present study compares the results of addition of two different additives namely zinc oxide and zirconia dioxide on the reaction sintering process. Maximum of 2 wt. % additive was incorporated in the compositions. The mixed compositions were compacted under a uniaxial pressure of 150 MPa and was sintered in the temperature range of 1200 -16000C. Spinel formation and associated expansion was studied using dilatometry.

Density,porosity,phases of sintered product were characterized.Microstructure was studied using a field emission scanning electron microscope. The addition of additives were found to reduce the spinel formation temperature and also accelerated the sintering behavior at higher temperatures, indicating better densification. Thermal shock behavior and flexural strength of the 16000C sintered products were also studied.

Keywords:Reaction Sintering,Additives,Microstructure,Refractory.

Agro-morphological characterization of rice landraces variety (Oryza sativa L.) of Majuli Districts of Assam

Venus Borgohain1, Debolina Bhattacharjee1, Arunima Das Hazarika1, Sourabh Kr Das2, Nilave Bhuyan1,3

1. Department of Botany, J.B. College; 2. Department of Biotechnology, J.B. College; Department of Zoology, J.B. College

ABSTRACT

Rice varieties show extensive genotypic and phenotypic diversity, resulting in about 120,000 different accessions worldwide. Based on several morphological and genetic markers, Oryza sativa is broadly divided into two varietal groups, namely japonica and indica, and these groups are further subdivided into five distinct subpopulations. Apart from that, considerable morphological, ecological and physiological variations exist within each varietal subpopulation owing to selection for adaptations to different agro-climatic conditions. Therefore, assessment, documentation, analysis and conservation of the extant genetic diversity are essential prerequisites to mine useful genes for the development of the new, adaptive cultivars.

During this study, using a set of 10 descriptors, 50 rice landraces from Majuli district of Assam were morphologically characterized to investigate the major determinants of phenotypic diversity. Photographic records of the collected rice seeds were made. Variation in qualitative and quantitative characteristics of the collected seeds was also recorded. We further identified the core groups for seed characteristics using principal component analysis. Landraces can be useful source of genetic material for development of new adaptive cultivars in future. Therefore we also experimented on development of a simple method for DNA extraction from the collected landraces. A simple method of DNA extraction from Rice seeds was established and PCR amplification using primers specific to chloroplast and nuclear DNA was confirmed.

Key words – Rice, Landrace, Seed Characters, DNA isolation

Investigation of the Structural and Dielectric properties of Antiferromagnetic CoO containing Wurtzite ZnO

Authors: Mir Motakabbir Alom, Sayandeep Ghosh, Deep Chandra Joshi, Sanjib Nayak, Prativa Pramanik and Subhash Thota
Amity University

ABSTRACT

Semi-magnetic semiconductors (SMSs) have attracted immense interest in the recent past because of their potential application in spintronic devices. They utilize both the charge and the spin of electrons and exhibit novel combination of semiconducting and magnetic properties. A SMSs is essentially a semiconductor with dilute dispersion of a magnetic species, e.g., different semiconductor materials explored include II–VI (namely, CdTe, ZnSe, ZnO) and III–V (namely, GaAs, InAs, InP) compounds with magnetic elements like Mn, Co, Ni, or Fe. In the present work we report the synthesis of Cobalt (Co) doped Wurtzite ZnO together with its structural and ac-transport properties. The x-ray diffraction analysis reveals that beyond 10 atomic % of Co doping in ZnO, CoO (Mott Insulator) emerges as secondary phase. We discuss the role of such antiferromagnetic Mott Insulator on the global dielectric properties of ZnO-CoO two-phase composite.

Effect of Plant Growth Regulator on Seed germination and Protocorm Development of Dendrobium Jenkensii Wallich ex Lindley Endangered Orchid using MS medium

Bikramjit Barman1 , Someswar Rao2 and Sofia Banu1*
1 Department of Bioengineering and Technology, Gauhati University, Guwahati-781014, India
2 Department of Botany, Goalpara College, Goalpara, Assam, India
E-mail: sofiabanu2@gmail.com

ABSTRACT

Orchids occupy top position among all flowering plants valued for cut flowers and as potted plants. Orchid is well known for their exploitation as major trade in developed countries. The world consumption of orchids was valued for more than $500 million in 2000. Dendrobium jenkensii is a rare, endangered and threatened orchid species mainly found in Hainan China, Assam, eastern Himalayas, Nepal, Myanmar and Laos in open forests on tree trunks at elevations of 700 to 1500 meters. Because of its beauty and long shelf life it has high ornamental value. Dendrobium jenkensii shows complex life history and special habitat requirement together with the fact this species show small populations and a narrow-pattern of distribution make them more vulnerable to the threats derived from habitat loss and degradation. Furthermore, because D. jenkensii have high ornamental value, over-collection has become another significant threat to the survival of the species. D. Jenkensii were included into the scope of Convention on International Trade in Endangered Species (CITES). Therefore at present the conservation of this orchid is utmost important. Therefore, aim of the present study was development of a protocol for the in vitro induction of protocorm and shoot formation of Dendrobium jenkensii by using seeds.The seeds were sterilized and cultured with full strength Murashige and Skoog (MS) basal medium with 3% sucrose and 0.9 % agar and autoclaved. 15 different combination of plant growth regulators were tested for seed germination and protocorm development. The combination of BAP and Kinetin with a concentration of 1.5 mg/L and of 0.5 mg/L yield better results in the protocorm formation and shoot development.

Comparative analysis of different dietary antioxidants on oxidative stress pathway genes in L6 myotubes under diabetic condition

P. Sarkar, A. Bhowmick and S. Banu*
Department of Bioengineering and Technology, GUIST, Guwahati, India
E-mail: sofiabanu2@gmail.com

ABSTRACT

Introduction: Type 2 diabetes (T2D) is the most prevalent and serious metabolic disease all over the world. Oxidative stress caused by increased generation of reactive oxygen species (ROS) under hyperglycemia may contribute to the development of T2D. Therefore, cells have antioxidant networks to scavenge excessively produced ROS and antioxidants neutralize these ROS and decrease oxidative stress. In the present study, we have attempted to gain a better understanding of the therapeutic potential of different dietary antioxidants on oxidative stress induced impairments by treatment of antioxidants on L6 cell lines.

Methods and Materials: L6 cells were grown in DMEM and were treated in Control, Antioxidant, HNE+Antioxidant, HNE+Antioxidant+Insulin, Antioxidant+Insulin, Rosiglitazone, HNE+Rosiglitazone, Mannitol,HNE+Mannitol,Insulin+Mnitol, HNE+Insulin, HNE, Insulin, HNE + Insulin, Insulin+Rosiglitazone, HNE+Insulin+Rosiglitazone combinations. The effects of Antioxidants on oxidative stress pathway genes (SOD, CAT, GPx and GST) in skeletal muscle were evaluated from the RNA isolated from these treatement set after 24 hrs of incubation of differentiated L6 skeletal muscle cells treated with Antioxidants (Curcumin, Mangiferin, Resveratrol, Hesperidin, Capsaicin, Baicalein, Carvacrol, Estragole and Lycopene). The expression analysis of oxidative stress pathway genes were evaluated by qPCR with cDNA of four combinations with the antioxidants.

Result and Discussion: In our study, real time PCR was performed using the comparative Ct method, the relative abundance of the target transcript was calculated after normalization against housekeeping gene, GAPDH. The expression of SOD, CAT, GPx and GST genes were studied. With different treatment combinations along with different antioxidants showed Insulin+Mannitol combination is the most effective combination in combating the ROS generated as it showed maximum expression with all the genes tested in the study. Treatment with HNE was found to alter the expression of SOD,CAT,GPx and GST. The relative fold change of all the genes were observed to be significantly downregulated in presence of HNE, when compared with untreated control L6 myotubes. Pretreatment with antioxidants Curcumin, Mangiferin, Resveratrol, Hesperidin, Capsaicin, Baicalein, Carvacrol, Estragole and Lycopene on HNE treated L6 myotubes significantly upregulated the expression of tested genes.

Conclusions: The results of this study indicated that antioxidant Resveratrol shows a positive impact in bringing down the effects of induced diabetes in antioxidative genes expression. The analysis of SOD, CAT, GPx and GST gene with different combinations along with different antioxidants indicates that the highest expression was found in cells treated with Insulin and Antioxidant treatment combination, from which we can draw a conclusion that the Antioxidants along with Insulin works best to scavenge ROS generated during stress.

Deepti Lourembam
Assam donbosco University,Airport road,Azara,Guwahati-781017,Assam

ABSTRACT

Soil testing for correct macronutrient needs has become indispensable in the past few years. Newer trends have set in contributing significantly to precision farming. Reflectance measurements in the near-infrared region have proved to be reliable in terms of measuring various soil attributes like pH, Organic matter and soil nutrients. In the current work, diffused reflectance method was used to estimate the amount of nitrogen present in soil. Soil samples were found to be clayey loam type. An NIR source was used to collect the reflectance data when variable amount of chemical was added to the sample which was then correlated to the output voltage. Based on the raw data collected, a mathematical model was developed through statistical analysis. The statistical analysis of soil nitrogen reflectance data showed that the exponential based model exhibited the best fit with the characteristic data obtained from the sensor. The model performance estimated in laboratory for the optimized combination from the best fit data were R2 of 0.99 and RMSE of 0.5. It gave an f-test of 0.75 and t-test of 0.79. Moreover, an algorithm based on this model was tested and validated with a success rate of 92%. The results obtained from the model validated the satisfactory performance of the system and thereby it has the potential to be employed for building up a cost-effective optical based soil nitrogen sensing system.

Mr. Gaurav Kalita
School of Technology, Assam Don Bosco University

ABSTRACT

All agricultural products have to meet certain quality standards before it is put in the market. So, detection of quality of fruit/vegetable is important. The quality cannot be judged solely based on its outer appearance. Obviously, it is an important factor but along with it the internal quality of fruit/vegetable is also an important factor. In this paper, we use visible spectroscopy to determine the internal quality of tomatoes.. Tomatoes are being used as the fruit/vegetable under test as it is easily available in all seasons and is also a staple food across India. The optical source used here is 650nm (red) LASER that is incident on the test tomato and the transmittance, reflectance and absorbance are measured using phototransistor. The values of parameters are recorded for different types, and ripening stages of the tomato, based on which a database is being generated. To validate the proposed system, numerous experimental analysis on tomatoes of various size and color were carried out. Based on the results, we came to a conclusion that the proposed system can be used to determine if a tomato is ripe or not. The different sizes of the tomato puts a limitation to the system. Due to this limitation the exact ripening stage of a tomato is hard to determine. But still this method which is very simple and cost effective can be used to determine whether a tomato is ripe, unripe or rotten.

Identification of differentially expressed transcript derived fragments that can be used as biomarkers to identify infected wood during agarwood formation in Aquilaria malaccensis

Md. Rofiqul Islam and Sofia Banu*
Department of Bioengineering and Technology, GUIST
Gauhati University, Guwahati-781014, India
E-mail: rafiqul.biotech@gmail.com
*sofiabanu2@gmail.com

ABSTRACT

Aquilaria malaccensis produce a resinous heartwood known as agarwood after wounding followed by fungal infection. Agarwood is widely used in traditional medicines, incense and perfume. The objectives of this study is to identify the transcripts that are differentially expressed in wounded (infected condition) in plants under natural conditions. For achieving the objective, cDNA- AFLP technique was used to identify transcriptionally regulated genes in Aquilaria malaccensis. Samples of wood were collected from plants showing infection from three different locations of Assam and cDNA was prepared. cDNA- AFLP analysis involved selective amplification with 25 different pair of primers that allowed the visualization of 150 reliable differentially expressed transcript derived fragments (TDFs). Of these 30 different TDFs were successfully cloned and 12 fragments were sequenced. Eight of which have been identified as Aquilaria transcript using homology search by BLAST, six have been found to be directly involved in terpenoid pathway. Primers were designed from these TDF sequence and expression patterns in infected and non-infected plants were studied using the Real-time polymerase chain reaction. All the terpenoid genes TDFs were found to be upregulated in infected Aquilaria plants as compared to non-infected plants. The study has identified the TDFs that are overexpressed in infected plants which can be used as biomarkers for distinction of Non-infected from infected plants using very small wood samples from the plant. The study can thus be used to promote the production efficiency and protect the resource of A. malaccensis, while conserving and protecting the remaining wild Aquilaria trees.

Keywords: Aquilaria, cDNA-AFLP, Gene Expression, TDF

Ms. Namrata Borgohain
Assam Don Bosco University

ABSTRACT
Potassium is an essential mineral that helps regulate the electrolyte balance in the body. Therefore, we have developed a model for “Sensor System for detection and monitoring of Potassium in Liquids”.This paper is a study of the variation of reflectance and absorbance response of light in correlation to the increase/decrease in concentration of potassium and thereby building an integrated sensor system for determination of potassium in liquids. The sensing system consist of RGB Laser light sources and a photovoltaic cell as a detector. Based on varying concentration of potassium in the sample, the sensor output also varies. This output characteristics is analysed and studied to establish a relationship between the concentration of potassium in the sample and the reflectance/ absorbance obtained from the sensor. After processing the reflectance data collected from extensive experimentation, an algorithm has been developed and the success rate of the algorithm was found to be 82%. Also studies and experimentation were carried out to check the stability and reproducibility of the developed method. In future, based on this developed model and algorithm, an integrated Potassium Sensing system for liquids employing microcontroller will be developed.

Post Harvest Spoilage of Fish

Priyam Sharma* Jiljily Thaosen* Pampi Deka*
* M.Sc. Students
Assam Agricultural University, Jorhat
Assam,785013

ABSTRACT
Post-harvest fish loss is the discard of fish after harvest that causes the loss of potential income (Getu, 2015). Poor processing techniques, animal predation and insect infestation, inadequate packaging, improper marketing and storage are the main reasons for post harvest loss. Many factors such as: long transport, unhygienic conditions, lack of preservation, high ambient temperature, and long storage time determine the occurrence of many types of post-harvest fish losses (Getu et al., 2015). These losses are classified as; loss in nutritional value, quantity loss and quality loss. The spoilage of fish is a complicated process brought about by actions of enzymes, bacteria and chemical constituents. The spoilage process starts immediately after the death of fish. The process involves three mechanisms: autolytic enzymatic spoilage, oxidative spoilage and microbial spoilage. During these mechanisms many compounds are produced which are responsible for spoilage (Ghaly and Budge, 2010). Fish that is decomposed to such a degree is unfit or unsafe for human consumption (Gram et al, 1996). Fish losses caused by spoilage are estimated at 10-12 million tons per year, accounting for around 10 percent of the total production from capture fisheries and aquaculture. Chemical deterioration and microbial spoilage are responsible for loss of 35% of gross primary agricultural and fishery products every year (FAO, 2010).Gutting is a common process to control enzymatic spoilage in fish on storage. To control oxidative spoilage antioxidants and chelating agents are used and antimicrobials are used to control microbial spoilage for long-term storage (Ghaly, 2010). For short-term storage icing is the most common and effective method. Other preservative methods which are commonly followed are drying, freezing, canning, addition of acids, salt etc. Awareness and popularization of different techniques for preservations at different levels will help in post-harvest loss of this important food commodity, thereby contributing to economic gain.
Keywords: Post-harvest, spoilage, processing techniques, gutting, autolytic spoilage, oxidative spoilage, microbial spoilage
REFERENCES
Getu, A. Misganaw, K. Bazeze, M. (2015). Post-harvesting and major related problem of fish production. Fish Aquac. J. 6:4
Ghaly, A.E. Dave, D. S. Budge, S. and Brooks, M. S. (2010). Fish spoilage mechanisms and preservation techniques. American J. Appl. Sci. 7: 859-877.
Gram, L. Huss, H.H. (1996). Microbiological spoilage of fish and fish products. Int. J. Food Microbiol. 33: 121-137.
http://www.fao.org/fishery/topic/12320/en, retrieved on 17-02-2017

Identification and characterization of Ty3-gypsy and Long interspersed nuclear elements (LINEs) in *Ricinus communis*

Rahul G. Shelke and Latha Rangan*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam, India 781039
E-mail:-*r.shelke@iitg.ernet.in*

ABSTRACT
Retrotransposons constitute the significant portion of genome in many eukaryotes and are one of the important classes of genetic elements. These elements play major role in evolution and genome size variation. The present study is conducted in *Ricinus communis*, aimed at identifying and characterizing the Gypsy and LINE like retrotransposable elements in a view to understand the genome better. The highly conserved domain of *reverse transcriptase* (RT) of Gypsy and LINE retrotransposons was successfully amplified by degenerate primers indicating, they are the universal feature of plant genomes. The copy numbers of RT gene of Gypsy and LINE elements were determined by dot blot analysis. In order to assess the diversity of RT, phylogenetic analysis was performed to compare the existing sequences with previously isolated retrotransposons sequences. The copy number of Gypsy and LINEs in haploid genome of *Ricinus* was found to be 15% and 3% respectively. Higher heterogeneity was observed among Gypsy and LINE elements and a majority of elements were found to belong to different lineage group. Though RT highly sequences are conserved, no two sequences are identical. The characterization of Gypsy and LINEs in *Ricinus* genome would be helpful in designing molecular markers for useful trait. The results of the current study will be discussed during the presentation.
Keywords: Long interspersed nuclear elements (LINEs),*Reverse transcriptase* (RT), Retroelement, Ty3-gypsy.

Sagarika Banerjee
Hemchandracharia North Gujarat University

ABSTRACT
A flavonoid compound was isolated from Cardanthera difformis whole plant material using ethanol alcohol as a solvent, the isolated compound was identified using conventional characterization methods, such as Thin Layer Chromatography(TLC),Ultraviolet-Visible (UV-Vis) and Fourier transform infrared spectroscopy(FT-IR), as well as, some biochemical assays using color reagents. Antibacterial activity of extracted flavonoid was carried out against various types of bacteria both Gram positive and Gram negative, the results shows that the extract of Cardanthera difformis has a good antibacterial growth activity in Salmonella typhi a Gram positive bacteria.
Mr. Strong Fuller Nongkynrih

Potassium is an essential mineral that helps regulate the electrolyte balance in the body. Therefore, we have developed a model for “Sensor System for detection and monitoring of Potassium in Liquids”.This paper is a study of the variation of reflectance and absorbance response of light in correlation to the increase/decrease in concentration of potassium and thereby building an integrated sensor system for determination of potassium in liquids. The sensing system consist of RGB Laser light sources and a photovoltaic cell as a detector. Based on varying concentration of potassium in the sample, the sensor output also varies. This output characteristics is analysed and studied to establish a relationship between the concentration of potassium in the sample and the reflectance/ absorbance obtained from the sensor. After processing the reflectance data collected from extensive experimentation, an algorithm has been developed and the success rate of the algorithm was found to be 82%. Also studies and experimentation were carried out to check the stability and reproducibility of the developed method. In future, based on this developed model and algorithm, an integrated Potassium Sensing system for liquids employing microcontroller will be developed.

Ms. Zeba Firdows
Tezpur University

ABSTRACT

α-Synuclein is an intrinsically disordered protein of 140 amino acids and the abnormal aggregation of this protein results in the pathogenesis of Parkinson's disease. One of the mechanisms of α-synuclein which leads to the aggregation mechanism is post translational modifications (PTMs). The truncation of C-terminal region is one of the significant known PTMs. In this study, we analyzed the docking and inter-molecular interactions between the monomeric units of WT and C-terminal truncated (1-119) α-synuclein using PatchDock and PDBsum online server. We also checked the association between the WT α-synuclein and C-terminal truncated (1-119) using Potential of Mean Force study. From our results, we noticed higher non-bonded contacts, interface area and interacting residues between the two monomeric units. We also observed higher dissociation energy between the monomeric interaction of the WT and its truncated counterpart. Thus, we can infer that dimerization process occurs easily after truncating the C-terminal region of α-synuclein as the C-terminal truncation plays a significant role in the aggregation propensity of α-synuclein. Further, we can conclude that targeting C-terminal region might help us in understanding the aggregation mechanism along with the development of therapeutic drugs.

Polymeric nanoparticles containing Tamoxifen citrate controls breast cancer cell proliferation in vitro.

Ruma Maji, **Ashique Al Hoque**, Niladri Shekhar Dey, Bhabani Sankar Satapathy, Biswajit Mukherjee,

ABSTRACT

Currently about one-fifth of cancer patients suffer from breast cancer worldwide. Various chemotherapeutic agents are used in the breast cancer therapy. The existing anticancer agents do not greatly differentiate between the cancerous and normal cells, leading to systemic toxicity and adverse effects. Drug permeation into the cancer cells from the conventional formulation is very poor due to less distribution and quick elimination. The extensive distribution and rapid elimination from targeted organs result in a greater requirement of the drug by the tissue, which causes undesirable toxicity. Polymeric nanoparticles play an important role in delivering such kinds of chemotherapeutic agents in a controlled manner. Nanoparticles make it possible to deliver the desired concentration of drug in the specific site, thus minimizing the side effects and reducing the toxicity. A number of novel formulations with Tamoxifen citrate loaded polylactide-co-glycolide (PLGA) based nanoparticles (TNPs) were developed and characterized. Their uptakes in Michigan Cancer Foundation-7 (MCF-7) breast cancer cells were also investigated. Nanoparticles were prepared by a multiple emulsion solvent evaporation method. Drug-excipients interaction, surface morphology, zeta potential and size distribution, cellular uptake were carried out using Fourier transform infrared spectroscopy (FTIR), Field emission scanning electron microscopy (FESEM), Zetasizer Nano ZS90, particle size analyzer and confocal microscopy respectively. No chemical interaction was observed between the drug and the selected excipients. TNPs had a smooth surface, and a nanosize range (250–380 nm) with a negative surface charge. Drug loadings of the prepared particles were 1.5%±0.02% weight/weight (w/w), 2.68%±0.5% w/w, 4.09%±0.2% w/w, 27.16%±2.08% w/w for NP1–NP4, respectively. There were observed a sustained drug release pattern of the nanoparticles were internalized well in the cytoplasm by the MCF-7 breast cancer cells on a concentration dependent manner. Drug loaded nanoparticles were found to be more cytotoxic than the free drug. TNPs (NP-4) showed the highest drug loading and were taken up well by the MCF-7 breast cancer cell line in vitro. Thus the formulation may be suitable for breast cancer treatment.

Efficacy of Design Optimization Tool for Small Scale Solar PV Home Systems

Brajesh Dhiman* [1], Debkumar Chakrabarti [2]
Dept. of Design
[1,2] Indian Institute of Technology Guwahati
Email Id: brajesh.dhiman@iitg.ernet.in

ABSTRACT

Improving energy access is one of the prime concerns for a country like india. there are about 1.4 billion people who lack access to electricity. Sub-saharan Africa and South East Asia has lowest electricity access in the world. In India alone about, 237 million people do not have access to electricity (iea, world energy outlook 2015. in this regard, govt. of india is majorly focusing towards promoting the use of solar technologies for the country with initiatives like national solar mission of setting 100 gw of solar power by 2022.

At small scale, one of potential barrier towards efficient use of solar electricity is non quality verified home system resulting in poor configurations, higher electrical losses, frequent malfunctioning of components which is adversely affecting the overall performance leading to poor longevity and more expensive product in longer duration due to cumulative repair & maintenance costs. It is in this regard tool for design optimization may play an important role by facilitating system efficiency and design resulting in improved user experience. This may help in spreading better awareness for appropriate technology based on solar. An Alfa prototype for optimization tool was developed and validated in local context as part of study.

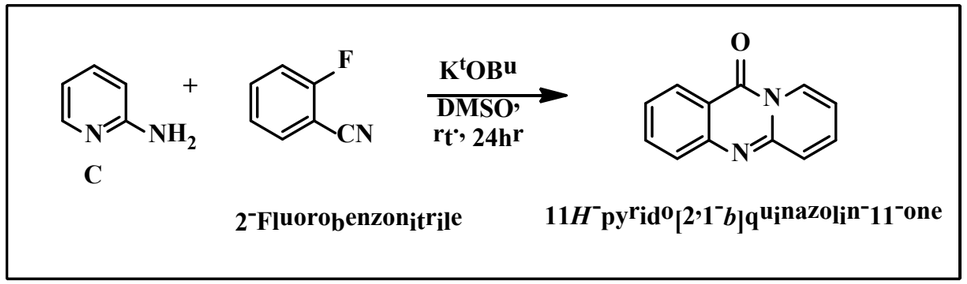
In general, the aim of this paper is to demonstrate possible benefits of design optimization for small scale solar electric systems and how it may result in improving social acceptance among masses.

Synthesis of Quinazolinone

Chayanika Bharadwaj[a], Mounita Bharadwaz & Debabrat Kotoky[a]
[a]Department of Chemistry, JB College, Jorhat, Assam, India

Abstract

Quinazolinone is a class of heterocyclic compounds with unique place in medicinal chemistry. It has gained vast importance as antimicrobial, anti-inflammatory, analgesic, anticancer etc. agents. Therefore the chemistry of quinazolinone compounds has been a subject of considerable interest. This broad spectrum of biological and biochemical activities has been further facilitated by synthetic versatility of quinazolinone which allows the generation of a large number of structurally diverse derivatives.



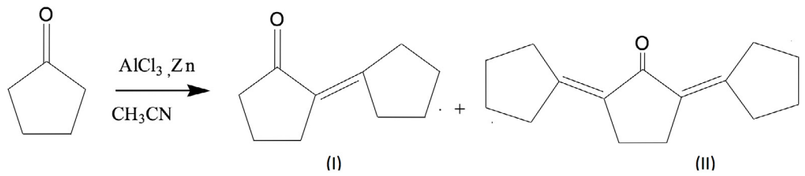
Key Words: Quinazolinone, antimicrobial, anti-inflammatory, analgesic, anticancer

Synthesis of Aldol Products of Some Cyclic Ketones by Self- Aldol Condensation Reaction

Dharismita Borah[a] & Ritupurna Saikia[a]
[a]Department of Chemistry, JB College, Jorhat, Assam, India

ABSTRACT

Aldol condensation of a symmetric cyclic ketone (cyclopentanone) was carried out at 0^0C and atmospheric pressure by using anhydrous $AlCl_3$ and zinc metal (Zn) in acetonitrile solvent medium. Self coupling reaction produces two products (I) & (II). NMR data and TLC study reveals that 2– cyclopentylidine -1 – cyclopentanone (I) is the major product of the reaction.



Key Words: *Aldol condensation, Self coupling etc.*

Study on major Bio-chemical Properties of CTC Black Tea

Kashmir Phukan[a] & Prayashi Devi[a]
[a]Department of Chemistry, JB College, Jorhat, Assam, India

ABSTRACT

Tea is the most widely consumed drink after water in the world. Based on degree of oxidation of polyphenols of tea it is divided into three basic types: black tea – totally oxidized, green tea – unoxidised and oolong tea – partially oxidized. India is the second largest producer of tea and more than 80% of total production of CTC black tea. Assam produces more than 55% of total tea production in India. The biochemical quantity of CTC black tea is mostly determined by the amount of moisture content and various chemical constituents present in it.

A study was carried out to determine the chemical constituents such as, theaflavins, thearubigins, total polyphenol, caffeine content, moisture content in four different commercial black tea samples collected from four open market of Jorhat District of Assam. From the study it is observed that total soluble solid content in the samples ranges from 41.04 to 43.58. And all component content were found lower than the average quality of black tea.

Key Words: Black Tea, Chemical Components,

Study on Biochemical Constituents of SOM (*Perseabombycina*) and SOALU (*Litseapolyantha*): Major Host Plants of Muga Silkworm (*AntheraeaassamensisHelfer.)*

ShankabJ. Phukan[a], KoushikSaha[a]&AshifurRahman[a]
[a]Department of Chemistry, JB College, Jorhat, Assam, India

ABSTRACT

Silk is nature's gift to mankind and a commercial fiber of animal origin other than wool. Muga is an Assamese word which indicates the golden brown (amber) color of the cocoon. The Muga silk worm is multivoltne and passes through four moults and five instar stages. Generally 4-5 crops are raised in a year. Muga silkworm is a polyphagous insect.The Muga silk worm, Antheraeaassama is mainly confined to the Brahmaputra valley of Assam and foothills of East Garo hills of Meghalaya. Its distribution in the wild state, however, extends from western Himalaya to Nagaland, Cachar district of Assam and south Tripura.

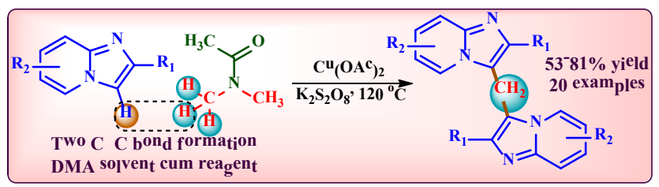
Carbohydrates, particularly reducing sugars are very important for growth and development of silkworm; carbohydrates are utilized by the silkworms for energy source and for synthesis of both lipids and amino acids. These are very important for healthy growth of silkworm; especially they are effective for keeping healthy growth of infant larvae.The present experiment was conducted to see the composition of five biochemical constituents of two major host plants of Muga silk worm. From the study it is revealed that SOM, SOALU, contains around 14.295% & 9.827% of phenol.; 20.767% & 21.2% reducing sugar,; 16.27% & 33.95% of protein, 35.63% & 39.55% carbohydrate; 0.0255% & 0.048875% chlorophyll.From the study it has been found that SOM is superior to SOALU in respect of phenol and reducing sugar whereas SOALU leaves are superior in protein, carbohydrate.

N,N-Dimethylacetamide (DMA) as a Methylene Synthon for Regioslective Linkage of Imidazo[1,2-*a*]pyridine

AnjuModi, Wajid Ali and Bhisma K. Patel*
Department of Chemistry, IIT Guwahati, India
E-mail: anju.modi@iitg.ernet.in

ABSTRACT

Construction of C-C bonds via cross dehydrogenative coupling (CDC) under oxidative conditions are so powerful that even the commonly used organic solvents such as DMF and DMSO have been utilized as the source of various functional groups. Recently, DMA has been utilized as a one-carbon synthon for the generation of terminal alkene via sp^3-sp^3 C-H couplings. Herein, we report a copper catalyzed dimerization of two imidazo[1,2-*a*]pyridine moieties with a methylene linkage in the presence of an external oxidant. Isotopic labeling experiment revealed that *N,N*-dimethyl moiety of *N,N*-dimethyl acetamide (DMA) is the source of the methylene group. Use of cheaper reagents, regioselectivity, and broad substrate scope are the notable features of this methodology. The synthesized imidazo[1,2-*a*]pyridine derivatives with methylene bridge may find further applications in the field of medicinal and material chemistry



Reference

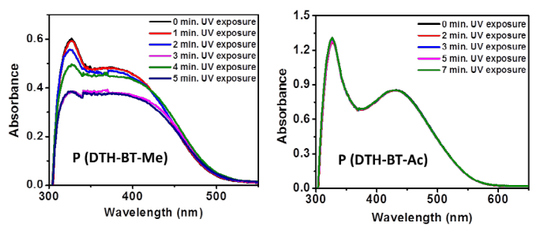
(1) Modi, A.; Ali, W.; Patel, B. K. ***Adv. Synth. Catal.*** **2016**, *358*, 2100.
(2) Itoh, M.; Hirano, K.; Satoh, T.; Miura, M. *Org. Lett.* **2014**, *16*, 2050.
(3) Ding, S.; Jiao, N. *Angew. Chem., Int. Ed.* **2012**, *51*, 9226.

Implementing new strategy to improve durability of D-A and D-π-A type conjugated polymers used for solar cell application

[1]Radhakrishna Ratha, [2]Mohammad Adil Afroz, [1]Ritesh Kant Gupta,[1,2]Parameswar Krishnan Iyer*
[1]Center for Nanotechnology, Indian Institute of Technology Guwahati, Guwahati-781039. India
[2]Department of Chemistry Indian Institute of Technology Guwahati, Guwahati-781039. India
E-mail:pki@iitg.ernet.in, rdratha@gmail.com

ABSTRACT

In line with utilizing renewable source of energy and convert into electrical energy, solar cells (converts solar energy to electrical energy) have proved to be one of the efficient and durable devices to light our streets, power portable electronic devices and are gaining momentum to be an alternate source of energy conversion devices to tackle energy crisis the world is facing. Presently commercialized solar cells comprise of two inorganic semiconductors (Si-B, Si-P or Ge-Ga, Ge-As) and are able to convert 20 % of the absorbed solar photons into electrical energy. But the high material and manufacturing cost limits these inorganic devices leading to design new cost effective architecture for next generation solar cell. One such design is conjugated polymer (comprising π-electron donor (D) and π-electron acceptor (A) type aromatic heterocyclic compounds) based solar cells, which has reached power conversion efficiency (PCE) of 11 % and needs explorationboth in terms of efficiency and durability. Major efforts during past few years were devoted to synthesize efficient solar harvesting polymers along with their durability to resist UV radiation and steps to improve it. In this work we explore the effect of non-conjugating ester functionalization on conjugated polymer used for solar cell. We have synthesized two D-A type polymers, one with ester group on side chain namely P(DTh-BT-Ac) and polymer without an ester group on side chain namely P(DTh-BT-Me). Side chain ester group improves optical, electrochemical, crystalline property and photo stability of P(DTh-BT-Ac) compared to P(DTh-BT-Me) (Figure). We further extend the idea to D-π-A type of co-polymer (π stands for enhanced conjugated unit) and density functional theory (DFT) calculation that shows similar behaviour. This ester group improves physical property of co-polymers used for solar cell and a novel strategy for designing durable, cost effective and efficient polymer for solar cell application.



Development of electronic prototype for visual on-site detection of nitroexplosive using organic crystalline material

A.Kalita[1],A. H. Malik[2] and P. K. Iyer[1,2]
[1]Centre for Nanotechnology,IIT Guwahati,India
[2]Department of Chemistry,IIT Guwahati,India
E-mail: kanamika@iitg.ernet.in

ABSTRACT

Development of a simple, rapid and cost-effective method or a convenient prototype for monitoring traces of nitroexplosive Picric Acid (PA)/Trinitrophenol vapor with high selectivity is desirable to prevent growing terrorist threats. Electronic sensor devices fabricated on low cost substrates have recently attracted enormous attention owing to their multiple applications in the field of portable electronics. The detection of analytes in such devices is based on the variation in electrical behaviour of organic semiconductors through partial charge transfer or doping effect. This motivated us to develop a new derivative of naphthalene diimide (NDMI) that was used to fabricate a low-cost two terminal sensor device by growing the micro-rods on Al-coated glass substrate for realizing vapor mode detection of nitroexplosive Picric Acid (PA) at room temperature and under ambient conditions. On exposure to PA vapors, the device displayed significant increment in output current signal

with a very short response time of 8s and recovery time of 12s upon turning off the PA source. Furthermore, the recyclability of the device was checked by exposing a certain concentration of PA vapors continuously after definite interval of time into the testing chamber. Almost similar enhancement in current intensity was monitored after each exposure confirming the feasibility of the sensor device for real-time applications. The detection limit (LOD) value was found to be 2.92 ppt which is exceptionally high and very unique among all the reported methods for PA sensing in vapor mode.

Finally, an electronic prototype for instant on-field detection of PA vapors was developed using simple and affordable electronic components commonly available in the market. This prototype is primarily based on variation in the resistance of the device connected to the circuit after introducing PA vapor. The subsequent change in the voltage was further amplified and used to glow a suitable red LED that helps in visual detection of PA vapor. Thus, the present device prototype can be installed and used for the rapid on-site detection of PA vapors at various places such as busy markets, bus and train stations, airport.

References

1. A. Kalita, S. Hussain, A. H. Malik, U. Barman, N. Goswami and P. K. Iyer, *ACS Appl. Mater. Interfaces,* 2016, **8**, 25326-25336.
2. A. H. Malik, S. Hussain, A. Kalita and P. K. Iyer, *ACS Appl. Mater. Interfaces,* 2015, **7**, 26968-26976.

Influence of Multilayer Dielectric Systems on Photo-Sensitivity of ZnPc based Organic Field Effect Transistors

Anamika Dey[1, 2]Rahul Narasimhan. A[1] andParameswar K. Iyer[1, 2]
[1]Centre for Nanotechnology,IIT Guwahati,India
[2]Department of Chemistry,IIT Guwahati,India
E-mail:pki@iitg.ernet.in

ABSTRACT

The modern electronic world has led us to an advanced life style, in which various micro-electronic devices are frequently utilized almost everywhere in our daily life. Among them optical sensors has performed a very significant role for the development of different electronic equipment. In this regard, organic π-conjugated small molecules especially the Metal-substituted phthalocyanine (MPcs) based optical sensors have recently been widely use because of their potential to flexibility, low-cost and large-area fabrication possibility. Because of the simplicity in fabrication process and the device architecture, Photo-Sensitive Organic Field Effect Transistors (PS-OFETs) are one of the highlighted electronic components used in light sensing application.

Herein, we reported the influence of multilayer dielectrics system on the remarkable photo responsivity of Zinc Phthalocyanine (ZnPc) based PS-OFETs, at various incident optical powers. The combination of inorganic aluminum oxide (Al_2O_3) and organic non-polar poly (methyl methacrylate) (PMMA) are used as the bilayer dielectric configuration, whereas, for tri-layer, high-k polar dielectric, poly (vinyl alcohol)(PVA) have been used in between Al_2O_3 and PMMA layers. At 90°C substrate temperature, the fabricated PS-OFET with Al_2O_3/PVA/PMMA tri-layer dielectric configuration showed the best p-channel behavior (hole mobility, μ_h~1.3´10^{-2}cm^{2}V^{-1}s^{-1}) with enhanced and remarkable photo responsivity of R~9689.39 AW^{-1} compared to bilayer dielectric system (R~2679.40 AW^{-1}, μ_h~3.5´10^{-3}cm^{2}V^{-1}s^{-1}) due to the polarization of dipoles inside the polar PVA dielectric. The photoresponsivity (R~9689.39 AW^{-1}) reported here with tri-layer dielectric configuration, is one of the highest reported value for thin film based low cost, low operated (-10 V) PS-OFETs which can be used for various future optoelectronic application like optical memory devices where the light is not only transduced into an electric signal but also can be stored in the device like the conventional Compact disc (CD-ROM).

Targeted delivery of anticancer drug using folic acid functionalized carbon nano tubes

Ankit Gangrade and Biman B Mandal*
[1]Biomaterial and Tissue Engineering Laboratory, Department ofBiosciences and Bioengineering,IIT Guwahati,India
*E-mail: biman.mandal@iitg.ernet.in,

ABSTRACT

The incidences and mortality rate due to cancer is increasing worldwide. Chemotherapy is a major therapeutic approach available to treat cancer. However, there exists major limitations using chemotherapeutic approaches due to hydrophobic nature of molecules, lack of solubility and selectivity, loss of activity in blood circulation, burst release and drug resistance by cancer cells. To countercheck the indiscriminating action of anticancer drugs, specific targeting of drug molecule into cancer cells becomes inevitable for treatment modalities. In our approach, we have used cancer cell targeted, folic acid-functionalized carbon nanotubes (CNT-FA) to deliver doxorubicin. CNTs are probably one of the safest materials as they lack heavy metal composition. The high aspect ratio, surface area, mechanical strength, thermal stability and ultra-light weight makes CNTs an attractive vehicle for drug delivery. Physical characterization of aqueous dispersed CNTs were performed by UV-visible spectroscopy, DLS and FESEM. By weight, approximately 300% of DOX was successfully loaded onto CNT-FA, which further showed a pH-dependent release. Two cell lines namely, oral cancer KB (FR +ve) and lung cancer A549 (FR –ve) were used for the study. Our construct, CNT-FA/DOX specifically exhibited cytotoxic effect on KB cells when compared to A549 as depicted by MTT assay. Moreover, cell specific uptake assay also confirmed CNT-FA entry exclusively into KB cells. Cell cycle study of KB cells via flow cytometry showed its arrest in G2/M phase which then leads to its apoptosis. These preliminary studies confirm the targeted delivery of DOX to cancer cells which overexpresses folic acid receptors.

Effect of Interfacial Layers on the Charge Carrier Dynamics of P3HT: PCBM based Flexible Organic Solar Cell

Ashish Singh[1], Maimur Hossain[2] and Parameswar K. Iyer[1, 2]
[1]Centre for Nanotechnology,IIT Guwahati,India
[2]Department of Chemistry,IIT Guwahati,India
E-mail:pki@iitg.ernet.in

ABSTRACT

Low-cost, light in weight and flexible in mechanics, the solution-processed Bulk heterojunction (BHJ) organic photovoltaic (OPV) have aroused worldwide interest and have been the promising alternative to the traditional silicon-based solar cells. Control over the 3D morphology of BHJ blend films in various length scales is one of the pillars accounting for the significant advance of OPV performance recently. However, they are still not available for the commercialization due to their low power conversion efficiency (PCE). Therefore, many research works have focused on the employing of new materials and device structures to improve the device performance.

In this contribution, we focus on the strategy of incorporating different interfacial layers in the cathode contact as an additive buffer layer and analyses their effect on the output performance of flexible P3HT: PCBM based OPVs. This strategy has shown to be effective in tailoring the power conversion efficiency (PCE) and Fill Factor (FF) through different hole injection and electron blocking mechanism. we incorporated three different additional buffer layers, namely, tris(8-hydroxyquinolinato) aluminum (Alq3), Bathophenanthroline (BPhen) or Bathocuproine (BCP) with LiF/Al as conventional cathode contact in both rrP3HT:PC_{61}BM and rrP3HT:PC_{71}BM blend BHJ solar cells. The device with dual cathode buffer layer having ITO/ PEDOT:PSS/blend polymer/BCP/LiF/Al configuration showed the best device performance with PCE, η= 4.96%, Jsc= 13.53 mA/cm^2, Voc= 0.60 V and FF= 61% for rrP3HT:PC_{71}BM and PCE, η= 4.5% with Jsc= 13.3 mA/cm^2, Voc= 0.59 V and FF= 59% for rrP3HT:PC_{61}BM. This drastic improvement in PCE in both the device configurations are due to the combined effects of better hole-blocking capacity of BCP and low work function provided by LiF/Al with the blend polymer. These results successfully explain the role of dual cathode buffer layers and their contribution to the PCE improvement and overall device performance with rrP3HT: PCBM based flexible, low-cost BHJ solar cell.

Organic Light Emitting Diode: The Future of Artificial Lighting

Dipjyoti Das[1], Peddaboodi Gopikrishna[1], Yathirajula Ramesh Babu[1] and Parameswar Krishnan Iyer [1,2,*]
[1]Centre for Nanotechnology, [2]Department of Chemistry, Indian Institute of Technology Guwahati, Assam-781039, India.

ABSTRACT

Organic light-emitting diodes (OLEDs) have emerged as an intense research topic in the field of organic electronics owing to its potential applications in full-color displays and next generation solid-state lighting sources. Along with the advantages of low-cost fabrication, flexibility, large area and ease of construction, their high contrast ratio, wide viewing angle and high color quality makes them superior to their inorganic counterpart, However, extensive challenges still exist in designing and synthesis of highly efficient, color stable, and long-lifespan materials and fabricating its devices, especially in the development of pure white emitters, which are indispensable for high-quality displays and lighting sources. To achieve the white light there are several emitters which comprises of either three primary colors or two complementary colors which are usually employed to construct WOLEDs. The simplest way to generate white light from OLEDs is simply by physical doping of two or three different emitters (small molecule or polymers) with controlled doping ratio. However, apart from emission of white light, the most important parameter one need to look for in a WOLED is the stability of the emission color. Usually white light generated using physical doping lacks color stability. White light can also be generated by electroplex or exciplex emission where excitons are generated between two adjacent layers. Another approach to generate white light is by chemical doping in which narrow band gap small molecules are inserted into a high band gap polymer backbone. In this paper, we present a brief overview of the OLEDs, especially which emits white light using different approaches, fabricated at centre for organic electronics, IIT Guwahati.

LOW-COST DIAGNOSTICS

Indrani Medhi[1*], Priyanka Dutta[2], Parameswar K. Iyer [1, 2*]
1 Centre for Nanotechnology, IITG
2 Department of Chemistry, IITG

ABSTRACT

The present era witnesses the rising demand for bio-devices which are easily accessible, portable and as cheap as possible. Accordingly, the fabrication methods along with the materials used have to be conditioned. In this regard, a microfluidic system provides novel functions due to smart geometries. Fabrication of a microfluidic device is mostly done with polydimethylsiloxane (PDMS) owing to its exceptional elastic property, optical transparency, ease of operation and biological compatibility. Most frequently used detection technique of biological samples is electrochemistry and fluorescence. Although these methods are effective, they are mostly being fabricated for research purpose. Further explorations in these areas need to be made as they show great biosensing potential. Certain factors such as sensitivity, selectivity, response time and stability of the biosensor should be improved. Also, the biosensors which are developed should not be confined to laboratories alone. It should be commercialized and made readily available for improving the healthcare condition of patients. Our work involves developing such cost effective flexible biomedical devices for green sensing.

Graphene growth over Cu film using liquid hydrocarbons

Shatrudhan Palsaniya[1],Ashok Kumar Dasmahapatra[2]andHarshal B. Nemade[1]
[1]Centre for Nanotechnology,IIT Guwahati,India
E-mail:shatrudhan@iitg.ernet.in

ABSTRACT

This study reports the growth of wide area of graphene layer by the chemical vapour deposition (CVD) process. The exposure of hydrocarbon plays an important role for producing thin carbon layer under the high vacuum and constant temperature at 800° C. Following this, liquid benzene and p-terpheynl powder were used as source material to growth of graphene layer over thin Cu surface. Furthermore, there are not allowing as precursor carrier gas for rapid deposition of carbon, at constant temperature benzene ring starts to vaporise and get dissociate in to the carbon flakes , therefore, thin carbon layer starts deposit over Cu surface at atomic scale. The resonating structure of benzene and p-terpheynl easy to ionize above 800 °C temperature. The structural analysis done by the micrographs and raman characteristics represents the multi-layer of graphene growth. The polymeric dispersion drop casted above the copper deposited graphene film using spin coating, hence coated film kept on the etchant wet solution to dissolve the copper substrate and remaining deposited graphene layer completely transferred on the polymeric film. Hence polymeric film treats as substrate correspond to graphene layer. At this stage prepared graphene can be used as hetrostructure and schottky barrier applications.

Regional bivariate analysis of drought in western India using copula functions.

Centre for Nanotechnology, Indian Institute of Technology Guwahati

ABSTRACT

Drought is major concern natural hazard throughout the world. It has effects on human and environment. Due to global warming and climate change occurrence of intense droughts has been increased. In viewing of India, the western states Rajasthan, Gujarat and Maharashtra are severely drought affected areas. In this study, a general framework is proposed which exploits copulas to analysis the frequency of droughts with a use of regionalization. The analysis of drought often required long historical series to bring the reliable estimates. To overwhelm this problem, the regional frequency analysis is frequently used. The regionalization incorporates the criteria 'homogeneity' and segregates study area into different regions. The drought attributes, severity and duration were calculated from standardized precipitation index for time scale of 6 months. Based on fuzzy C means clustering algorithm regions were identified, through validating cluster indices and homogeneity. Clayton, frank and gumbel copulas have used to estimate bivariate nature of drought in terms of duration and severity. The results have shown the significance of definite definition to drought in any situation because; in our illustration the severe drought event does not necessarily represents the longest drought. Another basic perception of this study was that, irrespective of climatic condition droughts are likely to occur in all clusters with a provided mean annual rainfall of station. Though, the areas receives high mean annual rainfall can experience longer but more severe droughts. This application shows the bivariate analysis advantages in drought characterization.

Impact of climate and land use land cover change on future water availability and soil erosion

Manas Khan1 , Ashutosh Sharma1 and Manish Kumar Goyal1
1 Department of Civil Engineering, IIT Guwahati, India

ABSTRACT

Assessment of impact of climate as well as land use and land cover (LULC) change on fresh water ecosystem services (ES) has paramount importance from planning future strategies for sustainable development of a basin point of view. Shifts in the pattern and makeup of LULC over time have consequences to the future amount and location of ES on the landscape. Again, climate change will shift the amount and timing of water movement through the landscape, which alter the transport dynamics of nutrients and sediments. Therefore, projected scenarios of ES which are inevitably useful and important to human society by providing important information regarding managing water resources and agricultural practices play a key role in planning strategies for socio-economic development of a country. This study is carried out to find out the potential freshwater ecosystem services response under both climate change and LULC change in the form of increased agriculture in upper Narmada River basin in India. From the results it has been observed that the agricultural field has been increased from 28% (2005) to 47% (2030) which is m ainly due to conversion of fallow land to crop land (Figure 1). Water yield is projected to increase by 21-26% for different RCP scenarios (i.e. 2.6, 4.5 & 8.5) under climate change whereas it is projected to decrease by 11% under LULC change for 2021-2030. Water yield is projected to increase by 7-15% under combined effect of climate and LULC change. Therefore, water availability will increase under futuristic scenarios. Sediment export at the outlet is projected to increase by 11-14% under climate change and 29% under LULC change for 2021-2030. This is mainly due to increase in rainfall (under climate change scenario) and conversion of fallow land to agricultural land (under LULC change scenario) in the basin which will in turn, increase water quality related problems if proper land manageme nt strategies are not adopted. While water availability is essential for proper functioning of reservoir operation, soil erosion reduces the storage capacity of reservoir as well as affects the hydro power potential of it leading to huge socio -economic loss. Therefore, we thinkour study will be beneficial in furnishing important insights during making operation policies in Rani Avanti Bai Sagar reservoir situated downstream of Manot gauge station in Narmada river basin for the future scenarios.

Analysis of temperature anomalies under climate change scenarios over a river basin in Northeast India

Shivam1, Manish Kumar Goyal1 and Arup Kumar Sarma1
1Department of Civil Engineering, IIT Guwahati, India
E-mail: s.shivam@iitg.ernet.in

ABSTRACT

The increase of the greenhouse gas concentration in the atmosphere is causing alterations in the occurrence and magnitude of many hydrological events as well as the water availability. Temperature is one of the several climatic parameters, which is supposed to be most vulnerable to the climate change phenomena. The Intergovernmental Panel on Climate Change (IPCC) has reported an increase of 0.6°C in the global mean temperature over the last 100 years of the 21st century with 1998 being the warmest year; it is likely to
increase further by 1.1°C to 2.9°C for their lowest emission scenario and 2.4°C to 6.4°C for their highest emission scenario. This research work focuses on changes in temperature over Subansiri river basin of Northeast India under climate change scenarios (Fig. 1). IPCC fifth assessment report (AR5) datasets were used for the impact studies. Maximum temperature (Tmax) and minimum temperature (Tmin) time series were generated for the period of 2011-2100, using the statistical downscaling model (SDSM) for low, moderate and extreme emission scenarios. Three general circulation model (GCM) datasets were selected with their predictors for model preparation. Potential predictors were selected on the basis of the correlation and partial correlation between the predictors and predictand. Downscaling model was further prepared using the linear regression method, and calibration and validation was performed with the observed datasets of Tmax and Tmin. Bias corrections of the datasets were performed for removing the biasness in the timeseries. Trends and change of magnitude in Tmax, Tmin, and diurnal temperature range (DTR) were analysed for different interdecadal time scales (Table 1). Observed temperature data series shows the increasing trend in Tmax and Tmin at different timescale (annual and monthly) whereas downscaled temperature for the period 2011–2100 shows increase in Tmax and Tmin for different emission scenarios.

Impact of DEM resolution, sources & resampling techniques on performance of SWAT model in Upper Narmada catchment

ABSTRACT

Ease of availability of GIS software and readily available spatial data makes hydrologic modelling simpler, but without appropriate knowledge of the resampling and resolution of digital data, model outcomes can be of minimal importance. The principle purpose of this study is to investigate the uncertainty of Soil & Water Assessment Tool (SWAT) model in simulating outputs of runoff and sediment yield due to changes in Digital Elevation Model (DEM) resolution, sources and resampling methods. In regional watershed studies, the resolution of the most precise DEMs is too fine to run hydrologic model, thus these DEMs are needed to be resampled to coarser resolution, which in turn affects the terrain representation and model predictions. The Upper Narmada catchment was selected as the study area. DEM scenarios were generated based on DEMs differing in resolution (30m to 300m), sources (ASTER GDEM2, CartoDEM & SRTM 1-Arc Global DEM) and resampling technique (Nearest Neighbour, Bilinear Interpolation, Cubic Convolution & Majority). Various DEM scenarios were generated in ArcGIS software package. Performance of models under various DEM scenarios was assessed based on a few selected statistical measures (R^2, NSE & RMSE). The key findings of this study are: 1) model simulated monthly output of runoff was found to be insensitive towards changes in DEM resolution and choice of resampling method; 2) in simulating monthly sediment yield, DEMs having resolution in between 80m and 300m were found to be inefficient; 3) in simulating runoff and sediment yield, models based on SRTM DEM performed well compared with other two sources; 4) nearest neighbour method of resampling was found to be a suitable choice in simulating monthly outputs of sediment yield at coarser resolutions.

Remote Triggered Digital System Laboratory

Sanjay Jyoti Dutta[1],
Nanu Alan Kachar[2]
[1]Department of Computer Science and Engineering,IIT Guwahati,India
E-mail: sanjaydutta@iitg.ernet.in

ABSTRACT

The remote triggered digital system laboratory is an initiative of ministry of human resource development (MHRD), govt. of India, under the national mission on education through information and communication technology (NME-ICT). In this laboratory, we can access lab experiments over the Internet and here the laboratory deals with performing real experiments. The real experiment setup is available in the laboratory. It aims to provide a virtual laboratory platform for undergraduate Engineering students, studying the course of Digital Electronic Circuits. Our lab covers the introductory digital logic course containing Boolean algebra, logic gates, combinational circuits and sequential circuits. Individual setup is built for each experiment using ICs (logic gates, MUXes, DeMUXes, Encoders, Decoders, Flip-Flops) mounted on a programmable logic trainer kit. The setups can be accessed using a web-based interface thereby making the experiments also accessible via the Internet.

Index Terms—e-learning, virtual lab, remote triggered.

Radiation Characteristics of Terahertz Photoconductive Antenna

Jitendra Prajapati and Mrinmoy Bharadwaj Department of Electronics & Electrical Engineering, IIT Guwahati, India
E-mail: j.prajapati@iitg.ernet.in

ABSTRACT

The Terahertz (THz) frequency band is situated between microwave and optical frequency bands. It ranges from 100GHz-10THz [1]. Until recently, the THz band had not been utilized properly compared to other frequency bands mainly due to the lack of efficient and practical sources. Photoconductive Antenna (PCA) is the most prominent source for generation of THz radiation based on opto-to-electrical-to-radiation conversion techniques. A 3D schematic diagram of PCA is shown in Fig. 1. Although, many experimental and simulation studies of PCA have been reported in the literature [2-4], but a direct relation between radiated THz field and the current density generated in PCA has not been reported yet. In this study we present an analytical study of the PCA in which a relation between radiated electric and magnetic fields with the current density generated in the PCA is presented. Also by using the semiconductor carrier dynamics the radiated pulse from PCA is presented and the radiation pattern of PCA is analyzed.

Fig.1: A 3D representation of PCA Analysis of the PCA shows that the radiated fields from it depends on the current density at the electrode gap as well as on the polarization of the carriers. A time dependent radiation characteristics of the PCA is analyzed and presented in this study.

References: [1] D.Dragoman and M. Dragoman, "Terahertz fields and applications", *Prog. Quant. Electron.* **28**, 2004. [2] Michael R. Stone *et al.,* "Electrical and radiation characteristics of semi large photoconductive terahertz emitters", *IEEE Trans. on Mircrow. Theory Techn.*, 52, 2004. [3] Christopher W. Berry and Mona Jarrahi, "Terahertz generation using plasmonic photoconductive grating" *New J. Phys.,* 14, 2012. [4] Suen *et al.*, "Characterization and modelling of a terahertz photoconductive switch", *Appl. Phys. Lett.*, 96, 2010.

Microstrip Patch Antenna Design: Issues at Terahertz Frequencies

Mrinmoy Bharadwaj, Jitendra Prajapati and Ratnajit Bhattacharjee Department of Electronics & Electrical Engineering
Indian Institute of technology Guwahati, India E-mail: b.mrinmoy@iitg.ernet.in, ratnajit@iitg.ernet.in

In recent years a new trend of research has been observed in literature dealing with the design of Microstrip antennas at the terahertz band of frequencies [1]. The present work addresses some of the issues associated with such implementation. Although simulation provides various effective designs and desired performance characteristics, practical realization of such printed antennas beyond 0.9THz remains questionable without the availability of proper and low cost technologies. Rigorous research into this aspect of practical realizability of printed antennas at terahertz frequencies holds tremendous potential for future wireless communication networks.

For a given height 'h' and dielectric constant 'ϵr' of a substrate material, the maximum resonant frequency at which the substrate is expected to produce reliable results, can be estimated by equation (1). In equation (1), ϵo and μo are the permeability and permittivity of free space respectively. Literature [2, 3] show that Polytetrafluoroethylene (PTFE) and its composites exhibit almost constant dielectric constant and loss tangent values upto frequencies of about 3 THz. Commercially available, low ϵr materials which are PTFE based composites, such as Rogers RT/DUROID 5880LZ (ϵr= 1.96), Arlon AD250C (ϵr= 2.50) are of thickness 254μm and 508μm, respectively. Using (1), the calculated fr0,max of RT/DUROID 5880LZ and Arlon AD250C are 0.48 THz and 0.223 THz respectively. Using these substrates with the given specifications for microstrip antenna design at frequencies higher than fr0,max may lead to unreliable results.

Fig. 1. Real and Imaginary parts of frequency-dependent Intrinsic Bulk Conductivity σ(ω)

The intrinsic bulk conductivity of a normal metal at room temperature, using the Classical Relaxation Effect Model, is expressed as in equation (2)[4]. In equation (2), σ(ω=0) is the DC conductivity of the metal, ω is the angular frequency and τ is the characteristic carrier scattering life time of the free carriers in the metal. In case of metals, τ is of the order of femtoseconds. Due to this extremely small value, the effect of finite conductivity of metals in antenna modelling is sometimes ignored by commercial EM solvers. Fig. 1 shows that at low frequencies the imaginary part of the intrinsic conductivity in equation (2) is insignificant. However, as frequency increases into the THz band, the imaginary part starts being significant

as well as the real part of the conductivity decreases, these effects have to be taken into account for proper antenna design and characterization at THz.

At high frequencies, it is difficult to achieve impedance matching at lower values of characteristic impedances on commercially available substrates due to the fact that the width of the microstrip feed line approaches and even exceeds the width of the microstrip patch antenna. Therefore at THz band impedance matching has to be done at higher characteristic impedances. This facilitates the edge feeding in antennas because at the edges of the patch, the impedance is usually high.

Thickness 't' of commercially available copper(Cu) cladding on dielectric substrate material, ranges from 9μm-70μm on a dielectric laminate of 127μm thickness. In metals, since at a depth of 5 skin depth (δs) the fields attenuates to less than 1% of the value at the surface, we are considering 5δs as a reference thickness. At 40GHz,'t' is well above 5δs of Cu at the same frequency. At 1 THz, 5δs 1.7μm and to maintain the same 194t/h ratio, the corresponding h=24μm. However, commercial substrates have not yet been available at such low values of thickness to be used as printed antenna substrates. Further, as the frequency increases, the thickness of the cladding becomes comparable to the wavelength of operation thereby bringing other effects into the performance. To maintain the same t/5δs ratio at 1 THz, the corresponding cladding thickness has to be about 0.14μm. Clearly this value is less than 5δs of Cu at 1 THz thereby leading to unreliable quality of performance. Moreover, reducing thickness of rolled copper to 3-4μm is tremendously costly as well as it renders copper hard to handle and it may begin to have pinholes. An alternative process for producing a thin copper layer on a dielectric substrate used in a patch antenna is with electroless plating of copper onto the dielectric material surface. However, proper and good bonding of such thin copper layers with thin dielectric materials, in practice, needs to be ascertained for reliable quality of performance. Therefore, although simulations could produce a variety of proposed designs and desired performances of printed antennas at THz band frequencies, practical realization of such designs would not be feasible without the availability of proper and low cost fabrication technology. As per available printed antenna substrates from various commercial manufacturers such as Rogers Co.,Arlon EMD etc., the maximum resonant frequency that can be realized is around 0.9THz calculated using equation (1).

References:

[1] A. Sharma and G. Singh, "*Rectangular microstirp patch antenna design at thz frequency for short distance wireless communication systems*," Journal of Infrared, Millimeter, and Terahertz Waves, vol. 30, no. 1, pp. 1–7, 2009.

[2] J. Hejase, P. R. Paladhi, P. P. Chahal et al., "*Terahertz characterization of dielectric substrates for component design and nondestructive evaluation of packages*," Com-ponents, Packaging and Manufacturing Technology, IEEE Transactions on, vol. 1, no. 11, pp. 1685–1694, 2011.

[3] Y.-S. Jin, G.-J. Kim, and S.-G. Jeon, "*Terahertz dielectric properties of polymers*," 2006.

[4] Y. Zhou and S. Lucyszyn, "*HFSSTM modelling anomalies with THz metal-pipe rectangular waveguide structures at room temperature*," Piers Online, vol. 5, no. 3, pp. 201– 211, 2009.

Cryptosystem

Uddipana Dowerah[1] and Srinivasan Krishnaswamy[1]
[1]Department ofElectronics&ElectricalEngineering,IIT Guwahati,India
E-mail: {d.uddipana, srinikris}@iitg.ernet.in

ABSTRACT

Fully Homomorphic Encryption allows unauthorized parties to perform arbitrary mathematical computations on encrypted data without the secret key or original data. A symmetric key fully homomorphic encryption scheme based on multivariate polynomial rings has been proposed. The scheme has been designed to resist Gröbner Bases attacks and hence it differs from the existing schemes in its security aspect which, in most cases, is based on the difficulty of Gröbner Bases computation. The main idea is based on constructing a nested sequence of subrings R_i running over an indexed set J, such that for all i,j in J, if $i < j$, R_i is a subring of R_j.

References:

Martin R Albrecht, Pooya Farshim, Jean-Charles Faugere, and Ludovic Perret. Polly cracker, revisited. In Advances in Cryptology–ASIACRYPT 2011, pages 179–196. Springer, 2011.

Boo Barkee, Deh Cac Can, Julia Ecks, Theo Moriarty, and RF Ree. Why you cannot even hope to use gröbner bases in public key cryptography: an open letter to a scientist who failed and a challenge to those who have not yet failed. Journal of Symbolic Computation, 18(6):497–501, 1994.

Craig Gentry. A fully homomorphic encryption scheme. PhD thesis, Stanford University, 2009.

Gottfried Herold. Polly cracker, revisited, revisited. In International Workshop on Public Key Cryptography, pages 17–33. Springer, 2012.

Jung Hee Cheon, Hyunsook Hong, Moon Sung Lee, and Hansol Ryu. The polynomial approximate common divisor problem and its application to the fully homomorphic encryption. Information Sciences, 326:41–58, 2016.

Brakerski Zvika, and Vinod Vaikuntanathan. "Fully homomorphic encryption from ring-LWE and security for key dependent messages." Annual cryptology conference. Springer Berlin Heidelberg, 2011.

Numerical Investigation of Unsteady Aerodynamics Effects of Attached Flow for a Floating Wind Turbine

Umesh Chaudhary , Praveen Tripathy and Sisir Kumar Nayak
Department of Electronics & Electrical Engineering,
IIT Guwahati, India
E-mail: c.umesh@iitg.ernet.in

ABSTRACT

The dynamic response of a floating offshore wind turbine rotor is influenced by the aerodynamic loads, which are normally calculated using the blade element momentum (BEM) theory. This is an approach based on steady-state conditions, and the unsteady aerodynamics forces are normally included by a semi-empirical model, e.g. Beddoes-Leishman method. The term unsteady aerodynamics has been often used to describe dynamic stall phenomenon, but the term also includes the unsteady conditions during attached flow. This study has been focus on the unsteady aerodynamics impacts during attached flow that occurs during normal operation of an offshore floating wind turbine.

Modelling of polymeric drug delivery device and the role of specific drug binding

Koyel Chakravarty and D. C. Dalal
Department of Mathematics,
Indian Institute of Technology Guwahati,
Guwahati-781039, Assam, India

ABSTRACT

Local drug delivery system has received much attention in recent years, though it is still uncertain how drug efficacy depends on physicochemical properties. The purpose of the current study is to provide useful mathematical model for drug release from a polymeric drug delivery device and subsequent drug transport in biological tissue, thereby helping in the process of development of new medicine by a systemic approach. In order to study the complete process, a two-layer mathematical model depicting drug transport between the coupled media is presented. It is now considered that a non-linear saturable reversible binding model is necessary to properly describe the binding process. In the current study, the main objective is to understand the significance of polymer degradation of the drug delivery device and to assess the extent of importance of modelling specific and non-specific binding in the biological tissue.The model has led to a system of partial differential equations describing the important properties of drug kinetics. This model contributes towards the perception of the roles played by diffusion, mass-transfer, reaction, particle binding and internalization parameters.

On Algebraic Connectivity of Graphs

Rakesh Jana
Department of Mathematics
IIT Guwahati
j.rakesh@iitg.ernet.in

ABSTRACT

Algebraic connectivity is one of the most important property of graph that we can obtain from the Laplacian Matrix. The algebraic connectivity of a graph is simply the second smallest eigenvalue of Laplacian matrix. In this article I will discuss how the algebraic connectivity of a weighted connected graph behaves when the graph is perturbed by removing one or more connected components at a _xed vertex and replacing this collection by a single connected component
Keywords: Algebraic Connectivity, Characteristic Set, Fiedler vector, Bottleneck Matrix

Numerical and Experimental Investigation of Varying Offset Distance from Mechanical Micro-Textured Tool Cutting Edge in Dry Machining

Kishor Kumar Gajrani[1],Mamilla Ravi Sankar[1]
[1]Department ofMechanical Engineering,IIT Guwahati,India
E-mail: gkishor@*iitg.ernet.in*

ABSTRACT

This paper investigates the performance of varying offset distance from mechanical micro-textured tool cutting edge in dry machining using ANSYS Workbench finite element simulation. Micro-textures are designed on the rake face of cemented carbide (WC/Co) cutting inserts. The purpose is to examine the effect of varying offset distance (50-400 µm with 50 µm intervals) textured tools on stress generation and machining performance. For comparison purpose un-textured tool performance is also investigated. Their effects are assessed in terms of the stress generation, main cutting force, feed force, cutting temperature and workpiece surface roughness. It is found that mechanical micro-textured cutting tools generate lower stresses, cutting force, feed force, cutting temperature and workpiece surface roughness. 250 µm offset micro-textured tools performed best among all.

Experimental Investigation of Variation of Actuation Parameters of Valveless Micropumps

Debendra Nath Sarkar,Pranab Kr. MondalandGautam Biswas
Department of MechanicalEngineering,IIT Guwahati,India
E-mail:*s.debendra@iitg.ernet.in*

ABSTRACT

Lab-on-a-chip systems (also known as micro total analysis systems) are integrated micro electromechanical systems (MEMS) that can carry out all stages of biological and chemical processes. One of the important components of micro total analysis systems is micropump. Such micropumps are used to deliver accurately minute quantities of chemical reagents. The most popular type of micropump used is valveless micropump due to its ease of fabrication, more accurate flow control, better handling of sensitive fluids, more reliability and longer service life. Valveless micropumps also find a wide range of applications in drug delivery, fuel delivery, mammalian cell pumping, etc. As the name suggests 'valveless', no valves are present in the micropump. Such pumps consist of a pump chamber with an oscillating membrane. The pump chamber is connected with two flow rectifying elements-nozzle & diffuser section. Common mode of actuation is by piezoelectric actuation. When the oscillating pump chamber membrane bulges out of the pump chamber (known as suction stroke), fluid pressure inside the pump chamber reduces. Due to the lower pressure inside the pump chamber, pumping fluid enters the chamber through both the nozzle & diffuser sections. More fluid enters through the section which converges towards the pump chamber (termed as inlet) as the nozzle offers lower flow resistance. When the oscillating pump chamber membrane bulges into the chamber (known as delivery stroke), fluid pressure inside the chamber increases. Fluid flows out of the chamber through both the nozzle and diffuser sections. More fluid leaves through the section which diverges towards the pump chamber (termed as outlet). In a cycle, consisting of a suction & a delivery stroke, there is a net movement of fluid from the inlet to the outlet section. The pump in this study consists of the following geometrical dimensions: chamber depth & diameter: 0.03 & 18 mm, diffuser throat & length: 0.6 & 5.7 mm. Diffuser divergence angle: 6.2°. The pump is actuated by sinusoidally varying voltage applied to the piezoelectric, which oscillates the pump chamber membrane. Ethanol is used as the pumping fluid. Pump performance depends on geometrical dimensions, actuating voltage and frequency, and pumping fluid. Pump performance is studied at different actuating voltages and frequency. The performance parameter studied is pressure head developed. The pressure head developed is defined as the difference as the liquid columns between the outlet and inlet (termed as positive pressure). For 140 V (peak to peak), three resonant frequencies are observed at 150, 250 and 500 Hz. At 150 and 500 Hz, positive pressure head is developed, i.e., net fluid flow is through the outlet. At 250 Hz, negative pressure head is developed (i.e. net fluid movement is through the inlet). Therefore, bidirectional flow behaviour is observed. In general, with the increase in actuating voltage, the positive and negative pressure head developed increases. Maximum flow rate or, in terms of pressure head, maximum pressure head is developed at resonant frequencies. Therefore, determination of resonant frequencies is of prime importance for the performance of the pump. Such kind of bidirectional pumping behaviour is attributed to the non-linearity present in the system and due to the vibration of the liquid in the chamber, nozzle & diffuser sections. Thus, we come to know about the pumping characteristics of the valveless micropump. A full detailed characterization is essential so that that excitation parameters (driving voltage and frequencies) can be determined to achieve the required pressure head and flow rate.

References

P. Verma, and D. Chatterjee, 2011, "Parametric Analysis of Piezoelectric Valveless Micropump," *Microsystem Technology*, 17, pp. 1727-1737.
S. Chandika, R. Asokan, and K. C. K. Vijayakumar, 2012, "Flow Characterization of the Diffuser/Nozzle Micropump - A State Space Approach," *Flow Measurement & Instrumentation*, 28, pp. 28-34

ABSTRACT

Flood is a seasonal calamity that devastates human and other forms of life. Subsequent effects include the outbreak of infectious life demanding diseases and scarcity of food. In the tropical areas like North East India, especially Assam flood is an inevitable disaster that havocs mass population every year. This needs the attention and endeavours of the researchers to tackle the post-flood affects like food shortage. The proposed work put forward the idea of healthy aqua farming in the low lands and flood logged areas by using domestic cattle wastes. Thus the idea of a pond, connected directly to the cowshed may be a facile alternative. The animal excreta along with water would be allowed to flow to the pond, after passing through a semi-permeable net having vermi-culture inbuilt. This composted extract would serve as the sustainable nutrient source for the water cropping planned in the pond area. Further, the outlet of the pond would be connected to a fish tank. This model may be an ideal one to implement in the flood affected areas to compensate the loss of cultivation. Such implementation would also provide a hygienic animal husbandry.

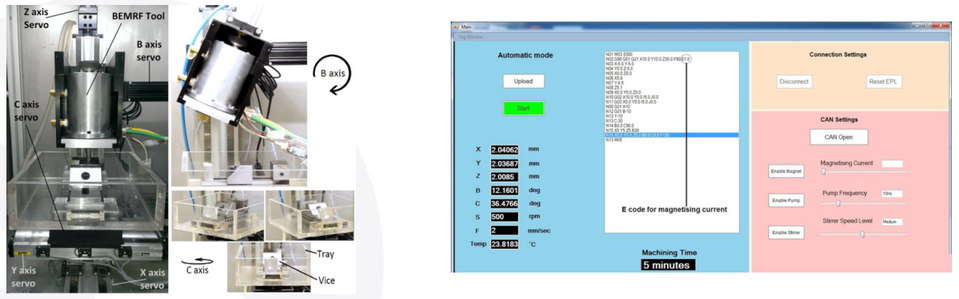
Design and Development of Automated Five Axis CNC Ball End Magnetorheological Finishing Machine

Zafar Alam, Dilshad Ahmad Khan, Faiz Iqbal and Sunil Jha
Department of Mechanical Engineering, Indian Institute of Technology Delhi, India
E-mail: zafar21oct@gmail.com

ABSTRACT

The demands for ultra-finished products have increased substantially over recent years due to their niche industrial applications. In present time, surface roughness of the order of nanometer is required for advanced engineering industries. Conventional methods of finishing are incapable of producing the desired surface characteristics as they have limited control over the normal forces during the finishing operations.So an advanced ultra-precision finishing technology called the ball end magnetorheological finishing (BEMRF) was developed for nanofinishing of 3D ferromagnetic and diamagnetic surfaces. It is primarily a magnetically controlled fluid based finishing process and has the ability to provide precise control of finishing forces by varying the intensity of externally applied magnetic field.In operation it resembles a vertical milling operation, with the ball shaped tip of magnetically stiffened abrasive laden fluid in place of the milling cutter.

In the past, engineers and researchers have made an attempt to automate the finishing process of plane and axisymmetric parts. However the area of developingan automated process for nanofinishing of complex 3D parts still remains unexplored. Therefore this project is related to the design and development of a fully automated five axis CNC ball end magnetorheological finishing setup from the conceptual idea to an industry standard machine. A five axis CNC BEMRF machine based on programmable automation controller is designed and developed at IIT Delhi (see figure1 (a)).



(a) (b)

Figure. 1. (a)Five axis CNC BEMRF setup and (b)Graphical user interface of customized CNC controller developed for five axis BEMRF machine

A graphical user interface is designed to provide integrated control of both motion and process parameters. The Visual C# based graphical user interface (see figure 1 (b)) enables the users to import CNC part programs into the customized controllerand carry out the finishing process with the tool tip following the path defined by the part program. For finishing in automatic mode, magnitude of magnetizing current (with prefix 'E') is also included in the part program.This facilitates in-process change in magnetizing current (finishing forces) as and when desired without interrupting the finishing process. The machine setup is also equipped with confocal sensor for in-situ surface roughness measurement. An important reason to incorporate the roughness measurement system within the BEMRF setup is that it eliminates the need of removing the workpiece every time a measurement is required. This makes the BEMRF process more efficient and precise. Also after the integration of in-situ roughness measurement, the system is capable of using the feedback available from the roughness measurement sensor for closed loop control of the finishing process. Once the initial input (machining parameters, process parameters, motion control part program) is received from the user, the first iteration of the finishing process starts. After suitable finishing time the process is stopped and the measurement is done in-situ with the help of the confocal sensor. Surface roughness value obtained from the measurement system is compared to the target value required. Based on this comparison further action is taken by the controller to either stop the process if target value is achieved or toadjust the machining and process parameters in order to get closer to the target surface roughness value.

The automated fiveaxis CNC BEMRF machine can cater to a wide variety of industries likemold and die, high precision optics, biomedical implants, LASER, gems and jewellery,automobile, aerospace,defence, etc.

Artificial flood control system in urban areas

R.Ahmed*,P.Bordoloi and K.Das
Department of Chemistry, School of Basic Sciences
The Assam Kaziranga University, Jorhat, Assam
E-mail:roseleenahmed62@gmail.com; mailto:baruashaswat@gmail.com

ABSTRACT

Artificial flood is a big problem in urban areas. This arises mainly because of the poor drainage systems. With the development of concrete gardens in big cities, artificial flood is also becoming a regular summer scene. This raised the concerns of civil engineers to build systematic planned road and drainage system which again demands a huge financial investment. Hence, the present model put forward the idea of using a dual purpose drainage system which would serve as an outlet to over flooded water as well as an inbuilt system for road cleaning. The proposed system would use big pipes where the valves would be opened by the downward thrust of water. The underground-basement of the road would serve as a reservoir to the water. Again, when the reservoir is full the valves would be opened by the upward thrust of water and this can be used for road cleaning. This will help us in recycling the rainwater. Thus, this proposed system may be a possible measure to control artificial flood without the wastage of our most essential commodity, *water*.

Hydrography of Mesoscale Eddiesin Bay of Bengalusing ARGO and Altimetry Data

Subrota Halder[1] andSourav Sil[1]
[1]School of Earth, Ocean and Climate Sciences, IIT Bhubaneswar, India
Email: sh15@iitbbs.ac.in

ABSTRACT

Mesoscale eddies plays a great role in transport of the Salt, temperature, mass and nutrients in the ocean in both horizontally and vertically. The objective of the present study is to find out the mesoscale eddy characteristics and mean vertical structure of Bay of Bengal (BoB). ARGO float profile datasetsavailable with time period of 5-10 days and satellite altimeter derived monthly Sea Surface Height Anomaly (SSHA) datasets from Archiving, Validation and Interpretation of Satellite Oceanographic data (AVISO) between January 2006 and December 2015 are used in this study.

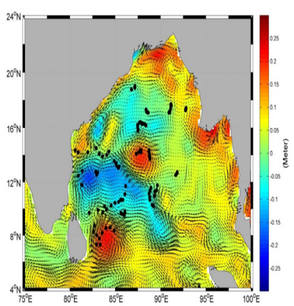


Figure 1: Anti-cyclonic (red) and Cyclonic (blue) eddies

Total 982 Anti-Cyclonic Eddies (AE) and 1001 CyclonicEddies (CE)are identified by geometrical method recently developed by Faghmous, J.H.(2015)using SSHA datasetsand the vertical structuresobtained from ARGO floats profiles (Temperature and Salinity).The geostrophic currents are derived using the geostrophic balance formula (balance of Coriolis force with pressure gradient force) from SSHA.

Geostrophic current plotted over the study region for the month October 2012. Monthly mean SLA shaded in background. Solid dots are showing the available Argo profiles position of these months. Red blue contour showing down-welling and upwelling eddy respectively (Figure 1).Figure 2 (a) showing the available number of ARGO profiles in every month. The histogram of the length of minor and major axis of AE and CE respectively are shown in the figure 2 (b).

Profiles are separated according to their location in AE or CE or Outside Eddy. Vector distances of the ARGO profiles position from the corresponding eddy centre (AE and CE) are calculated to find the composite eddy and horizontal and vertical structure of the eddies.

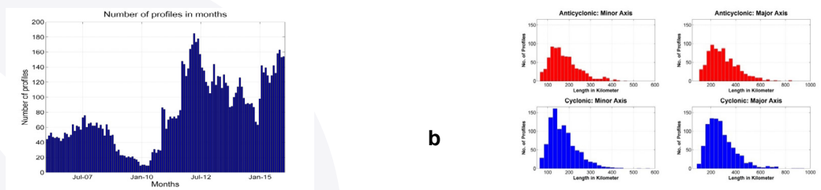


Figure 2: (a) Monthly variations of the number of Argo profiles (Jan, 2006 to Dec, 2015).
(b) Histogram of minor and major axis of Anti-cyclonic and Cyclonic Eddies

References:

Chaigneau, A., M. Le Texier, G. Eldin, C. Grados, and O. Pizarro (2011), Vertical structure of mesoscale eddies in the eastern South Pacific Ocean: A composite analysis from altimetry and Argo profiling floats, J. Geophys. Res., 116, C11025, doi:10.1029/2011JC007134.

Faghmous, J. H. et al. A daily global mesoscale ocean eddy dataset from satellite altimetry. Sci. Data 2:150028 doi: 10.1038/sdata.2015.28 (2015).

Development of intelligent adaptive fault diagnostics for mechanical and electrical systems based on support vector machine

P. Gangsar, J S. Rapur and R. Tiwari[1]
Department of Mechanical Engineering
Indian Institute of Technology Guwahati, Guwahati, 781039, INDIA
Corresponding author: Email: rtiwari@iitg.ernet.in, Ph.: +91 361 258 2667, Fax: +91 361 2690762

ABSTRACT

With the increasing demands on enhancing production efficiency, industrialists are looking for best practices to help maintenance management to maximize reliable production, reduce costs and eliminate risks. Intelligent condition monitoring offers a predictive approach to plant maintenance ensuring optimum asset performance, whilst keeping downtime to a minimum. In the present work, a versatile condition monitoring technique is developed for diagnosing faults in mechanical and electrical systems based on support vector machine (SVM). The systems considered for monitoring are bearings, centrifugal pumps and induction motors. Time signal processing of vibration and current of each of the systems are used fault classification and identification. The Machine Fault Simulator (MFS) has been used for the experimentation to acquire the aforementioned signals. For the fault diagnosis, best suited statistical features as well as SVM parameters have been selected. The developed methodology is tested in wide operating ranges, so as to check the robustness of it. The fault prediction performance of the developed methodology is promising for all the considered mechanical systems and may have significant industrial applicability.

Keywords: Condition monitoring; Multi-fault diagnosis; Vibration and current signals; Support vector machine (SVM); Bearings; Centrifugal pumps; Induction motors.

Effect of viscosity on the dynamics of drop formation from an orifice in air

Manash Pratim Borthakura, Gautam Biswas[a] and Dipankar Bandyopadhyay[b]
[a]Department of Mechanical Engineering, IIT Guwahati
[b]Department of Chemical Engineering, IIT Guwahati

ABSTRACT

The effect of viscosity on the dynamics of drop formation is studied computationally using a combined Levelset and Volume-of-fluid (CLSVOF) method. It is observed that viscosity plays a profound influence on the evolution and breakup of a liquid drop from an orifice in air. The qualitative features of drop formation with increasing viscosity is presented in Fig. 1 (a). For low viscous drops characterised by a small Ohnsorege number, the drop detaches close to the orifice due to relatively higher effect of surface tension forces. As the Ohnsorege number increases, the liquid thread connecting the drop with the orifice significantly elongates before pinchoff occurs. However, due to reduced formation time of the drop at higher Ohnsorege number, the detached drop volume also decreases sharply with increasing viscosity. This can be clearly interpreted from Fig. 1 (b) where the variation of limiting length of liquid column at breakup and detached drop volume is plotted as function of *Oh*. Additionally, the phenomenon of interface overturning is found to be fundamentally dependent on the drop viscosity. The interface overturns for low viscosity drops while at higher viscosity, overturning ceases to occur.

(a) (b) Fig. 1. Effect of viscosity on drop formation. (a) shows the qualitative features of drop formation with increasing *Oh = 0.003, 0.10 and 0.43* respectively. (b) presents the variation of limiting length of liquid column at breakup and detached drop volume as function of *Oh*.

A parametric study of dispersed laminar gas-particle flows

A.Subrat Kotoky,B.Amaresh DalalandC.Ganesh Natarajan
Department ofMechanical Engineering,IIT Guwahati,India
E-mail:s.kotoky@iitg.ernet.in

ABSTRACT

A numerical study of laminar gas-particle flow through a vertical channel and over a backward facing step is carried out using finite volume method (FVM) on unstructured grid. In this context, a numerical solver has been developed to take into account the flow characteristics of gas-particle flows. Eulerian-Eulerian two-fluid model is employed to analyse the flow behaviour of both the phases inside the domain. The interaction between the phases is taken care by introducing drag force term in their governing equations. The developed solver is validated for the classical problems of flow through a vertical channel and flow over a backward facing step. It has been found that the particle Stokes number and particle phase volume fractions have significant effects on the gas phase flow physics in both the cases.

Saturated film boiling under normal and reduced gravity with applied electric field

Vinod Pandey, Gautam Biswas andAmaresh Dalal
Department ofMechanical Engineering,IIT Guwahati,India
E-mail: p.vinod@iitg.ernet.in

ABSTRACT

The objective of this investigation is to study the influence of superheat temperature and applied uniform electric field across the liquid-vapor interface during film boiling using a coupled level set and volume of fluid (CLSVOF) algorithm. The hydrodynamics of bubble growth, detachment and its morphological variation with electrohydrodynamic forces are studied considering the medium to be incompressible, viscous and perfectly dielectric at near critical pressure. The transition in interfacial instability behavior occurs with increase in superheat, the bubble release being periodic both in space and time. Discrete bubble growth occurs at a smaller superheat whereas vapor columns form at the higher superheat values. Destabilization of interfacial motion due to applied electric field, results in decrease in bubble separation distance and increase in bubble release rate culminating in enhanced heat transfer rate. A comparison of maximum bubble height owing to application of different intensities of electric field is performed at a smaller superheat. The change in dynamics of bubble growth due to increasing superheat at a high intensity of electric field is studied. The effect of increasing intensity of electric field on the heat transfer rate at different superheats is determined. The boiling characteristic is found to be influenced significantly only above a minimum critical intensity of the electric field.

The phenomena of bubble growth is strongly influenced by the buoyant forces due to gravity and its dominant effect is found to be replaced by the electrohydrodynamic forces in reduced gravity conditions. The decrease in gravitational acceleration results in increasing the characteristic wavelength and time scale. The bubble volume and maximum height before pinch-off, thus increase enormously as the gravity value is reduced. The bubble pinch-off velocity is found to be decreased significantly in the case of reduced gravity condition. Heat transfer rate deteriorates in reduced gravity conditions which can be recovered by the externally imposed electric field. The dominance of electric field on the heat transfer rate is found to be more in reduced gravity condition. However, as the value of imposed electric field is enhanced, the difference in the effect of increasing heat flux tends to reduce.

Sign Reversal of Magnetization and Exchange Bias Field in $Ni(Cr_{1-x}Fe_x)_2O_4$ (x = 0.30 & 0.40)

Junmoni Barman and S. Ravi
Department ofPhysics,IIT Guwahati, Guwahati-781039, Assam, India
E-mail:junmoni@iitg.ernet.in

ABSTRACT

Exchange bias as well as magnetization reversal behaviour has been studied extensively in recent years because of their potential for various technological applications. Several materials exhibiting coexistence of sign reversal of magnetization and exchange bias field have been discovered in recent years [1-3]. But in most of them these behaviours are observed well below the room temperature. Therefore realizing these behaviours near room temperature is a very challenging problem. In the present work we have investigated these behaviours in $Ni(Cr_{1-x}Fe_x)_2O_4$ (x = 0.30 & 0.40) samples.

We have prepared the samples by using sol-gel method and room temperature X-ray diffraction patterns (XRD) were recorded in order to examine the phase purity of the samples. Rietveld refinement of the XRD patterns confirmed that the samples are prepared in single phase form and they crystallize in cubic structure with $Fd\bar{3}\bar{3}m$ space group. The lattice parameter of the samples are found to be a = 8.3069 Å and 8.3032 Å respectively for x = 0.30 and 0.40 samples. Temperature dependent magnetization measurement shows a ferrimagnetic transition of the samples with the transition temperature (T_C) of 421 K and 504 K respectively for x = 0.30 and 0.40 samples. The field cooled magnetization curves (H = 200 Oe) of both the samples exhibit magnetization reversal (MR) behaviour with a compensation temperature of around 358 K for x = 0.30 and 366 K for x = 0.40 sample. The observed MR in the present samples can be explained by considering different temperature dependences of the two sublattice moments in the sample. The field cooled (H = 3000 Oe) hysteresis loops of the samples are found to shift towards both positive and negative field axis with change in temperature. Such sign reversal of exchange bias field across the magnetic compensation temperature is observed due to the change in domination of one sublattice moment over the other due to the change in temperature. Furthermore, field induced magnetization reversal is realized at room temperature for both the samples by switching the applied magnetic field. The detailed analysis of these behaviours will be presented.

References

[1] T. Bora, S. Ravi, *J. Magn. Magn. Mater.* 2015, *386*, 85-91.
[2] R. Padam, S. Pandya, S. Ravi, A. K. Nigam, S. Ramakrishnan, A. K. Grover, D. Pal, *Appl. Phys. Lett.* 2013, *102*, 112412.
[3] P. D. Kulkarni, A. Thamizhavel, V. C. Rakhecha, A. K. Nigam, P. L. Paulose, S. Ramakrishnan, A. K. Grover, *EPL* 2009, *86,* 47003.

TIME-DEPENDENT MARKOV STATE MODEL FOR SINGLE MOLECULE FORCE SPECTROSCOPY

Susmita Ghosh[1], Abhijit Chatterjee[2] and Swati Bhattacharya[1,2]
[1]Department ofPhysics,IIT Guwahati,India
[2]Department of Chemical Engineering, IIT Bombay, India
E-mail:susmitaghosh@iitg.ernet.in

ABSTRACT

We show that using time-dependent Markov state models (TD-MSMs) one can obtain molecular-scale insights into force-extension curves for a variety of stretching experiments. A unique feature of our approach is that a master-MSM constructed at a reference extension using a handful of molecular dynamics (MD) calculations forms the basis for generating the required TD-MSM. Changes in the network topology upon stretching is related through a thermodynamic quantity termed as the mechanical disposition. Proof-of-principle is provided from detailed insights into the conformational changes in stretched alanine deca-peptide under a pulling force. This can open up the possibility of exploring the force induced folding/unfolding dynamics on the complex energy landscape comprising of multiple pathways associated with biomolecules.

Strong Antibunching in a Kerr-type Optomechanical Cavity

B. SarmaandA. K. Sarma
Department ofPhysics,IIT Guwahati,India
E-mail:sbijita@iitg.ernet.in

ABSTRACT

The photon-photon correlations in an optomechanical cavity containing a Kerr-type nonlinear medium is studied. The photon statistics is explored by solving the master equation for steady-state density matrix. The parameters are considered in the weak optomechanical-coupling regime and are motivated by experimentally studied optomechanical systems at telecommunication wavelengths. The second-order correlation function of the cavity field indicates strong antibunching effect at resonant transition of the cavity field [1-3]. Therefore, this device relaxes the requirement of strong coupling and might be used as an effective single-photon source at telecommunication wavelength, that is beneficial for long-distance transmission [4].

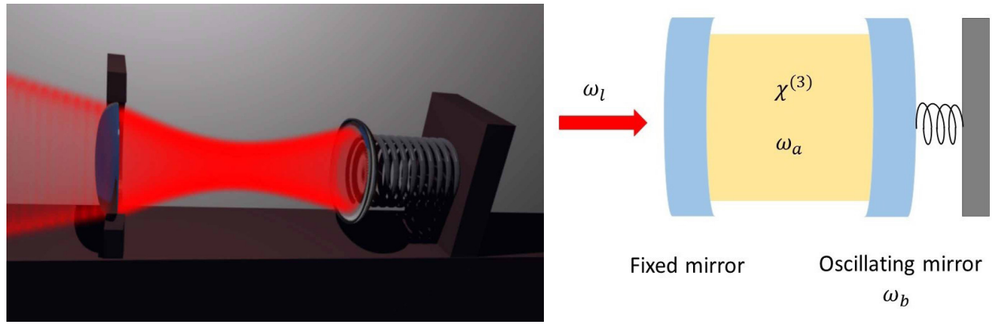


Fig. 1. Schematic diagram of a single optomechanical cavity and an optomechanical cavity with added Kerr-type nonlinearity. $\omega_a\omega_a$ and $\omega_b\omega_b$ are the resonance frequencies of the optical and mechanical modes respectively. $\omega_l\omega_l$ is the drive frequency.

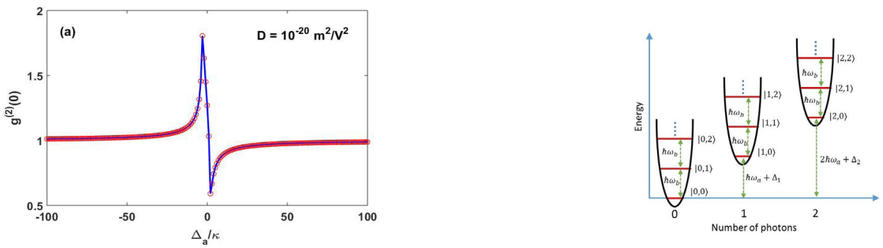


Fig. 2. Energy level diagram of the system and numerical results of zero-time-delay second-order correlation function with respect to detuning.

References:

[1] K. M. Birnbaum, A. Boca, R. Miller, A. D. Boozer , T. E. Northup, and H. J. Kimble, "Photon blockade in an optical cavity with one trapped atom", Nature 436(7047), 87-90 (2005).
[2] P. Rabl, "Photon blockade effect in optomechanical systems", Phys. Rev. Lett. 107(6), 063601 (2011).
[3] A. Nunnenkamp, K. Børkje, and S. M. Girvin, "Single-photon optomechanics", Phys. Rev. Lett. 107(6), 063602 (2011)
[4] B. Sarma and A. K. Sarma, arXiv:1612.07529.

Development of a Grating Array Based Zonal Wavefront

Sensor with Enhanced Spatial Resolution

Biswajit Pathak* and Bosanta R. Boruah
Department of Physics
Indian Institute of Technology Guwahati, Guwahati – 39, India
* E-mail: p.biswajit@iitg.ernet.in

ABSTRACT

Spatial resolution is one of the primary performance criteria of a wavefront sensor such as the Shack-Hartmann wavefront sensor (SHWS) and plays a very important role in optical metrology, ophthalmology, ground based telescopes etc. The lenses used in a conventional SHWS have a fixed size and number that invariably puts a fixed limit on the achievable spatial resolution. In this work, we introduce a novel approach to enhance the spatial resolution of a grating array based zonal wavefront sensor (GAZWFS) that works in a manner similar to that of the SHWS. We show that the 24 bit-planes of a fast response ferroelectric liquid crystal spatial light modulator can be effectively implemented to facilitate instantaneous display of several laterally shifted binary grating patterns, and the programmability of the device enables simultaneous capturing of each focal spot array. This eventually leads to wavefront estimation with an enhanced spatial resolution at a standard video refresh rate or at an even faster rate. Both experimental and theoretical results are added to demonstrate the effectiveness of the proposed scheme.

Effect of spacer layer thickness and temperature on the magnetic interactions in CoFeB/Cr/CoFeB thin films with different domain structures

Anabil Gayen, Camelia Das, Perumal Alagarsamy
Department of Physics, Indian Institute of Technology Guwahati, Guwahati -781039, India
E-mail: g.anabil@iitg.ernet.in and perumal@iitg.ernet.in

ABSTRACT

We report systematic studies on the effects of spacer (z) and ferromagnetic (FM) (y = 20 and 100 nm) layers thickness and spacer layer material on the magnetic properties of amorphous CoFeB (y nm)/Cr(z nm)/CoFeB (20 nm) trilayer thin films deposited directly on oxidized Si substrate using magnetron sputtering technique. All the as-deposited films exhibit amorphous nature. With increasing z, the trilayer films exhibit oscillatory variation of coercivity (H_c), field required for saturation (H_{sat}), and magnetization. Interestingly, the nature of oscillation depends on the thickness of the FM layers, spacer layer and the measurement temperatures. The observed results are elucidated on the basis of spacer layer dependent interlayer exchange coupling between the FM layers and the measurement temperature for different spacer layer thicknesses.

1. INTRODUCTION

Magnetic tunnel junctions (MTJs) and interlayer exchange coupling comprising amorphous CoFeB film have attracted enormous attention due to their potential applications in future magnetoelectronic devices [1,2]. CoFeB based MTJs exhibit high tunneling magnetoresistance [2] and hence suitable for replacing Fe in MTJs. Although significant efforts were shown to fabricate CoFeB based multilayer films with different spacer layers, there is no detailed report on temperature dependent interlayer coupling between the FM layers at different spacer layer and FM layer thicknesses. Hence, we report here a systematic investigation on the variation of interlayer coupling and resulting magnetic properties of the CoFeB (y nm)/Cr(z nm)/CoFeB (20 nm) trilayer films with y = 20 and 100 nm and z = 0-6 nm over a wide range of temperature.

2. Experimental Details

Amorphous films of $Co_{20}Fe_{60}B_{20}$ in trilayer form CoFeB(y nm)/Cr(z nm)/CoFeB(20 nm) were prepared directly on thermally oxidized Si substrate using magnetron sputtering technique with y = 20,100 and z = 0–6 . Thickness of the films was calibrated ex-situ by using surface profilometer. Crystal structure and microstructures were analyzed by using X-ray diffraction patterns and transmission electron microscope. Magnetic properties were characterized using Vibrating Sample Magnetometer.

3. RESULTS AND DISCUSSIONS

Amorphous nature of the as-deposited films was confirmed from the structural analysis using XRD and TEM techniques. Figure 1 shows typical room temperature magnetic properties of CoFeB(100nm)/Cr(z nm)/CoFeB(20 nm) trilayer thin films

with z=0–6. All the M-H loops show typical FM behavior. However, the film with z=0 exhibits transcritical loop with large H_{sat} due to the existence of stripe domain. On the other hand, the introduction of even a thin spacer layer changes the shape of M-H loops drastically from transcritical to rectangular one with low H_{sat}. This could be attributed to interlayer coupling between FM layers induced by the exchange interaction through spacer layer. With increasing z from 0.25 to 4, the loop shapes are found to be nearly same, but the values of H_C, H_{sat} and M_S exhibit oscillatory behavior. On further increasing z to 6, the loop shape again changes to transcritical one due to the loss of interlayer coupling for thick spacer layer. The rate of variation in $H_r(z)$, $H_{c,r}(z)$ and $M_r(z)$ depends significantly on the spacer layer materials.

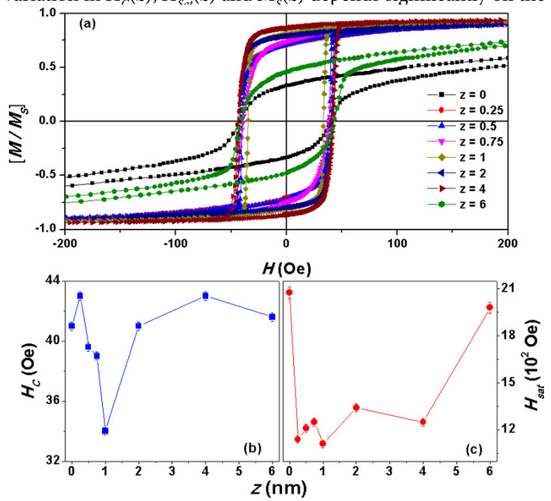


Fig.1. M-H loops (a) and variations of (b) H_C and (c) H_{sat} as a function of z for CoFeB(100nm)/Cr(z nm)/CoFeB(20 nm) trilayer films.

Temperature dependent M-H loops for different spacer materials reveal that interlayer coupling varies strongly with temperature and FM layer thickness. The detailed investigation of tuning of magnetic properties of CoFeB based trilayer films with spacer and FM layers thicknesses at different temperatures would be presented.

4. REFERENCES

[1]. L. Cuchet et al., Appl. Phys. Lett. 105 (2014) 052408.

[2]. Yi Wang et al., J.Appl.Phys.113(2013)133906.

Effect of resonator displacements in inductively coupled terahertz metamaterials

S. Jagan Mohan Rao[1],Deepak Kumar[1], Gagan Kumar[1] andDibakar Roy Chowdhury [2]
[1]Department of Physics, Indian Institute of Technology Guwahati, Guwahati, 781039, Assam, India
[2]Mahindra Ecole Centrale, Jeedimetla, Hyderabad 500043, Telangana, India
E-mail:deepakkumarvashista@gmail.com

ABSTRACT

We present the effect of resonator displacements in case of a pair of broadside coupled split ring resonators (SRRs) constituting near field coupled terahertz (THz) metamaterials. We have numerically studied the effect of displacement of the top resonator with respect to the bottom resonator in a particular fashion. In case of zero or certain displacements the terahertz transmission through the proposed configuration results in the split of fundamental resonances due to the resonance mode hybridization effect. We have further shown that a gradual shift from the coupled to the uncoupled state can take place with successive displacements between the resonators.

References:

1. Pendry, J.B., et al., *Magnetism from conductors and enhanced nonlinear phenomena.* IEEE transactions on microwave theory and techniques, 1999. **47**(11): p. 2075-2084.

2. Grady, N.K., et al., *Terahertz metamaterials for linear polarization conversion and anomalous refraction.* Science, 2013. **340**(6138): p. 1304-1307.

3. Otsuji, T., et al., *Graphene-based devices in terahertz science and technology.* Journal of Physics D: Applied Physics, 2012. **45**(30): p. 303001.

4. Knap, W., et al., *Nanometer size field effect transistors for terahertz detectors.* Nanotechnology, 2013. **24**(21): p. 214002.

5. Docherty, C.J. and M.B. Johnston, *Terahertz properties of graphene.* Journal of Infrared, Millimeter, and Terahertz Waves, 2012. **33**(8): p. 797-815.

6. Prodan, E., et al., *A hybridization model for the plasmon response of complex nanostructures.* Science, 2003. **302**(5644): p. 419-422.

Belle II Distributed Computing System, KEK Japan

Dhiraj Kalita1 and Bipul Bhuyan 2
1 Department of Physics, IIT Guwahati, India
2 On behalf of Belle II Computing Group, KEK Japan
E-mail: dhiraj.kalita@iitg.ernet.in

ABSTRACT

The Belle II is a next generation B-factory experiment, which aims to find the physics beyond the Standard Model with a data sample of 50 ab-1 integrated luminosity. In order to provide computing resources which can process and store huge data sample, a distributed computing model is adopted. It has a similar hierarchical structure to the Worldwide LHC Computing Grid (WLCG), but is a bit simpler. It is expected to store a copy of RAW data (10%) in India, as a part of Belle II collaboration IIT Guwahati has start adopting distributed computing architecture and since 2015 started providing computing resource to the Belle II computing grid. IIT Guwahati (DIRAC.IIT.in) is a MC production TIER-2 site situated at High Energy Physics lab, which perform the Monte- Carlo (MC) data production for Belle II MC campaigns. It has performed successful generation of around 60,000 simulated events since 2015 and is still in production. In coming years we are going to adopt cloud resource as an alternate for production of simulated events.

Belle II distributed computing architecture is based on the existing technologies, DIRAC has been choose as a workload and data management system. It provides a common interface to a number of heterogeneous computing resources such as grid, local resource and cloud. Belle II software is been distributed by Cern VMFS(CVMFS) and distribution of data is done by File Transfer Service(FTS).

Study of Graphene Quantum Dot-TiO_2 Nanoparticle Heterojunction and the Interfacial Charge Transfer for Visible light Photocatalytic Application

Gone Rajender*and P. K. Giri
Department ofPhysics, IIT Guwahati, India
*Corresponding author E-mail:g.rajender@iitg.ernet.in

ABSTRACT

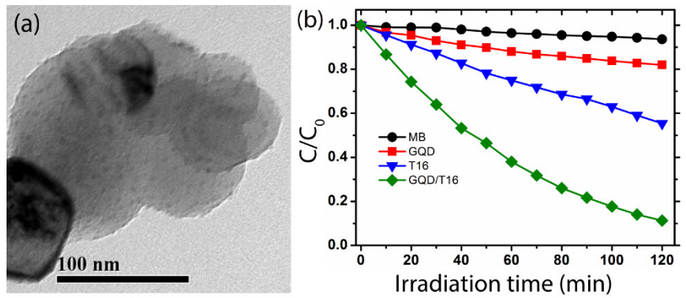


Figure 3(a) TEM image of GQD-TiO2 hybrid, and (b) concentration ratio of MB over the different catalyst samples at irradiation time up to 120 min.

Over the past decades metal oxide semiconductor nanostructures have been utilized for various applications, such as solar cells, sensors, spintronics, water splitting and photocatalysis etc. However, the band gap of most of the metal oxide semiconductors falls in the ultraviolet region, which restrict the utilization of solar energy for the practical applications. To address this issue, most of the research has been devoted to reduce the band gap of such materials for energy conversion applications. Among other applications, visible light photocatalysis is one of the environmental benign processes for purification of water. The present work discusses the enhanced visible light photocatalytic degradation of methylene blue by graphene quantum dots (GQDs) and TiO_2 nanoparticle (NP) hybrid. The advantage and role of GQDs in visible light photocatlysis application will be elucidated in detail. TiO_2 NPs were prepared by ball milling method [1] and GQDs have been synthesized by a solvothermal method, and then the GQDs/TiO_2 hybrid has been prepared by simple ultrasonication method. XRD analysis reveals the characteristic peaks of anatase phase TiO_2 and sp^2 hybridized carbon in hybrid samples. The TEM results of TiO_2 and GQDs as shown in Fig. 1(a). It is evident from the Fig. 1(a) the TiO_2 NPs surface is embedded with small GQDs have the size ~5 nm. Raman studies suggested the presence of characteristic bands related to the anatase phase TiO_2 and GQDs. Interestingly, in hybrid of GQD-TiO_2 the E_{1g} peak is blue shifted due to the covalent bond formation of C-O-Ti. UV-Vis absorption spectrum of GQDs shows the absorption peaks related to the π-π* and n- π* transitions [2] and importantly, in hybrid of GQD-TiO_2 the absorption tail is extended from UV to visible region, which further confirms the GQD coupled to the TiO_2. Photoluminescence studies confirm the oxygen vacancy defects in TiO2 NPs, whereas it is important to note that the PL spectrum broadening is reduced in GQD-TiO_2 This indicates that the PL emission due to the oxygen vacancy defects is supressed. Time resolved PL results confirm charge transfer between GQD to TiO_2 Visible light photocatalysis degradation of methylene blue (MB) in different catalyst samples are studied by visible light irradiation. Fig. 1(b) represents the change in dye concentration as a function of irradiation time up to 120 min. The formation mechanism of the hybrid and the degradation mechanism of MB will be discussed in detail.

References
[1] G. Rajender, P.K. Giri, Journal of Alloys and Compounds (2016), **676,** 591-600.
[2] G. Rajender, P.K. Giri, Journal of Materials Chemistry C (2016), **4**, 10852-10865.

Efficient near band edge photoluminescence in PLD $Zn_{1-x}Al_xO$ (0≤x≤0.10) thin films

Gyan Prakash Bharti and Alika Khare*
Laser & Photonics Lab, Department of Physics, IIT Guwahati, Guwahati-Assam.
*Corresponding Author Email: alika@iitg.ernet.in

ABSTRACT

An improvement in the UV emission and a partial reduction of the defect associated broad emission band from the pulsed laser deposited $Zn_{1-x}Al_xO$ (0≤x≤0.10) thin films as a function of *x* is demonstrated in the present work. The $Zn_{1-x}Al_xO$ (0≤x≤0.10) thin films are fabricated onto fused silica substrate employing 2nd harmonic of a Q-switched Nd:YAG laser (l=532nm, t=10ns, 10Hz). An improvement in film crystallinity is observed in the films till *x*=0.05 of Al doping and reduces thereafter. A blue shift in the optical band gap in the films is observed with increase in *x*. The UV photoluminescence emission peak is blue shifted with the incorporation of Al in the ZnO system which is in accordance with trend followed by their optical band gap. The broad visible green-yellow band in pure ZnO film centered at 550 nm is mainly associated with the oxygen vacancy. It drastically reduces with increasing *x* resulting into the enhancement in the band edge UV emission in the films. A correlation among the crystalline structure, band gap energy and optical emission along with involved mechanism will be discussed in the details.

Tuning the magnetic properties of stripe domain structured CoFeB films through spacer layer thickness dependent interlayer magnetic exchange coupling

Camelia Das, Jumal Das and Perumal Alagarsamy
Department of Physics, Indian Institute of Technology Guwahati, Guwahati -781039, India
E-mail: d.camelia@iitg.ernet.in and perumal@iitg.ernet.in

Abstract: We report a novel approach for tuning the magnetic properties of stripe domain structured Co40Fe40B20 (CoFeB) thin films through non-magnetic spacer layer thickness dependent interlayer magnetic exchange coupling. As-deposited single-layer CoFeB (100-300 nm) films exhibit transcritical loops with high coercivity (*HC*) due to the formation of stripe domain structure. The introduction of thin Ta spacer layer in multilayer [CoFeB (100 nm)/Ta (*z*)]*n*=0-4/CoFeB (100 nm) films helps tuning the magnetic hysteresis loop shape and reducing *HC* by four times. However, the improvement in the magnetic properties of multilayer films strongly depends on Ta spacer thickness and number of multilayers. The observed results are discussed on the basis of stripe domain magnetic structure caused by the stress in single-layer films and spacer layer thickness dependent interlayer interaction between stripe domain structured CoFeB layers in multilayer films.

1. INTRODUCTION

Recently CoFeB alloy thin film with perpendicular anisotropy is found to be one of the pioneering materials for various magnetoelectronic device applications [1]. However, fundamental studies reveal that soft magnetic properties of CoFeB films strongly depend on film thickness and are degraded at higher thicknesses (> 100 nm) due to the formation of stripe domain structure [2]. Hence, it is important to control the magnetic properties of CoFeB films at higher thicknesses for selective magnetic applications. Therefore, we report here tuning the magnetic properties of CoFeB films exhibiting stripe domains at higher thicknesses through interlayer magnetic exchange coupling by preparing multilayer structured films of CoFeB/Ta with different spacer layer thickness.

2. EXPERIMENTAL DETAILS

Amorphous Co40Fe40B20 (CoFeB) films were prepared in the form of multilayers as [CoFeB (100 nm)/Ta (*z*)]*n*=0-4/CoFeB (100 nm) directly on thermally oxidized Si substrate using DC magnetron sputtering technique at ambient temperature. In order to compare the results of multilayers, the single-layer films of CoFeB (*x* nm) with *x* = 100 – 300 were also prepared. Amorphous nature of as-deposited films were confirmed through X-ray diffraction and transmission electron microscopy techniques. Magnetic properties of the films were characterized using Vibrating Sample Magnetometer (VSM) over a wide range of temperatures.

3. RESULTS AND DISCUSSIONS

Structural studies revealed that all the as-deposited films exhibit amorphous structure. Figure 1 shows typical room temperature normalized magnetic hysteresis (*M-H*) loops and coercivity (*HC*) variation of single-layer and multilayer CoFeB films. All single-layer films exhibit transcritical loop with high coercivity (*HC*) due to the formation of stripe domain structure caused

by the development of effective magnetic anisotropy instigated by stress induced during film deposition. On the other hand, the shape of *M-H* loops of multilayer films changes along with a considerable reduction in *HC* with increasing *n*. Interestingly, the magnitude of reduction in *HC* strongly depends on the values of *z* and *n*.

Fig.1: *M-H* loops of CoFeB (a) single-layer films with different *x* and multilayer films with (b) *z* = 1, (c) *z* = 1.5 and (d) variations of *HC* as a function of *n*.

This is mainly attributed to the spacer layer thickness dependent interlayer magnetic exchange coupling between CoFeB layers, which helps them to tune the magnetic properties of multilayer films methodically. This results in an enhancement in the soft magnetic properties of the CoFeB films at higher thicknesses. A detailed and systematic analysis of magnetic properties of thick CoFeB film exhibiting stripe domain structure and the effect of number of multilayers and Ta spacer layer thickness on the interlayer magnetic coupling over a wide range of temperatures would be presented.

4. REFERENCES

[1] J. Torrejon, et al., Nature Comm. 5, 4655 (2014).
[2] C. Das, et al., Thin Solid Films 616, 126 (2016).

Impact of Surface Plasmon Induced Hot Electrons on the Strong Visible Light Photocatalysis by Ag/TiO_2 Nanostructures

A.Kamal Kumar Paul[1] B.P K Giri[1,2]
[1]Department of Physics, IIT Guwahati, Guwahati, India
[2]Centre for Nanotechnology, IIT Guwahati, Guwahati, India
E-mail:*kamal.paul@iitg.ernet.in*

Metal-semiconductor nano-heterostructure (HS) allows tunable and intense absorption of light, making it very promising for efficient solar energy harvesting in photocatalytic and photovoltaic applications. Herein, we have synthesized Ag nanoparticle (NP) decorated anatase TiO_2 nanorods (NRs) HS by a simple photoreduction method. Localized surface plasmons on Ag NPs can accelerate photoconversion in TiO_2 by various mechanisms, such as light trapping, hot electron generation and their transfer through the interface and plasmon-induced resonance energy transfer in the Ag/TiO_2 HS. TEM imaging shows that the Ag NPs with average size ~17.6 nm are uniformly decorated on the surface of the TiO_2 NRs (diameter ~ 60-130 nm). The Ag/TiO_2 NR HSs exhibit very strong optical absorption due to LSPR effect over the entire visible region, having an absorption peak at ~520 nm. The broadening of these plasmonic peaks can be attributed to the presence of unsaturated Ag^+ ions and their oxides on the TiO_2 surface along with the metallic Ag NPs. Studies on photocatalysis of organic dye Rhodamine-B show high degradation rate for the HSs due to the LSPR effect in the noble Ag NPs and fast charge transfer at Ag/TiO2 interface. An optimized weight ratio i.e; 3:2 of Ag:TiO_2 exhibits almost double plasmonic absorbance than the other HSs and it shows highest degradation rate under the visible light irradiation. Interestingly, the degradation rate follows a bi-exponential rate kinetics separately. It is observed that after ~ 50 min of irradiation, the degradation rate constant strongly increases (10 times than that of bare TiO_2 NRs) as compared to the initial degradation rate. This result can be explained on the basis of reduction of unsaturated Ag^+ ions during the prolonged irradiation and hence the enhancement of LSPR effect at Ag NPs. Thus, Ag/TiO_2 NR HS is promising for the detoxification of water and environmental cleaning.

Confocal Microscopy and its application

Karuna Sindhu Malik*, S S Goutam Buddha, Ranjan KalitaandB RBoruah
Department ofPhysics,IIT Guwahati,India
*E-mail:*karuna.malik@iitg.ernet.in*

ABSTRACT
Confocal microscopy is a powerful imaging technique that enables to enhance the optical resolution and contrast in the image of a specimen. This is achieved by removing any out of focus information reaching the detector by placing a pinhole in front of the detector plane. The illumination beam is scanned over the specimen to be imaged by point-by-point raster fashion and simultaneously detecting the reflected or emitted light from the specimen using a detector such as a photomultiplier tube. The scanning of the illumination beam over a rectangular area can be achieved by using a galvanometer based mirror scanning system or a computer generated holography based scanning method. Here we will elucidate the above two scanning methods in a confocal microscope followed by some discussions on the applications of the confocal microscope.

Preparation of entangled states via Transitionless Quantum Driving

A.Koushik Paul[1]andB.Amarendra K. Sarma[1]
[1]Department ofPhysics,IIT Guwahati,India
E-mail:*pkoushik@iitg.ernet.in*

ABSTRACT
In quantum mechanics, controlling the dynamics of the time evolution of a system is of extreme importance. The methods of adiabatic passage have been studied rigorously to achieve precise control over system dynamics. Although, being robust and highly efficient, adiabatic passage method in principle slow with respect to time. However there are instances where one would need to enhance the speed of the passage processes in order to avoid de-coherence, noise etc. A recently proposed method, namely Transitionless Quantum Driving (TQD) proposed by Berry [1], enables us to design interactions by using inverse engineering approach so that the system can be driven exactly along adiabatic path but infinitely fast. In this work we applied the TQD method to prepare an entangled state on a system of a pair of spin ½ particles which are coupled by their intrinsic exchange interaction and an additional magnetic field. Our study shows that preparation of entangled states using TQD is possible even when adiabatic condition is not satisfied and is robust against the variation of applied field strength. We also showed that the fidelity for TQD is quite high compared to the adiabatic method and required less transition time to prepare the entangled state

[1] M. V. Berry, "Transitionless quantum driving", J. Phys. A: Math. Theor. 42, 365303-365311 (2009)

Front End Readout Prototype for FGT-Electromagnetic Calorimeter of Deep Underground Neutrino Experiment

M. Bhattacharjee[1],B.Bhuyan[2]
[1]Department ofPhysics,IIT Guwahati,India
E-mail:mahamab@iitg.ernet.in

ABSTRACT

The Deep Underground Neutrino Experiment (DUNE) is an upcoming international collaboration experiment for neutrino physics and proton decay, at Fermilab, USA. The DUNE is a dual-site experiment with a separation of 1300 km between the High Intensity neutrino source and the Far Detector. The aim of the experiment is precise measurement of oscillation parameters of $\nu_\mu \rightarrow \nu_e$, with the two detectors: Near (NDS) and Far (LArTPC). The Fine Grained Tracker - Electromagnetic calorimeter (FGT-ECAL) is a proposed essential component of the NDS and is required for identification of EM showers (e^+/e^- and γ) & for reconstruction of neutral hadrons such as π^0. The Indian collaborators are undertaking the simulation and development of FGT-ECAL and this study focuses on the design of its electronic readout system. The simulation and designs for the readout are based on existing ECAL Detectors for operation of Silicon Photomultiplier (SiPM) attached to Wavelength Shifting Fibre (WLS) of scintillator bars, and its Data Acquisition (DAQ) system. The goal is to have a Front-End Board efficient enough to control several SiPMs (Hamamatsu MPPCs) and extract data for processing simultaneously. In this study SPICE simulation of a model MPPC, its power supply and DAQ system has been completed. An SP5600 CAEN educational kit was tested with to understand the data acquisition process of MPPCs. A prototype consisting of a MOSFET based switching power supply to provide High Voltage biasing with low current, a precision amplifier based charge sensitive preamplifier and a counter for the MPPC output is under development.

Liquid Crystal Spatial Light Modulator Based Wavefront Sensing and its Application

Nagendra Kumar*, Santanu Konwar, Biswajit Pathak and Bosanta R. Boruah
Department ofphysics, IIT Guwahati,India
E-mail: nagendra.2015@iitg.ernet.in

ABSTRACT

Liquid Crystal Spatial Light Modulators (LCSLM) are the devices that have the ability to modulate the amplitude and phase of an incident light beam spatially and temporally. This ability of dynamic modulation enables the LCSLM to implement the Computer Generated Holography (CGH) technique to realize the two most important wavefront sensing methods namely, zonal and modal wavefront sensing. Wavefront sensing is a technique that uses a device called wavefront sensors, to detect and measure the amount of aberrations present in a beam. Here, we present some of the simulation and experimental results related to the development of the two sensors. The prototype for the application of zonal wavefront sensor in thin film deposition and surface profiling is also illustrated.

Electromagnetically Induced Transparency (EIT) in Rydberg atomic system

Nawaz S.Mallick[1]andTarak N.Dey[1]
[1]Department ofPhysics,IIT Guwahati,India
E-mail:nawaz@iitg.ernet.in

ABSTRACT

The coherent interaction of light fields with Rydberg-atoms attract significant experimental and theoretical attention over the past few decades. The atomic coherence induced by this coherent interaction, lead to quantum interference be- tween the excitation pathways of the atomic energy states. For destructive quantum interference, the absorption of the light field (photon) is cancelled which makes a usually opaque thick medium transparent within a certain spectral range at the resonant frequency of a transition. This remarkable phenomenon is known as Electromagnetically Induced Transparency (EIT) [1][2]. The EIT phenomenon allows sensitive light-atom interaction without absorption and Rydberg atomic system provide us a strong long-range atom-atom interaction. Therefore, the combination of EIT with Rydberg atoms is ideal for studying photon-photon interaction via Rydberg-blockade [3][4], quantum phase gate for quantum optical information processing[5] etc.

Here, we study various EIT-based investigation using interacting Rydberg atomic system. First we explore the EIT phenomenon using single atom model in which the interaction between the atoms are very weak. A two-atom model in coupled basis is built considering the distance dependent interaction, V(R) between the Rydberg atoms. We compare the results from single atom and two atom model and find that two atom model is more efficient in creating the nonlinearity in the atomic medium. The effect of interaction on the absorption and dispersion profile of the atomic system is also studied in details.

References

[1] S.E. Harris, Phys. Today **50**, 36 (1997).
[2] M. Fleischhauer, A. Imamoglu, and J. P. Marangos, Rev. Mod. Phys. **77**, 633 (2005).
[3] A. V. Gorshkov et al., Phys. Rev. Lett. **107**, 133602 (2011).
[4] T. Peyronel et al., Nature **488**, (2012).
[5] H. Gorniaczy et al., Phys. Rev. Lett. **113**, 053601 (2014).

Plateau Inflation and Production of Massive Particles

P.Saha[1] and D.Maity[1]
[1]Department of Physics,IIT Guwahati,India
E-mail:pankaj.saha@iitg.ernet.in

ABSTRACT

The inflation [1–3] is a successful paradigm proposed to solve some of the outstanding problems in standard Big-Bang cosmology. After the original proposal, large number of models have been introduced successfully realizing this mechanism [4], and explained the observed data [5]. Out of the large number of models, a particularly interesting class of model that has recently been discovered is called α attractor [6]. It has gained a significant attentions because of its unification of a large number of existing inflationary models.

In this work we propose and analyze a large class of inflationary models with plateau like potential by modifieng the power-law potential of the form $V(\varphi) \sim \varphi^n$. Because of the large plateau, the models naturally fit extremely well with the recent observations made by PLANCK for huge range of parameter space. The potential assumes the behaviour of simple power-law around the minimun of the potential. Hence, we show the perturbative reheating and production of heavy dark matter can be done using the equation of state w = (n-2)/(n+2).

References:

[1]. A. H. Guth, Phys.Rev. D 23, 347356 (1981).
[2]. A. D. Linde, Phys. Lett. B 108, 389393 (1982).
[3] A. Albrecht and P. J. Steinhardt, Phys. Rev. Lett. 48, 12201223 (1982).
[4] J. Martin, C. Ringeval and V Vennin, Phys.Dark Univ. 5-6 (2014) 75-235, [arXiv:1303.3787 [astro-ph.CO]].
[5]Planck Collaboration: P. A. R. Ade et al., Planck 2015 results. XX. Constraints on Inflation, Astron. Astrophys. 594, A20 (2016), [arXiv:1502.02114 [astro-ph.CO]];
[6] R. Kallosh and A. Linde, JCAP 1307, 002 (2013) [arXiv:1306.5220 [hep-th]];

Application of laser induced breakdown for nanoparticle synthesis and as a powerful spectroscopic technique

Prahlad K. Baruah, Kh. Shantakumar Singh, Sumit Goswami, Eshita Mal, Ashwini K. Sharma and Alika Khare
Laser and Photonics Lab, Department of Physics,
Indian Institute of Technology Guwahati, Guwahati-781039
Email: prahladkb@iitg.ernet.in

ABSTRACT

Laser induced breakdown involves the focusing of a high power laser onto a solid target. The high electric field associated with the process results in ablation of the material and then plasma formation takes place. Although the process of laser induced breakdown is very complex, it has gone a long way in terms of applications in various fields. Laser induced breakdown of a solid in liquid has evolved as a very efficient technique in the synthesis of stable colloidal nanoparticles. The nanoparticles synthesized via this technique does not involve the use of any hazardous chemical which has proven to be a major concern for the environment. The study of laser induced breakdown has also been applied to the field of spectroscopy. Laser induced breakdown spectroscopy (LIBS) is a powerful tool to detect the information about the ionic, atomic and molecular species present in a medium. Keeping in view the enormous potential of the process of laser induced breakdown, the basic phenomena involved along with a few applications will be presented in the conclave.

Spectroscopic Ellipsometry studies of PLD Si thin film

Rahul Kesarwani*, Partha Pritam Dey and Alika Khare
Department of Physics Indian Institute of Technology Guwahati, Guwahati, 781039, India *
Email: r.kesarwani@iitg.ernet.in

ABSTRACT

In this report, the optical and structural properties of Silicon (Si) films fabricated by pulsed-laser deposition (PLD) at various substrate temperatures (Ts); room temperature (RT), 400 ˚C and 700 ˚C, were studied. X-Ray diffraction (XRD) studies showed that all films were polycrystalline in nature whereas the spectroscopic ellipsometry (SE) studies showed that only at 700 ˚C, the film forms as crystalline otherwise largely amorphous. The SE studies were also used to estimate the optical constants, band gap and thickness of the films. Band gap energy was found to vary from 1.35 to 1.25 eV approximately with increasing Ts from RT to 400 ˚C, then gradually increasing to 1.55 eV at 700 ˚C. Details of modelling by dispersion laws and BEMA in SE studies were also discussed.

Very Low effective magnetic anisotropy and low Gilbert damping in Fe substituted Ni-Mn-In films

Rajkumar Modak[1], M. Manivel Raja[2], V.V. Srinivasu[3] and A. Srinivasan[1,3]
[1]Department of Physics, Indian Institute of Technology Guwahati, Guwahati 781039, India
[2]Defence Metallurgical Research Laboratory, Kanchanbagh, Hyderabad - 500058, India
[3]Department of Physics, University of South Africa, Johannesburg 1710, South Africa
E-mail: r.modak@iitg.ernet.in

ABSTRACT

During last few decades, off stoichiometric $Ni_{50}Mn_{25+x}Z_{25-x}$ (Z = Ga, In, Sn, Sb) alloys have gained immense attention due to their wide range of applications in magnetic refrigeration, magnetic actuated devices and spintronic devices *etc.*[1–4]the phase diagram of this alloy system was established. Considering the combination of large magnetization difference across phase transformation \u0394M and small transformation entropy change \u0394S, the optimal composition range of 5\ u2264x\u22648 for magnetic-field-induced phase transformation (MFIPT. These alloys possess a high temperature austenite (A) phase with $L2_1$ structure (space group 225) and a low temperature martensite (M) phase with 4*O*, $L1_{0,}$ 10M or 14M structure, apart from being ferromagnetic [5,6]. These alloys have been extensively investigated in the bulk form. However, several theoretical and experimental studies indicate that the physical properties of thin films are very different from their bulk counterparts [7,8]. In order to fully exploit these alloys for the above applications, a thorough knowledge of the magnetic quality, magnetic homogeneity, magnetic anisotropy and intrinsic damping characteristics of these thin films is required. We have deposited Mn-rich Ni-Mn-Fe-In films of thickness of 500 nm, 800 nm and 1000 nm on Si (100) substrate by dc magnetron sputtering at ambient temperature and then annealed *ex situ* at 700 ºC for 1 h under high vacuum. The structural characterization, using rotating anode based X-ray diffractometer (Rigaku TTRAX III) with Cu K_α radiation (λ = 0.15406 nm) revealed that the as deposited film is amorphous whereas, the annealed film crystalized in a two phase (austenite $L2_1$ and martensite 14M) structure. The magnetostatic characterization using vibrating sample magnetometer (VSM, Lakeshore 7410) equipped with a closed circle refrigerator and a high temperature oven showed that the annealed films are ferromagnetic at room temperature. Microwave resonant absorption spectra was recorded as a function of film orientation with respect to the applied field using an electron spin resonance (ESR) spectrometer (Bruker EMX EPR) operating at 9.44 GHz with a frequency modulation of 100 kHz) at room temperature. The spectra revealed ferromagnetic resonance (FMR) signal from which magnetodynamic properties of the ferromagnetic thin films were evaluated. The analysis of polar angle (θ_H) variation resonance field (H_r) and linewidth (ΔH) shows the presence of very low effective magnetic anisotropy (K_1= 3.0-5.0 × 10^4 erg/ cm^3) and very low Gilbert damping constant (α) of 0.009 for the first time in Ni-Mn-Fe-In films. These results suggest new applications for these films.

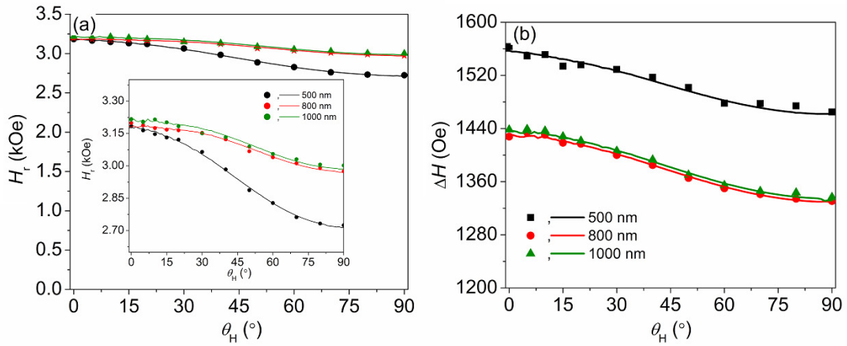


Fig. 1. (a) Variation of FMR resonance field (H_r) and (b) linewidth (ΔH) with polar angle (θ_H) at particular frequency (9.44 GHz) for annealed Ni-Mn-Fe-In films.

References:
1. D. Y. Cong, S. Roth, M. Pötschke, C. Hürrich, and L. Schultz, Appl. Phys. Lett. **97**, 21908 (2010).
2. A. Planes, L. Mañosa, and M. Acet, J. Phys. Condens. Matter **21**, 233201 (2009).
3. N. Teichert, A. Boehnke, A. Behler, B. Weise, A. Waske, and A. Hütten, Appl. Phys. Lett. **106**, 192401 (2015).
4. R. Modak, B. Samantaray, P. Mandal, and A. Srinivasan, J. Alloys Compd. **692**, 529 (2017).
5. T. Krenke, M. Acet, E. F. Wassermann, X. Moya, L. Mañosa, and A. Planes, Phys. Rev. B **72**, 14412 (2005).
6. Y. Sutou, Y. Imano, N. Koeda, T. Omori, R. Kainuma, K. Ishida, and K. Oikawa, Appl. Phys. Lett. **85**, 4358 (2004).
7. D. C. Dunand and P. Müllner, Adv. Mater. **23**, 216 (2011).
8. G. A. Malygin, Tech. Phys. **54**, 1782 (2009).

Hydrogenated amorphous silicon solar cells on low-cost flexible substrates

Ramakrishna M[1], Venkanna K[1], Pratima Agarwal[1,2*]
[1]Department of Physics,IIT Guwahati,India
[2]Centre for Energy,IIT Guwahati,India
E-mail:pratima@iitg.ernet.in

ABSTRACT

Flexible substrates are very light weight, cheapest most widely available and compatible with the roll-to-roll printing process. Here we report hydrogenated amorphous silicon (a-Si:H) thin film solar cells fabricated on photo paper, polyimide and ITO coaded quartz by using plasma enhanced chemical vapor deposition (rf-PECVD) multi-chamber system. A series of intrinsic a-Si-H thin films was deposited by varying the substrate temperature (T_s) between 70 °C – 150 °C. These films were characterized by Raman spectroscopy, ellipsometry and conductivity. With the best quality of intrinsic a-Si:H fil, p-i-n solar cell at 150 °C were fabricated and the influence of i-layer thickness on the solar cell efficiency was studied. It is observed that on photo paper substrate best efficiencies were observed for i-layer thickness at ~ 178 nm with short-circuit current density (J_{sc}), open circuit voltage (V_{oc}), fill factor (FF) and efficiency(η) as 7.17 mA/cm^2, 0.61 V, 0.35 and 1.54% respectively. Where as on polyimide substrate i-layer thickness at ~ 335 nm showed best performance with short-circuit current density (J_{sc}), open circuit voltage (V_{oc}), fill factor (FF) and efficiency (η) as 10.87 mA/cm^2, 0.79 V, 0.52 and 4.4% respectively. Though these efficiencies are low compared to cells simultaneously fabricated on ITO coated quartz substrates, the results are encourasing. Further optimization is expected to increase the efficiency. More results will be present during the conference.
Keyword: a-Si:H, solar cell, flexible substrates, polyimide,photo paper

Dynamics of mechanical activation on aluminothermic reduction process and magnetic properties of NiO powders

Aneeta Manjari Padhan1, M. Satish2, P. Saravanan3, Perumal Alagarsamy1
1Department of Physics, Indian Institute of Technology Guwahati, India.
2 Functional Materials Division, CSIR-Central Electrochemical Research Institute, India
3 Advanced Magnetic Lab, Defence Metallurgical Research Laboratory,Hyderabad, India
E-mail: a*neeta@iitg.ernet.in*

ABSTRACT: We report the dynamics of mechanical activation on aluminothermic reduction process of NiO into Ni-NiO-Al2O3 nanocomposites and their magnetic properties by using high-energy ball milling. As-mixed NiO-Al (*x* wt.%) powders with *x*=20,40 show antiferromagnetism. With increasing milling time (*tm*), the addition of Al in NiO develops reduction reaction process, where the percentage of reduction strongly depends on Al content. The formation of Ni-NiO-Al2O3 nanocomposites can be evidently followed by the increase of saturation magnetization

(*MS*). For NiO-Al(20%), NiO reduction reaction occurs gradually and *MS* increases progressively from 0.14 to 4.1 Am2kg-1 for *tm* up to 30 h. On the other hand, NiO-Al(40%) sample exhibits a large increase in *MS* values (29 Am2Kg-1) even for 5 h milling due to rapid reduction of NiO into Ni-NiO-Al2O3 nanocomposites. The observed results are explained on the basis of *tm* and Al content dependent reduction process in NiO and the controlled reduction is promising for the application in catalysis and ore reduction processes.

INTRODUCTION:

The reduction of transition metal (TM) oxides has been extensively studied from the applied and fundamental points of view [1]. In particular, the control of reduction process in NiO and the properties of subsequent Ni are of practical significance in the fields of ore reduction, solid-state fuel cells, gas sensors and catalysis. NiO can be reduced either by high temperature annealing under controlled gas atmosphere [2] or by mechanochemical reactions [3].
These studies revealed the formation of nanocomposite consisting of metallic nanoparticles embedded in an oxide matrix. As no systematic studies have been reported on the dynamics of mechanically activated aluminothermic reduction process, we, here, report the reduction of NiO by Al as a function of milling time (*tm*) and Al content and the resulting magnetic properties of novel nanocomposites

EXPERIMENTAL DETAILS:

NiO-Al (*x* wt.%) powders with *x*=0,20,40 were milled in a high energy planetary ball mill with a ball-to-powder weight ratio of 10:1. The milling was carried out for different *tm* with a milling speed of 500 rpm. The phase evolution and changes in surface morphology and microstructure were monitored by using X-ray diffraction (XRD) and electron microscopy techniques (SEM,TEM), respectively. Magnetic properties were characterized using vibrating sample magnetometer by performing magnetic hysteresis (*M-H*) loops and thermomagnetic (*M-T*) measurements.

RESULTS AND DISCUSSION:

Figure 1 displays room temperature XRD patterns and *M-H* loops of the samples with *x* = 20, 40 milled at different *tm*. For NiO-Al(20%), the peaks corresponding to Al, observed in as-mixed powders, disappear at 5 h along with a large peak broadening due to the formation of solid solution.
Fig.1. XRD patterns and *M-H* loops of NiO-Al (*x* wt.%) powders with *x* = 20 % ((a),(c)) and 40 % ((b),(d)).
With increasing *tm*, NiO(200) peak around 43.5 exhibits asymmetric nature along with development of peak at around 52°. This reveals the formation of Ni, which could be clearly understood from the progressive increase in magnetization (see Fig.1(c)) from 0.14 to 4.1 Am2kg-1 for *tm* up to 30 h. On the other hand, for NiO-Al(40%) sample,
NiO reduction occurs into Ni-NiO-Al2O3 nanocomposite even after 1 h, indicating the necessity of critical Al content to initiate reduction process. Hence, magnetization increases rapidly to 29 Am2kg-1. A careful analysis of reduction of NiO by Al using mechanochemical reaction as a function of *tm* and Al content and the correlation between structural and magnetic properties would be presented in detail.

4. REFERENCES

[1] Q. Jeangros et al, *J. Mater. Sci.* 48 (2013) 2893.
[2] Ch.Laurent et al, *Nanostruct. Mater.* 6 (1995) 317.
[3] A.M.Padhan et al, *J. Magn. Magn. Mater.* 418 (2016) 253.

Structural, Magnetic and Dielectric properties of Y3-*x*Sm*x*Fe5O12

Aakansha*, Pratap Behera, Bipul Deka and S. Ravi
Department of Physics, Indian Institute of Technology Guwahati, Guwahati -781039, India
Email: *aakansha@iitg.ernet.in

ABSTRACT: Single Phase samples of Y3-*x*Sm*x*Fe5O12 (x = 0.0-3.0) were prepared by using solid state reaction method. The lattice constant is found to increase with Sm concentration. M-H loops measured at room temperature and the analysis of initial magnetization curve show that saturation magnetization value decreases with increase in Sm concentration due to possible antiferromagnetic interaction with the net magnetic moment of Fe3+ ions. On the other hand, the ferrimagnetic transition temperature is found to increase with Sm concentration. The dielectric constant increases upon Sm substitution and the analysis of impedance spectra shows the contribution of both grain and grain boundaries.

INTRODUCTION:

Yttrium iron garnet (YIG) continues to be the subject of research interest due to its controllable saturation magnetization, low dielectric loss, large electrical resistivity and narrow ferromagnetic resonance linewidth [1]. The saturation magnetization values of YIG samples doped with other magnetic rare earth elements are reported to decrease with increase in doping concentration [2]. According to theoretical prediction, the substitution of lighter rare earth element such as Sm3+ in place of Y can results in ferromagnetic interaction with the net magnetic moment of Fe3+ ions [3]. In the present paper, we report the preparation of Sm doped YIG and study of their structural, magnetic and dielectric properties.

EXPERIMENTAL DETAILS:

Polycrystalline samples of Y3-xSmxFe5O12 were prepared by solid state reaction method by using Y2O3, Fe2O3 and Sm2O3 of purity better than 99% as starting compound. The mixed powder was calcined at 600º C for 12h followed by final sintering in pellet form at 1400º C for 8h. Powder X-ray diffraction pattern were recorded using Rigaku TTRAX III X-ray diffractometer with CuKα (λ=1.546Å) radiation. Temperature and field variations of magnetization were measured by using vibrating sample magnetometer. The dielectric properties were studied by using Wayne Kerr LCR meter.

RESULTS AND DISCUSSION:

All the Sm doped YIG samples are found to be in single phase form as per Reitveld refinement using Fullprof program by choosing Ia d space group. The lattice constant is found to increase from 12.37Å for x = 0 to
12.52Å for x=3.0 and it is due to larger ionic size of Sm3+ (1.07Å) compared to Y3+ (1.01Å). M-H loops recorded at room temperature for different samples are shown in Fig 1(a). The saturation magnetization value is found to decrease with increase in Sm3+ concentration and this can be due to possible antiferromagnetic alignment of Sm3+ ion with the net magnetic moment of Fe3+ ions. All samples show ferrimagnetic transition and its transition temperature is found to increase with increase in doping concentration due to strong exchange interaction among various magnetic sublattices. The measured dielectric constant value is found to be increase with Sm concentration. The complex impedance data could be fitted to Cole-Cole equation as shown in Fig 1(b), and it confirms the contribution from both grain and grain boundaries in the dielectric relaxation.

Fig 1: (a) Room temperature M-H curve (b) Nyquist plot of Sm doped YIG.

ACKNOWLEDGEMENT:

We acknowledge Central Instrument Facility IIT Guwahati for VSM facility, UGC DAE-CSR and CSIR are acknowledged for financial support.

REFERENCES:

[1]. E. J. J. Mallmann, A. S. B. Sombra, J. C. Goes and P. B. A. Fechine, Solid State Phenomena **202** (2013) 65.
[2]. Zhongjun Cheng, Hua Yang, Lianxiang Yu and Wei Xu, J. Mater. Sci. Mater Electron **19** (2008) 442.
[3]. T.C. Mao, J.C. Chen, J. Magn. Magn. Mater **302** (2006) 74.

Liquid Crystal Spatial Light Modulator Based Wavefront Sensing and its Application

Nagendra Kumar, Santanu Konwar, Biswajit Pathak and Bosanta R. Boruah
Department of Physics, IIT Guwahati, Guwahati – 39

ABSTRACT

Liquid Crystal Spatial Light Modulators (LCSLM) are the devices that have the ability to modulate the amplitude and phase of an incident light beam spatially and temporally. This ability of dynamic modulation enables the LCSLM to implement the Computer Generated Holography (CGH) technique to realize the two most important wavefront sensing methods namely, zonal and modal wavefront sensing. Wavefront sensing is a technique that uses a device called wavefront sensors, to detect and measure the amount of aberrations present in a beam. Here, we present some of the simulation and experimental results related to the development of the two sensors. The prototype for the application of zonal wavefront sensor in thin film deposition and surface profiling is also illustrated.

Controlling diffraction of narrow optical beams in atomic vapors

Sandeep Sharma[1]Tarak N. Dey[1]
Department ofPhysics,IIT Guwahati,India
E-mail: sandeep.sharma@*iitg.ernet.in*

ABSTRACT

We propose a scheme based on all-optical waveguiding for diffractionless propagation of narrow optical beams through a atomic vapor in N-type configuration. We use a suitable control beam to optically create a waveguide like structure in the atomic medium for the probe beam. We show that this waveguide is incapable of controlling the diffraction of narrow probe beam with widths down to 10μm. So, in addition we use a Laguerre-Gaussian Kerr beam to enhance the feature of this waveguide by squeezing the core along with sharply increasing index variation between core and cladding. Furtheremore, We show that a Gaussian probe beam with width 10μm can propagate over 15 Rayleigh lengths with scarcely perceptible diffraction through this induced waveguide.

AIMD Investigation of Waterborne Selenium Species

S. BorahandP. K. Padmanabhan
Department ofPhysics,IIT Guwahati,India
E-mail: b.sangkha@*iitg.ernet.in*

ABSTRACT

Selenium (Se), an element of essentially metalloid characters, plays a dual role in human and animal lives because of its needs as micronutrient and toxicity in mild excess. In natural and biological conditions, Se is found is solvated states as Se (VI) and Se (IV) species, both nearly equally available, as reported in experimental studies available in literature. Since phenomena involving solvation are atomic in origin, Molecular dynamics (MD) has been considered as a powerful tool to investigate the microscopic detail of solvation of water and waterborne species having biological and environmental importance. Classical MD however cannot explain bond breaking and reaction mechanisms and systems involving itinerant electrons in general. Density Functional Theory (DFT) based, computationally expensive ab initio Molecular Dynamics (AIMD) is employed for describing such systems. In this study, we have carried out ab initio Car Parrinello Molecular Dynamics (CPMD) studies on various waterborne Se (VI) and Se (IV) species in aqueous environment. The stability of different species in different pH conditions, deprotonation, structural dissimilarities leading to the changes of hydration behaviors and spatial distribution of waters in the hydration shells, hydrogen bonds and strengths and lifetimes of different types of hydrogen bonds, structural relaxation of aqueous environment due to the presence of different Se species and spectroscopic consequences of hydrogen bonding in water are discussed in detail [1,2].

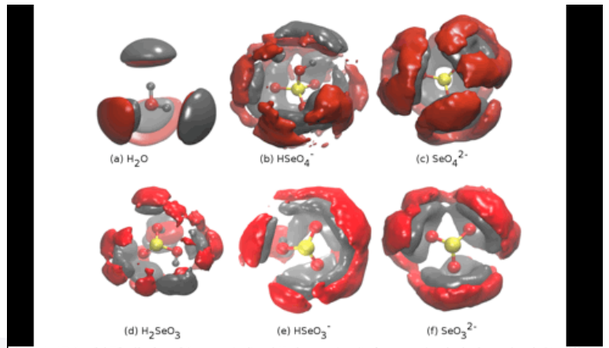


Figure 1: 3D Spatial Distribution of Oxygens (red) and Hydrogens (gray) of water molecules hydrogen bonded to different solutes (b)-(f), compared to bulk waters (a), obtained from CPMD simulations at 315 K.

References:
[1]. S. Borah and P. Padma Kumar, Phys. Chem. Chem. Phys., 18, 14561, 2016.
[2]. S. Borah and P. Padma Kumar, Phys. Chem. Chem. Phys., 18, 26755, 2016.

Study of Surface Morphology and Optical Properties Of Thin Films Grown By PLD

Sasmita Behera*, Gobinda Pradhan, Rahul Kesarwani, Ashwini K Sharma and Alika Khare
Department of Physics Indian Institute of Technology Guwahati,
Guwahati, 781039, India *Email: behera.s@iitg.ernet.in

ABSTRACT

Pulsed laser deposition (PLD) is a versatile technique for deposition high quality thin films. In this technique, a Q- switched Nd-YAG (2nd harmonic) laser is focused onto a target material resulting into ablation and plasma formation which is deposited on the substrate kept parrallel to and few cm apart from the target. PLD technique possesses significant advantages over other film deposition technique firstly because of the capability for stoichiometric transfer of material from target to substrate and secondly relatively high deposition rates can be achieved at moderate laser fluences, with a precise control over film thickness and thirdly a laser is used as an external energy source results in an extremely clean process. The deposition can occur in both inert and reactive background gases. In addition to that the use of a carousel which is accommodated by a number of target materials enables multilayer films to be deposited. By using this technique plasmonic, oxide and sulphide thin films were deposited and studied its structural properties by recording Raman Spectra, Xray diffraction and Atomic Force Microscope images and optical properties were characterized by UV–Visible-NIR Spectroscopy.

Computations of finite temperature properties in magnetic materials

A.Sheuly Ghosh[1],B.Ashis Kundu[1]andC.Subhradip Ghosh[1]
[1]Department ofPhysics,IIT Guwahati
E-mail:sheulyghosh@*iitg.ernet.in*

ABSTRACT

Magnetic materials have been the subject of intensive research due to their multifaceted usages in state of the art technological applications. The characterization of the magnetic properties is an important component in their research. One of the most important parameters that characterizes a magnetic material is the magnetic transition temperature, which is known as Curie temperature for ferromagnets and Neel temperature for antiferromagnets. Accuracy in determining the magnetic transition temperature and its variation against changes in various other parameters is a key component in developing new and novel magnetic materials.

In this work, we propose a first-principle based methodology to compute the magnetic transition temperatures for any complex magnetic material. It consists of accurate computations of the magnetic exchange parameters[1] and using them to compute the magnetic transition temperatures by Monte Carlo method. The magnetic exchange parameters are computed by very accurate Density Functional theory based electronic structure methods and the transition temperatures are obtained from the magnetization versus temperature curve computed by a Monte Carlo code developed in-house. We apply this method to a series of ternary magnetic materials which crystallize in Heusler structure. Our results demonstrate that the Monte Carlo code developed in-house is capable of addressing the quantitative and qualitative variations in the transition temperatures for both ordered and chemically disordered systems[2].

References:
1. *Reports on Progress in Physics* **2011,***74* (9), 096501.
2. *Physical Review B* **2012,***86* (13), 134418.

Probing Heavy Higgs through Cascade Decay

Shibananda Sahoo
Department of Physics, IIT Guwahati, India
E-mail: shibananda@iitg.ernet.in

ABSTRACT

After the Higgs discovery, the multi-Higgs models receive a lot of attention among particle physics community. Searching additional scalars is the primary focus for ongoing LHC experiment. Our main aim to probe these additional Scalars. In this work, we present the analysis for cascade decay of a heavy Higgs by considering four leptons and two b-jets in the final state. We follow a model independent approach. Later, we derive model dependent limits in the context of Type-II 2HDM. We show that this specific final state has potential to probe heavy Higgs of mass up to 1 TeV.

Phase transitions in binary magnetic systems

Sourav Chattopadhyay,and S. B. Santra
Department ofPhysics, Indian Institute of Technology Guwahati,India
E-mail:c.sourav@iitg.ernet.in

ABSTRACT

Very often a first order structural phase transition accompanied by a second order magnetic phase transition are found to occur in variety of materials [1]. Ferrimagnets have two sub-lattices with different magnetic moment and display multiple transitions depending on the value of the spin angular momentum [2, 3, 4]. Such multiple transitions in a single system are also observed in magnetic alloys different magnetic elements. Characterization of such transitions and understanding of critical properties in these systems are rarely found in literature. Here a numerical model of a binary system of a and b type of magnetic ions each of spin- but with different spin-spin interaction energy is developed. The Hamiltonian of such a system in absence of external field is given by, where and represent the spin state of ion and at lattice site and respectively. The interaction strengths among different ions are defined as , and where positive values of s represent ferromagnetic interaction. Similar ions are kept together forming a block of definite size. Blocks of ions and are either kept in regular two dimension array like a checkerboard or randomly distributed over the lattice. The system is simulated following single spin flip Monte Carlo (MC) technique under canonical ensemble keeping temperature and total number of ions fixed. Despite the simplicity of this model, it is able to display double magnetic transitions of two different natures. The first transition at a lower temperature from a ferromagnet to ferromagnet phase is seem to be of first order in nature whereas the second transition at a higher temperature is found to be a second order phase transition from ferromagnet to paramagnet phase. The peaks in the magnetic susceptibility at the respective s confirm occurrence of both the transitions. The order of transitions can be confirmed by evaluating Binder cumulant as well as by evaluating the critical exponents at the respective transition points.

References

[1] S. C. Ma, Y. Wu, Y. L. Huang, Y. Y. Gong, Y. H. Hou, J. F. Ou, Z. C. Zhong, D. H. Wang and Y. W. Du, J. All. Comp. **588**, 316 (2014).
[2] K. Htoutou, A. Ainane, and M. Saber, J. Mag. Mag. Mat. **269**, 245 (2004).
[3] T. Kaneyoshi, Phys. A Stat. Mech Appl. **229**, 166 (1996).
[4] J. Tucker, J. Mag. Mag. Mat. **195**, 733 (1999).

Adatoms in graphene nanoribbons : tuning of spin polarized conductance

Sudin Ganguly[a] and Saurabh Basu
Department of Physics, IIT Guwahati, India
[a]sudin@iitg.ernet.in

ABSTRACT

We study the possibility of realizing tunable spin polarized conductance in graphene nanoribbons (GNR) with randomly distributed adsorbates (adatoms) in presence of Rashba spin-orbit interaction (RSOI). In the clean limit, owing to longitudinal mirror symmetry of the system, only the *y*-component of the spin polarized conductance survives. In presence of adatoms, two things happen. The mirror symmetry is lost which results in finite *x* and *z*-component of the spin polarized conductance. Further, with an infinitesimal concentration of adatoms, the spin polarized conductance is heavily suppressed, which however, increases significantly as the concentration of adatoms is increased. Finally, computation of the charge conductance provides a solid support of the existence of quantum spin Hall phase which remains robust in presence of adatoms

Influence of hydrogen plasma treatment on the performance of the c-Si/a-Si:H heterojunction solar cells

V.Kanneboina[1], Ramakrishna Madaka[1] and Pratima Agarwal[1,2,*]
[1] Department of Physics, Indian Institute of Technology Guwahati, Guwahati, Assam, India.
[2]Centre for Energy, Indian Institute of Technology Guwahati, Guwahati, Assam, India.
E-mail:*pratima@iitg.ernet.in

ABSTRACT

c-Si/a-Si:H heterojunction solar cells(Ag/(n) c-Si/(i) a-Si:H/(p) a-Si:H/ITO/Ag) were fabricated by RF PECVD in multichamber system. Double side polished n-type crystalline silicon wafer of thickness 275-325 μm, resistivity 5-10 Ω cm, was used for fabricating heterojunction solar cells. The cells were deposited with and without hydrogen plasma treatment of (i) a-Si:H layer prior to the deposition of top (p) a-Si:H layer. Two different i-layer thickness of 10 nm and 50 nm were used when no plasma treatment were done. Further 50 nm thick (i) a-Si:H layer was subjected to 1 min and 2 min H_2 plasma treatment. Figure shows the characteristics of solar cell with 2 min, 1 min and no H_2 plasma treatment. It was observed that 2 min H_2 plasma treatment of i- layer resulted in an improvement of both V_{oc} and FF of the solar cell. Open circuit voltage and fill factor of solar cells are decreased with decreasing H_2 plasma treatment time. The Hydrogen plasma treatment of i-layer passivated the interface recombination sites and surface dangling bonds and also decreased the series resistance, which resulted in improved open circuit voltage and fill factor.
We achieved high open circuit voltage of 613mV and efficiency of 5.17 % for the solar cell with 2 min H_2 plasma treatment of i-layer. Further optimization of thickness of i-layer, p-layer and H_2 plasma treatment is required to achieve the state of the art efficiency.

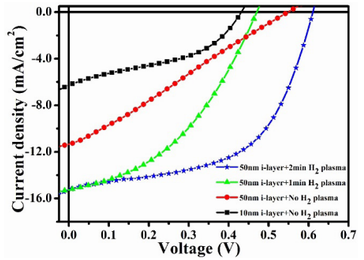


Fig: J-V characteristics of c-Si/a-Si:H heterojunction solar cells with and without H_2 plasma treatment.

Conservation of *Bari* Biodiversity through Empowerment of women in Assam

Nivedita Deka[1], Kalyan Pathak[2] and Rinumoni Buragohain[3]
[1] Professor, [2]Principal Scientist and [3]Junior research Fellow
Assam Agricultural University, Jorhat-13, Assam, India

ABSTRACT

Assam is one of the hot spot of biodiversity in the world. *Bari* is the integral part of the livelihood of the poor rural communities, contributing to health, food and nutritional security. A diverse ethnic community of the state has distinctive management practices coupled with traditional knowledge on *bari* biodiversity. However, the composition of *bari* diversity is rarely documented in the state till date. Women play a vital role in the management of *baris*. *Bari* appears to be a potential source of additional income for the women. But the role of women in *bari* management is hardly recognized and expressed in socio cultural and monetary terms. Therefore the present study was conducted in Jorhat district covering four communities viz., *Ahom, Kalita, Mishing* and *Thengal Kachari* with 50 households from each community with the objective of assessing and documenting the bari diversity and empowering the women for value addition of bari products. Participatory Rural Appraisal (PRA) and Focus Group Discussions (FGD) were conducted in each village. Different numbers of plant species present in *baris* were identified and documented. There were differences in composition of bari products in different communities. Training on proper management of *bari*, value addition to *bari* products was given to the women. There were also brought for exposure visit to Assam Agricultural University, Jorhat. Various plant saplings including medicinal plants were distributed to them to plant in their *baris*. The study showed a nominal rate of about 6 per cent contribution of *bari* products to the household income. Further the study suggested that the households should go for value addition to theirs *bari* products to contribute significantly to the household income.

Key words: *Bari,* Empowerment, women, value addition, Assam

Marginalisation of Women: A study of Kafka's "Up in the Gallery" and "Clothes"

Sohini Dasgupta, BA(Hons) German Literature,
Jawahar Lal Nehru University,New Delhi
EMail sohiniasansol@gmail.com

ABSTRACT

"No age can ever have been as stridently sex-conscious as our own," Virginia Woolf wrote in 1928, and now almost a century later her words seem to be all the more coherent. Feminists in the last few decades have critically studied the role of women in the society and their representation in different works of literature. My paper attempts to trace this position of women in Kafka's short stories "Up in the Gallery" ("Auf der Galerie") and 'Clothes' ("Die Kleider")

The paper will attempt to bring out the usage of reality and illusion in these short stories of Kafka. It seems the reality lies in the appearance. There is a conscious filtration of tainted images of patriarchal canonical authority—the reality. There is possibly also a representation of patriarchal hierarchy in the story through the dominance of masculinity over the characters. This paper discusses the exploitation of female sexuality in these short stories and tries to reveal the marginalization of women, the voiceless. This paper will also seek the reason behind the use of themes like clothes and circus. The narrative style of using long sentences will also be discussed.

Kafka has acted as an instrument of the polemicist to delve into the marginalized condition of women and the immense exploitation which has left an indelible mark on the feminine world.

Woolf, Virginia. *A Room of One's Own*. Harmondsworth: Penguin, 1998. 94.

Body and Health : Women in the Margins of Nalbari District of Assam.

Purabi Bhagawati
Tezpur University (A Central University),
Department of Sociology, Tezpur ,Assam

ABSTRACT

The concept of 'Health' has been widely been understood differently and therefore a comprehensive understanding of the concept is still elusive. It's largely embedded in the wider historical as well as socio-cultural locale. The political economy of state also has a significant bearing in understanding the same. In this study, an attempt has been made to see how the various social determinants of health have played an important role in terms of marginalized women's health. Marginalised is often described as a social process in which certain sections the community has been relegated to the margins of society in terms of their affiliation (percived or real) to low status. It is a process where people or communities are being excluded from the mainstream. In a patriarchal world, the social location of women itself is in the margin. However, this study tries to disaggregate the differential social location of women in terms of their class, caste, tribe, place of residence, migrant status, etc to delineate the differential experiences in understanding what health means to them.How they negotiate with their body and health in their everyday life. How the micro level as well as macro level systems influences their own experiences of body and health?The paper tries to answer these questions with an ethnographic study conducted in three different villages of NalbariDistrict of Assam.

The data presented in this paper were gathered during fieldwork conducted from October 2015 to May 2016 for a study on Gendering Health :A study among the women in Nalbari District of Assam. The field work has been done in three villages in the same district. The interview guide is used for in depth interview. Meanwhile, the male counterpart as for instance the head of the village, the village pharmacist also have been interviewed to know the health condition of their locality. All interviews were audio-recorded, transcribed, translated into English.The data will be analysed with the help of atlas ti 7 version.

The Stage as a Medium of Resistance: A Comparative Analysis of Contemporary Assamese Plays

Deepashree Das
The English and Foreign Languages University
Hyderabad, India
Email:deepashreedas@gmail.com

ABSTRACT

The period post-1990s can undoubtedly be hailed the postmodern phase of theatre in Assam as it witnessed a myriad of experimentation and innovation in stagecraft and performance. In this paper I use three plays staged in the last two-three years, all critically acclaimed, to examine the evolution undergone by theatres to use performance as a medium of voicing protest and resistance against various social, political contentions. The play *Barkhaaswapna* by Himangshu Prasad Das is a statement against socio-political atrocities and violence in post-Assam Agitation Assam. The parallel stories depict the disillusion of armed rebellions, secret killings, army atrocities especially on women, flaws of the judiciary and government machinery and at the same time the clash of tribals and nontribals, the use of Sanskrit and Hinduism as colonising forces and distancing of men from nature. *Kanchan*, the theatrical adaptation by Utpal Dutta of Anuradha Sharma Pujari's novel with the same title, redefines the positions of women. *Kanchan*, the protagonist thwarts notions of shame, sexuality, ethics and mental health established by the society to target women. Playwright Kismat Bano's play *Bano* makes deft use of just one question raised by the Shakespearean character King Lear to depict a modern-day situation. Woven around the life of Bano, a young theatre artist, the play examines the position of women in a fatherless Muslim household and yet lets Bano overcome all forces that suppress her and emerge successful. These plays resist the representation of characters in stereotypical lights and make them appear more round, gray and fragmented. The characters are empowering and yet not heroic, more realistic and do not confine to thwarting representation alone. Instead, they act in a mode of resistance.Bano, Kismat. *Bano*.

Das, Himangshu Prasad. *Barkhaaswapna.*
Derrida, Jaques. "Plato's Pharmacy". http://www.occt.ox.ac.uk/sites/default/files/derrida_platos_pharmacy.pdf 09/10/16
Dutta, Utpal. *Kanchan.*

Mulvey, Laura. "Visual Pleasure and Narrative Cinema". *Screen*. 1975. Oxford Journals. 16 (3): 6–18.
Pewny, Katharina. "Staging Difference: Theater–Representation–Politics". IWM Junior Visiting Fellows Conferences, Vol. Vienna: IWM 2000.
Padma, V.(Managai). "Re-presenting Protest and Resistance on Stage". *Indian Journal of Gender Studies*. September 2000 vol. 7 no. 2 217-230
Singh, Anita. "Introduction On and Beyond The Stage Women and Theatre in Indiaǁ." *Gender Space and Resistance*. D.K. Printers Pvt. Ltd. 2013. Page 1-43.

COMPARISION OF GROWTH OF SMALL AND LARGE CITIES IN INDIA

TAMALI HALDER, CSRD, SSS, JAWAHARLAL NEHRU UNIVERSITY, NEW DELHI: 110067

ABSTRACT

The spatial distribution of urban population takes place among settlements of various size starting from small cities with population ranging from 5000-9999 to a large city having a population of more than 1,00,000. The study of size of urban population by size class of towns gives an insight into the urban development of a country or a state. On the other hand change in the size and distribution of population is also associated with the occupational structure Due to increase in the population typically the agricultural sectors are not able to accommodate such increase but with the accelerating industrialization or urbanization there is a gradual shift in the occupational structure of Indian workforce. The present paper seeks to analyze the growth of urban population by size class of towns in association with the nature of the work force participation along with the share of population involved in the agricultural and the non-agricultural sectors with special reference to large cities or the class one towns and small cities or class five towns focusing mainly on the time periods of 2001 and 2011.It is seen that the disparity in the growth rate is due to the declassification of the many small towns while on the other hand few areas registered increase in the population which reflects a duality in the nature of the economy or to be precise the instability in the economic base of the country.

REFERENCES:

P. Rana And G. Krishnan (1981) "Growth of small and medium sized towns in India." Geo Journal Vol 5, No1, pp-33-39
Ram. B. Bhagat (2005) "Urban Growth by City and town size In India"
Kundu. A (1997) "Trends and Structure Of Employment In The 1990s. Implications For Urban Growth" Economic and political weekly 32(4): 1399-1405
Kundu .A (1983) "Theory Of City Size Distribution And Indian Urban Structure- A Reappraisal". Economic And Political Weekly, 18(3)
Sen. A and Ghosh. J (1993)-"TrendsIn Rural Employment And Poverty Employment Linkage" ILO-ARTEP-Working Paper-New Delhi
Mukherjee Shekhar (1995) "Poverty Induced Migration And Urban Involution In ESCAPC Countries" Bangkok, pp 1-45
Kundu. A (1994) " Pattern Of Urbanization With Special Reference To Small And Medium Sized Towns In India", Har Anand Publications, New Delhi.

TRENDS IN MANUFACTURING TRADES IN INDIA
A COMPARISION OF THE DECADES OF THE 1990S AND 2000S

GOURAB SAHA, M.A SEM 2, CSRD, JNU, NEW DELHI 110067

ABSTRACT

Manufacturing process creates from raw material to more designable materials or products and it value to Raw material. By which process manufacturing goods are exported to a country and also imported from another country is called manufacturing trade. In this paper I want to infer into the various dimension of manufacturing trade like, the spatial (from INDIA TO OTHER COUNTRIES and VISE VERSA) and Temporal aspect (among 1990-91, 2000-01, 2010-11). I mainly focus on the export and import scenario of the various manufacturing goods along with the relation with the total national import and export of various years. I have fragmented import into two parts bulk and non-bulk goods. My major findings are like these, there is a sudden increase and decrease in the trends in export and import. India has focused only in one goods while exporting to a particular country in a particular period. In respect to the total national export increase, in the case of manufacturing goods it lags behinds. I suggest that government policy and FDI are very much essential to develop in this sector because it has a great potentiality to serve the future growth of the Nation.

Reference:

DAS DEB KUSUM (July 2003), "MANUFACTURING PRODUCTIVITY UNDER VARYING TRADE REGIMES: INDIA IN THE 1980s AND 1990s",INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS.
GOLDAR BISHWANATH AND KUMARI ANITA, "IMPORT LIBERALIZATION AND PRODUCTIVITY GROWTH IN INDIAN MANUFACTURING INDUSTRIES IN THE 1990s", The Developing Economics, XLI-4 (December 2003): 436-60.
GOLDAR BISHWANATH (2013)," Determinants of Import Intensity of India's Manufactured Exports under the New Policy Regime", Department of Economics, Delhi School of Economics, University of Delhi.
Alessandrini Michele, Fattouh Bassam and Scaramozzino Pasquale (2007)," The changing pattern of foreign trade specialization in Indian manufacturing", Oxford Review of Economic Policy, Vol. 23, No. 2, pp. 270-291
VeeramanicC. (2007)," Sources of India's Export Growth in Pre- and Post-Reform Periods", Economic and Political Weekly, Vol. 42, No. 25, pp. 2419-2427.
NayakShibananda, Aggarwal Vani, Mann Peeeti (2013), "India's Manufacturing Exports Dynamics: An Analysis of Technology Intensity Transition", Centre for WTO Studies (CWS), Indian Institute of Foreign Trade, New Delhi.
UnniJeemol, Lalitha N., Rani Uma (2001)," Economic Reforms and Productivity Trends in Indian Manufacturing", Economic and Political weekly, Vol. 36. No. 41, pp. 3914-3922.

LAND DISTRIBUTION INEQUALITY IN RURAL INDIA; A STATE LEVEL ANALYSIS ON THE BASIS OF GENDER (1995-96 AND 2010-11)

SUBHADEEP MONDAL, M.A SEM 2, CSRD, JNU, NEW DELHI 110067
CONTACT 8860844600, subhapgadmission2016@gmail.com

ABSTRACT

LAND is the major resource and fundamental means of Production in RURAL INDIA because India is still mainly an agrarian society. Land has dynamic relationship with society, economy and politics. I want to infer into the female autonomy and land holdings in the rural India in each states. From the various literatures I have found that they talked about the inequality in the land holdings in terms of cast class and many other things. But in this paper I have approached this inequality of marginal and large land holdings issue in a new ways which is GENDER which is by its nature multidimensional (link with social norms, legislative policy, various personal laws and inheritance laws). This is basically a comparative study of spatial (across the states of India) and temporal (1995-96 and 2010-2011) dimension of land holding inequality. Results shows that there is inequality in both large and marginal holding. LAND REFORM is the only solution to annihilate the GENDER

INEQUALITY.Question of holdings does not leads to the power of control. (NORTH EAST INDIA).Family structure has a major role to play in this case.Control on land is important to control the power & dominate the society. That's why Male are more domination than female.

Reference:

Agarwal, Bina. (1994),"Afield of one's own, Gender and Land rights in India", *Cambridge University Press.*
Banister, j. *(2004),*"shortage of girls in china today", *journal of publication Research.vol no 2, no1*
Boserup, e*(1989)*"population: the status of women and rural Indian development,
Population and development review, vol 15, September
Bardhan, p.k,"land labour and rural proverty"*OUP, New Delhi.*
Engels (1884), "the origin of the family, private property and sates, *resistance Marxist Library*
Goli, Srinivas. (2013),"Landholdings-patriarchy hypothesis and women's autonomy in rural
India", *International journal of social economics, vol11, no 3*
Mishra, R C. (2006), 'Women in India: Towards Gender Equality', *Author press, New Delhi*
Rawal,Vikas. (2008), 'Ownership Holdings of Land in Rural India: Putting the Record
Straight', *Economic and Political Weekly, Vol. 43, No. 10 (Mar. 8 - 14), pp. 43-47*
Sharma, H R. (2007) 'Land Distribution and Tenancy among Different Social Groups',
Economic and Political Weekly, Vol. 42, No. 41 (Oct. 13 - 19, 2007), pp. 4183-4185
Susie, Jacob (1996),'Structure and process: Law, Family and Gender Relations', *Geography and Development, vol 4, no 2.*
Tikal, B G. (1983),"Inequality in Education by sex in India", *journal of Industrial Relation, vol 18, no 3.*
Wadley, S. (1997),'Women and Hindu Tradition', *Manohar Books, New Delhi*

Kaziranga: Another side of the story
Kaziranga's contribution to livelihood of the surrounding community

Shyam Cheng Konwar
MBA in Agribusiness Management, College of Agriculture, Assam Agricultural University
E-mail:Shyamchengkonwar3@gmail.com

ABSTRACT

Kaziranga is famous for the conservation success story of the world famous One-Horned rhino. It has been declared as a World Heritage Site in the year 1985.The Kaziranga National Park contains stock of herbivores- Asian Elephant, Asiatic Water Buffalo and Eastern sub-species of the Swamp Deer. Kaziranga also has the highest density of tiger in the world and declared as a Tiger Reserve in 2006. Tourists benefit the people living in the fringe of the park and helps in empowering the local people. About 39 hotels are located outside the park. A total of 299 people are actively employed in those hotels. However, a few hotels are owned by the local people. Further, some families are offering home stay facilities so that the tourists may get a taste of the local life. Local people own vehicles which are allowed to be taken into the park and most of the owners act as driver cum guide. There are also shops selling souvenir etc. that are owned and managed by local community. Many local woman also regularly perform traditional dances at some of the large hotels like Bihu , Jhumu dance etc. Many sell locally homemade woven cloth to the tourist which act as money churner. Ministry of Tourism, Govt of India along with UNDP is jointly supporting rural tourism in village of Durgapur which falls in the periphery of Kohora range, Kaziranga. Approximately, 100 to 200 persons per season are hired for removal of mimosa as it is harmful weed for herbivores. The park authorities have also hired 15 local people as a security guard to protect tourist jeeps inside the park. There is tremendous scope for the sale of handicraft and employment opportunity for local youths. Self Help Groups could provide a platform for such mechanism.

Key words: Hotels, hand woven cloths, employment, SHG, Kaziranga

Smartness in smart cities: ICT based crowd-sourced solutions to make cities smart

Harish Kumar1, a), Manoj Kumar Singh1,b), M.P. Gupta1, c) and J. Madaan1, d)
1Department of Management Studies,
Indian Institute of Technology, IIT Delhi, New Delhi 110016, India
a)harishkr08@gmail.com,b)manojksiet@gmail.com,c)mpgupta@dms.iitd.ac.in,d)jmadaan@dms.iitd.ac.in

ABSTRACT

The increasing population causes a lot of pressure on infrastructure and services in cities. The cities are facing a lot of problems in terms of safety, job opportunity, civic services, transportation, mobility, economic restructuring. Smartness of a social system could be characterized in terms of intelligence, learning capability, digital innovativeness, knowledge management, sustainability and networking. The Information communication technology (ICT) infrastructure is considered as primary pillar in developing the smart cities. ICT drives innovations and redesigns the relationships among the governments, private sector and citizens in a city to ensure interoperability within as well as across the city. ICT introduces smartness in various service domains like transportation, energy, education, health and care, civic utilities, etc. The study focuses on the various ICT components required to build a smart city. The crowdsourcing method was used for idea generation. Conventional content analysis was used to classify the ideas into four inductive categories based on relevance. The findings suggest the various ICT components which could be implemented to make cities smart. The challenges in ICT implementations are also explored in the study.

Keywords: *Smart cities, crowd sourcing, content analysis, ICT solutions.*

(Endnotes)

1

Devolution of power and ethnic violence in Bodoland Territorial Area Districts (BTAD) of Northeast India

Aniruddha Kumar Baro1
1 Department of Humanities and Social Sciences, IIT Guwahati, India
E-mail: b.aniruddha@iitg.ernet.in

ABSTRACT

What are the conditions under which a territorial autonomy may fail to prevent ethnic violence? Territorial autonomy or devolution of power which is used to prevent ethnic violence/separatism by means of devolution of powers to sub-national units on the basis of cultural distinctiveness and territorial concentration of ethnic groups. Countries like Aland Island, South Tyrol, India and Indonesia contained ethnic violence by providing autonomy to ethnopolitical groups demanding separatism. Despite few success stories, there are instances where devolution of power led to contrary outcomes and created the conditions for separatist violence. For instance, South Asia, particularly, Northeastern regions of India and Sri Lanka and Bangladesh's northern region where political autonomy produced adverse outcomes and instead of preventing violence, autonomy created the conditions for separatist violence. The paper aims to address this question with the help of established literature on conflict prevention and electoral incentives. Evidence with the help of interviews and qualitative tools will be drawn from the Northeast part of India, particularly the Bodoland areas of Assam which attained territorial autonomy in 2003 by means of devolution of power as conflict prevention measure. Territorial autonomy was granted to the Bodos on the basis of their cultural distinctiveness, territorial concentration and long standing demands made by the ethnic group. The policy of devolution of power was implemented to reduce ethnic violence in the areas. However, this paper argues that power devolution in 2003 led to varied outcomes and created conditions for violence. This paper tries to understand ethnic violence from the perspective of elite competition and argues that elite competition as one of the primary conditions of discontentment and ethnic violence in territorial autonomous structure of BTAD. This paper contributes to understanding how electoral incentives of political elites have a role to play in ethnic violence after devolution of political autonomy.
Independent determining factors Dependent factor 1. Electoral competition
2. Competition for resources
X1 (Intensive power Ethnic violence struggle among elites)

Photographic Tourism in NE India: Its Prospects and Problems

Photographic Tourism in NE India: Its Prospects and Problems

Deborshee Gogoi
deborshee05@gmail.com
Digboi College

ABSTRACT

'Photographic tourism' as a new dimension to the existing tourism industry is slowly gaining momentum. The success of 'Photographic tourism' is directly linked with the popularity of photography among masses. With technological development in the field of camera and optics, it is observed that photography has become an integral part of our day to day life.

Every year people spend huge amount of money on buying photographic gears and travelling to near and far-off places only to take that particular photograph(s) that makes them happy. This can be treated as a separate discipline where tourists primarily involve themselves in travelling to places with the primary objective of taking photographs.

Northeastern Region of India poses huge potentialities with regard to Photographic tourism. Its exquisite landscape, colorful people and their culture, historical places, ethnic dress codes and cuisines, diverse flora and fauna will provide ample scope to photographers from around the world with diverse subject interest.

The concept of photographic tourism is quite new and there is a dearth of research that develops a conceptual framework. Due to scant research, potentialities of photographic tourism to contribute towards socio-economic and environmental aspects have never been highlighted nor effective plans and policies are being formulated to develop an area as a potential 'photographic tourism destination'. This paper tries to identify the potentialities of Photographic Tourism in NER and also the problems associated with it.

Present Status of White Winged Duck Cairina Scutulata in the District of Tinsukia Gaurav Das Digboi College deborshee05@gmail.com

Abstract

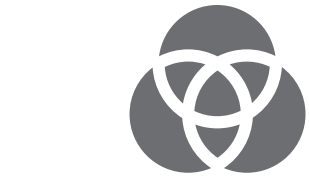
White winged Duck Cairina Scutulata is the state bird of Assam. Native to India, southeast Asia, and Indonesia, it is among the rarest of all birds. Perhaps less than 5% of the original population survives (Green 1993) today. Birdlife International (2011) considers it endangered based on rapid decline of its very small and fragmented population, and loss and disturbance of its habitat. The estimated population size is 250-999 which is declining due to destruction, degradation and disturbance of riverine habitats including loss of riparian forest corridors. Hydro-power development, inappropriate forest management, and pollution are more localized threats. It may be particularly susceptible to loss of large trees with nesting holes (W. Duckworth in litt. 2006). The bird has already gone extinct in Malaysia and Java. There are no confirmed recent records from Laos, however, a few birds probably survive in the Nam Theun catchment (W. Duckworth in litt. 2012). Its current distribution is chiefly in the eastern lowlands of Assam and Arunachal Pradesh (A. Rahmani in litt. 2012). Tinsukia district is one of the important strongholds of this species. It is believed that majority of its population is located in this easternmost district of Assam.

This makes conservation issues concerning White-winged Duck in and around Tinsukia district very much vital for its long-term survival. This paper aims at identifying the present status of this species in the district of Tinsukia and the probable threats concerning its conservation.

Research Conclave'17

An amalgamation of Academia, Industry & Startups

Research Conclave'17
Members


Research Conclave'17
An amalgamation of Academia, Industry & Startups