



# Abstract Volume

## 5<sup>th</sup> Regional Science & Technology Congress

2023

(Region 5: Paschim Medinipur, Purba Medinipur and Jhargram)

Date: January 13-14, 2023

Venue: Raja Narendralal Khan Women's College, Midnapore



*Organised jointly by*

**Raja Narendralal Khan Women's College (Autonomous)**

Midnapore – 721102, West Bengal

*and*

**Department of Science & Technology and Biotechnology**

Government of West Bengal

# উজ্জল বিশ্বাস

(ভারপ্রাপ্ত মন্ত্রী)

বিজ্ঞান ও প্রযুক্তি এবং জৈবপ্রযুক্তি দপ্তর  
পশ্চিমবঙ্গ সরকার  
বিজ্ঞান চেতনা ভবন  
২৬/বি, ডিডি ব্লক, সেক্টর - ১, সল্টলেক  
কোলকাতা - ৭০০ ০৬৪  
দূরভাষ : (০৩৩) ২৩৩৪-৮০৭৪, ২৩৩৪-১৪৩৩  
মেল : pstomicstbt@gmail.com



## UJJAL BISWAS MINISTER IN CHARGE

Department of Science and Technology & Biotechnology  
Government of West Bengal  
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E-mail : pstomicstbt@gmail.com

No.126-MIC/STBT

Date: 21.12.2022

### MESSAGE

I am indeed very happy to inform that Department of Science & Technology and Biotechnology, Govt. of West Bengal has initiated the effort of organizing West Bengal State Science and Technology Congress every year jointly with different Universities and Educational Institutions in order to encourage and provide a forum for scientific research especially for the young scientists and synergies new ideas with societal needs.

Seven Satellites Regional Science and Technology Congress are being organized this year (2022-2023) to expand the opportunity to the remotest parts of the state with the aim to confluence the ideas of budding scientists and eminent scholars.

Raja N.L. Khan Women's College, Medinipur, took the responsibility of holding the 5<sup>th</sup> Regional Science & Technology Congress -2022 for Region -5 to be held on 13<sup>th</sup> & 14<sup>th</sup> January, 2023 and going to publish an Abstract Volume of submitted scientific research papers of the participants.

I take this opportunity to convey my thanks and heartfelt gratitude to all those whose love of the subject made the science congress and the publication possible.

I welcome all the delegates and organizers.

I also wish them success in all spheres of pursuits for human development.

  
(Ujjal Biswas) 21.12.22

Dr. Jayasree Laha

Principal

Raja N L Khan Women's College, Medinipur

UJJAL BISWAS  
Minister-in-Charge  
Department of Science & Technology  
and Biotechnology  
Government of West Bengal

**Professor Sibaji Pratim Basu**

Vice-Chancellor  
Vidyasagar University  
Midnapore - 721102



## VIDYASAGAR UNIVERSITY

Date: 19.12.2022

### MESSAGE

I am happy to learn that the 5<sup>th</sup> Regional Science & Technology Congress, 2022-'23 (Region-5: Purba Medinipur, Paschim Medinipur and Jhargram) is going to be organized jointly by the Department of Science & Technology and Biotechnology, Government of West Bengal and Raja Narendra Lal Khan Women's College (Autonomous), Paschim Medinipur on January 13 & 14, 2023.

I commend the endeavour of the organizers and hope that the deliberations in the Congress will really be enriching to all the participants.

I extend my greetings and good wishes on the occasion.

*Sibaji Pratim Basu*

**(Professor Sibaji Pratim Basu)**

**Dr. Jayasree Laha,**  
**Principal and Joint Organising Secretary,**  
**5<sup>th</sup> Regional Science & Technology Congress, 2022-'23**  
**Region-5: Purba Medinipur, Paschim Medinipur and Jhargram,**  
**Raja Narendra Lal Khan Women's College (Autonomous),**  
**Paschim Medinipur.**

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# MAHATMA GANDHI UNIVERSITY

PURBA MEDINIPUR-721628  
WEST BENGAL, INDIA

Ref. No. : VC/MGU/MISC.(01)/2022  
.....

23.12.2022  
Dated : .....

## MESSAGE

It is my great pleasure to learn that the 5<sup>th</sup> Regional Science and Technology Congress 2022-23 (Region 5: Purba Medinipur, Paschim Medinipur and Jhargram) is going to organize jointly by Department of Science & Technology and Biotechnology, Government of West Bengal and Raja Narendra Lal Khan Women's College (Autonomous) on 13-14th January, 2023. The Congress will provide the platform for the young Scientists to interact and exchange their ideas on the subject.

I wish the congress all success.



[Prof. (Dr.) Subrata Kumar De]  
Vice- Chancellor  
Mahatma Gandhi University  
Purba Medinipur-721628

To  
Dr. Jayasree Laha,  
Principal & Joint Organizing Secretary (5<sup>th</sup> RSTC 2022-23)  
Raja N.L.Khan Women's College (Autonomous)  
Midnapore-721102



**Sadhu Ram Chand Murmu University of Jhargram**

Jitusol, Jhargram-721514, West Bengal, India

**Prof. Amiya Kumar Panda**

**Vice-Chancellor**



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**Date: December 19, 2022**

### **MESSAGE FOR SYMPOSIUM**

It is a matter of great pleasure that the 5<sup>th</sup> Regional Science and Technology Congress 2022-23 (Region-5: Purba Medinipur, Paschim Medinipur and Jhargram), is going to be organised jointly by Department of Science & Technology and Biotechnology, Government of West Bengal and Raja Narendra Lal Khan Women's College (Autonomous), Midnapore during January 13-14 January, 2023.

This is very much encouraging to get such vast responses from the scientific community in this region. I am sure that the symposium will provide a forum for Scientists, Faculty Members, Research Scholars and Students to participate and discuss about the recent development of Science and Technology.

I am also confident about the concomitant advancement of research in such a scientifically stimulating environment during the symposium.

I convey my best wishes to the organizers and dignitaries present in this seminar and wish it a grand success and all the participants to be immensely benefited from the scientific exchanges.

I also wish this praiseworthy effort of the organizers to surely make the grade in motivating the students to their future goals and thrive for excellence.

With sincere regards,

*Amiya Kumar Panda, 19/12/2022*

**Amiya Kumar Panda**

Vice-Chancellor

Sadhu Ram Chand Murmu University of Jhargram

**Dr. Jayasree Laha**

Principal

Raja Narendra Lal Khan Women's College (Autonomous)

Midnapore-721102

**Prof. Anuradha Mukhopadhyay**  
Vice Chancellor  
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**THE SANSKRIT COLLEGE AND UNIVERSITY**  
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Phone: 033 2241-3611/1906



23/12/2022

## Message

I am happy to learn that Raja Narendra Lal Khan Women's College (Autonomous) has been entrusted by the Department of Science & Technology and Biotechnology Government of West Bengal with the organization of the 5<sup>th</sup> Regional Science and Technology Congress 2022-23 (5<sup>th</sup> RSTC 2022-23) to be held on 13<sup>th</sup> & 14<sup>th</sup> January 2023.

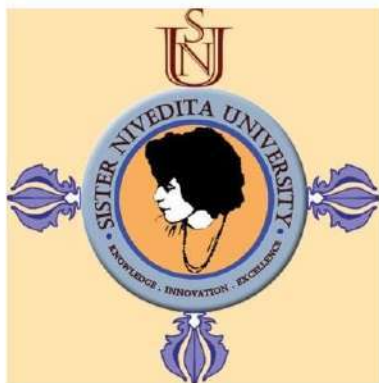
Raja Narendra Lal Khan Women's College (Autonomous) has earned a reputation for organizing many academic and co-curricular activities with great sincerity and efficiency.

I am confident that this mega event will be successful in providing a platform for interaction not only between participants and delegates but also with experts in the field.

I wish all members of the organizing committee, faculty members of the college, all experts and judges and all participants a very meaningful and enriching Science and Technology Congress.

*Anuradha Mukhopadhyay*

(Professor Anuradha Mukhopadhyay)  
Member of Academic Council  
Raja Narendra Khan Women's College (Autonomous)



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**Professor (Dr.) Dhrubajyoti Chattopadhyay**  
PhD, F.A.Sc, F.Na.Sc, F.A.Sc.T  
Vice Chancellor, SNU, Kolkata

**Dated: 17<sup>th</sup> December 2022**

## Message for the 5<sup>th</sup> Regional Science, Technology & Biotechnology Congress 2022-23

I would like to convey my good wishes to all the guests and esteemed dignitaries of the 5<sup>th</sup> Regional Science, Technology & Biotechnology Congress 2022-23. Raja Narendra Lal Khan Women's College (RNLKWC) was established 1951 and has been a epitome of knowledge spreading education in the area of Midnapore and being a pioneer in promoting Women Education.

The 5<sup>th</sup> Regional Science, Technology & Biotechnology conference will provide a platform for research and collaboration on various aspects. RNLKWC has come a long way to since 1957 in developing itself and its infrastructure to promote academic excellence in the campus. It's a great achievement for RNLKWC to host an event, like this one, which itself is a testimony to the fact that if one is determined to excel and push ahead the barriers one can achieve phenomenal progress. I would like to congratulate Dr. Jayasree Laha, Principal of RNLKWC for making this college grow exponentially and becoming the steering force to guide this college to achieve such remarkable progress.

The event will attract eminent Speakers and delegates from all over the country and would a platform to discuss new challenges affecting Science, Technology and Biotechnology. The Congress will also give an opportunity to various students across the country to present their papers and participate in various scientific discussions. Events like these are highly essential for the development of Science and the Scientific Temper.

The Congress will not only help RNLKWC in fostering research and development but would also be a source opportunity for other educational institutions in that area to update themselves in the recent developments of Science, Technology and Biotechnology.

I hope RNLKWC has taken a wonderful initiative in hosting this event and I hope this event becomes a grand success.

Yours Sincerely,

Dhrubajyoti Chattopadhyay  
Vice Chancellor, Sister Nivedita University Kolkata,  
India.



**SMT. AYESHA RANI. A., I.A.S.**

District Magistrate & Collector  
Paschim Medinipur

D.O No. 371 DM

Date 03/01/23

I am glad to learn that members of the Managing Committee of Raja Narendra Lal Khan Women's College (Autonomous) Midnapore and Department of Science & Technology and Biotechnology, Government of West Bengal jointly going to organise the 5<sup>th</sup> Regional Science and technology Congress 2022-23 (5<sup>th</sup> RSTC 2022-23) at Raja Narendra Lal Khan Women's College on 13<sup>th</sup> and 14<sup>th</sup> January, 2023.

I convey my best wishes & Congratulations to all the members associated with the programme and wish the same to be a grand success.

  
(Ayesha Rani A.)

Dr. Jayasree Laha,  
Principal & Joint  
Organising Secretary,  
5<sup>th</sup> Regional Science and  
technology Congress 2022-23,  
Raja Narendra Lal Khan  
Women's College(Autonomous),  
Gope Palace, Midnapore-721102.





OFFICE OF THE PRINCIPAL

# Raja Narendra Lal Khan Women's College (Autonomous)

GOVT. SPONSORED

ESTD : 1957

NAAC RE-ACCREDITED "A" GRADE | NIRF RANK-73 (2022) | DST - FIST | DST - CURIE  
UGC - BSR & COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)

Recognised Research Centres in (i) Natural & Applied Sciences and (ii) Humanities & Social Sciences

Gope Palace, Dist. - Paschim Medinipur, Pin - 721102, West Bengal

Ref. No. ....

Date : 4/01/2023

It is quite gratifying to note that Raja Narendralal Khan Women's [Autonomous], Midnapore is jointly organizing the 5<sup>th</sup> Regional Science and Technology Congress 2022-2023, in association with department of Science and technology, Govt. of West Bengal on 13<sup>th</sup>-14<sup>th</sup> January, 2023.

Organizing such an event at this point of time reinforces our objective of developing an environment for the exchange of ideas towards science and technological developments. I wish this Congress would be able to deliberate on current issues of national and international significance in the field of science and technology.

I am sure that this event will deliver a cordial environment for the researchers and academicians to freely exchange the views and ideas with others. I send my warm greetings and compliments to the organizing committee and the participants and extend my best wishes for the success of the Congress.

(Ashutosh Ghosh)



OFFICE OF THE PRINCIPAL

# Raja Narendra Lal Khan Women's College (Autonomous)

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Recognised Research Centres in (i) Natural & Applied Sciences and (ii) Humanities & Social Sciences

Gope Palace, Dist. - Paschim Medinipur, Pin - 721102, West Bengal

Ref. No. ....

Date : 4/01/2023

## MESSAGE FROM PRINCIPAL'S DESK

It is a great pleasure for me to welcome you all to the 5<sup>th</sup> Regional Science and Technological Congress 2022-2023 jointly organized by our college Raja Narendralal Khan Women's College [Autonomous] Midnapur and the Department of Science and Technology, Govt. of West Bengal to be held during 13<sup>th</sup> and 14<sup>th</sup> January, 2023. We are very fortunate to meet physically after the Covid-19 pandemic period. Scholarly discussion is critical to education and research activities for them to become socially significant. It is an occasion of enormous pride as RNLKWC[A] takes another step in this direction. This region [Paschim Medinipur, Purba Medinipur and Jhargram] has a rich repertoire of social, cultural, intellectual and scientific thought. Hence, it becomes very significant that we apprise ourselves with the latest debates and advancements in the field of Science and Technology.

It is my immense pleasure to welcome research scholars, faculties, scientists, eminent experts from different colleges, universities and institutes. With over 350 research papers scheduled to be presented, 2 keynote lectures, 12 invited lectures and numerous models by students, I am sure that this Congress shall reveal some significant breakthrough and innovative interventions in the field of Science and Technology.

As we embark on this journey of academic discussions across two days, I wish everyone the very best and hope the programme is a great success !!



*Jaha*  
Principal

Principal  
Raja Narendra Lal Khan Women's College  
(Autonomous)  
Midnapore

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2	AS-46160916	Seasonal length-weight relationship and condition factors of <i>Pachypterus atherinoides</i> (Bloch, 1794) in two habitats <i>Arun Jana, Godhuli Sit and Angsuman Chanda</i>	2
3	AS-26696381	Study of Relative Length of Gut and Length-Weight Relationship of <i>Lepidocephalichthysguntea</i> (Hamilton, 1822) from Kangsabati river, West Midnapore, West Bengal, India <i>Sayan Mandal and Basudev Mandal</i>	3
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5	AS-16683387	Freshwater ichthyofaunal diversity and sustainable socioeconomic developmental status around three states of the local fisher-folk of the river Subarnarekha, India <i>Mrinmay Ghorai</i>	5
6	AS-76843376	Restoration of Natural Colour of Goldfish in Glass Aquaria using Palash Flower Powder through Fish Feed <i>Joydev Maity, Sunita Pradhan, Jayita Gain and Ranita Mukherjee</i>	6
7	AS-30141229	Morphometric characteristics, Length-Weight Relationship, and Condition factors of one stripe spiny eel, <i>Macrogathus aral</i> (Bloch and J.G. Schneider, 1801) <i>Manas Das and Basudev Mandal</i>	7
8	AS-41123291	Introduction of Nylon Mosquito Nets in Traditional Fishing Practice: A Rising Threat to Indigenous Fish Diversity <i>Soumyadip Santra and Prosenjit Dawn</i>	8
9	AS-45954860	Fish Waste Utilization For The Development Of Social Economy <i>Ananya Gantait, Riya Paria, Kishalay Paria</i>	9
10	AS-10222562	Freshwater Mollusc Collection And Sale Of Molluscan Meat – The Women-based Trade At Mecheda, Purba Medinipur <i>Srabanti Dogra</i>	10
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12	AS-98384627	<i>Bacillus wiedmanni</i> SAB10, a hidden hero as plant probiotics: Assessment of its potential on the growth of <i>Amaranthus viridis</i> <i>Atasi Hazra, Sumita Sahoo, Arpita Mandal</i>	12
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**ABSTRACT OF  
INVITED TALK**

## **Biochemical Basis of Dysregulated cholesterol and Compromised Inflammation-resolution in Coronary Artery Disease**

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### **Abstract**

Cholesterol is a vital component of the cell, and its homeostasis is one of the critically regulated process. Although Reverse cholesterol transport (RCT) plays a critical role in removing cholesterol from the arterial wall very few reports directly relate chronic inflammation and RCT with atherosclerosis. Mass spectrometric analysis of the human plasma identified about 2500 proteins in subjects with myocardial infarction. Computational study indicated that most of the identified proteins were related to chronic inflammation, atherosclerosis and RCT. To understand the pathophysiological significance of the identified proteins, macrophage derived foam cells were utilized for their critical role in RCT which indicated the imbalance of RCT via the interaction of AZGP1 with CD36. We also found that ABCA1, the primary cholesterol transporter was downregulated in hyper-cholesterol conditions in macrophages, which might be responsible for compromised reverse cholesterol transport (RCT) and hyperlipidemia. Surprisingly, ABCA5, a lesser known family member was upregulated to maintain cholesterol efflux. We established ABCA5 as the primary efflux mediator under high cholesterol load. These observations were further validated *in-vivo* using mice models of atherosclerosis (ApoE<sup>-/-</sup>) and hyperlipidemia (PPAR $\alpha$ <sup>-/-</sup>) in response to high cholesterol diet. Computational analysis revealed a unique conformation of ABCA5 proposing a favoured route for cholesterol loading onto HDLs for reverse cholesterol transport especially in case of hyperlipidaemia. In overall, the present study demonstrates a biochemical basis for compromised reverse cholesterol transport in the local milieu of the luminal wall of the artery which are critical for atheroinflammation and atheroprogession.

## **Ecological Resilience: Conserving ecology and Saving Civilisation**

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### **Abstract**

Once our mother earth had been blessed with bounties of nature, and the plentiful of soil, water, biodiversity went on serving and supporting humanity and myriad of other life forms. It is not our need but our greed we the people have started extorting and destroying water, soil, air, biodiversity and our very own social ecology. Around 68 per cent of our soil is running with low to very low organic carbon, 120 blocks in West Bengal alone are struggling with arsenic contamination in ground water. Due to sea level rise, 30 per cent of a length of 7660 km. of Indian coastal line will go under a thick mantle of brackish water and 330 million of coastal dwellers need to quit their traditional coastal habitat to main land sicial ecology to generate a kind of social entropy. Indian farmers are strongly and desperately infatuated in tilling the soil as many time as possible to make the very precious soil a source of deleterious carbon di oxide and nitrus oxide emissions with a load of 12-15 tons of top soil eroding off per ha per yr. The indiscriminate use of chemical pesticides is not only killing friend microorganisms, but also proagating carcinoma in human bodies. An excess if nitrates applied in the crop field is responsible for serious health hazards including blue babby syndromes. So, we the peole have to act immediately to restore the ecological resilience to save ourselves and our biosphere! Mind that we have to produce more and more food from less and lesser per capita land resources due to humongous poulation preessure and resultant urbanization. It is already late, and any further delay in acting adequately and properly will go menacing and apocalyptic.

## **The Raman Effect: Fundamentals and Frontiers**

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### **Abstract**

One of the most significant discoveries in the 20<sup>th</sup> century was the inelastic scattering of light by matter. The journey started with the research paper ‘A new type of radiation’ by Sir C. V. Raman and K. S. Krishnanin *Nature* (volume 121, pages 501–502 (1928)). The scientific community coined this phenomenon of light scattering as the Raman effect. In today’s experimental science, Raman spectroscopy is attracting the research community from a wide variety of scientific disciplines. In this talk, I will begin with a basic understanding of the Raman effect. Later I will highlight recent studies in three different avenues in the field of physics, material science, and medicine, exploiting the efficacy of this spectroscopic technique. Unique Raman signatures of quantum spin liquid systems will be presented. I will also demonstrate how this spectroscopic technique can be used to measure the thermal conductivity of 2D films and as a diagnostic tool to detect the disease, diabetic retinopathy.

## **Does God play dice in Nature ?**

G. C. Layek

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### **Abstract**

In the talk I address some important issues on long-term predictions and the formation of organized structures in deterministic chaos. In many natural and social phenomena there is unpredictability. It is an intrinsic property present in the phenomenon itself. In fact, nothing in the universe behaves in a way that is predictable totally forever. Nonlinear driving process is sometime essential for the better way of maintaining life cycles/ engineering applications. Chaos is ubiquitous. Chaos theory gives us that simple systems can exhibit complex dynamics obeying simple laws. We discuss two classical discrete maps, viz., the tent and logistic maps and also their chaotic behaviors. Chaos theory and its fractals connection are considered as innovative research areas in the 21<sup>st</sup> century. The Feigenbaum diagram, the Mandelbrot set, butterfly effects and the Lorenz attractor are the icons of chaos study and are remembered as milestones in the deciphering of the secrets of nature. There are plenty of irregular processes in nature and the laws are mathematical, and how the chaos theory could explore a new answer to Einstein's famous question in case of macroscopic dynamics.



## **Quantum Zeno Effect re-establishes the Quantum Realm**

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### **Abstract**

'Zeno effect' named after the ancient philosopher Zeno of Elea. Its analogous quantum effect is presented in 1977 paper of E. C. G. Sudarshan and Baidyanaith Misra [1]. The Quantum Zeno Effect can be defined as the slowed down of the dynamic evolution of an unstable quantum system from its pre-defined initial state, due to frequent observations performed on the system within a definite period of time. There is evidence of opposite effect which is called as Quantum anti-Zeno Effect. In this work, an asymmetric nonlinear optical coupler composed of a probe waveguide (linear) and a system waveguide (non-linear) is considered. The system is a nonlinear waveguide operating under the non-degenerate hyper-Raman process, while both the pump modes in the system are constantly interacting with the probe waveguide. Quantum Zeno and anti-Zeno effects are studied for Stokes and anti-Stokes mode of hyper-Raman Processes under the influences of Probe mode [2]. The effect of the presence of the probe on the spatial evolution of the system in terms of the number of photons in Stokes and anti-Stokes modes as well as the phonon number is quantified as the Zeno parameter. The negative (positive) values of the Zeno parameter in the specific mode are considered as the signature of the quantum Zeno (anti-Zeno) effect in that mode of the system. It is observed that the initial phase difference between all the coherent amplitudes involved in the Stokes and anti-Stokes generation processes can be controlled to produce the quantum Zeno and anti-Zeno effects for the hyper-Raman process in both cases with and without phase matching. Further, the perturbative technique (Sen-Mandal) [3-5] used here allow us to analytically study the possibilities of observing quantum Zeno and anti-Zeno effects in a large number of special cases.

## **Current Research Activities in Atmospheric Sciences on Climate Change**

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### **Abstract**

In recent era, climate change is part of every discussion in any scientific forum not because of the present poor understanding of its process but due to its unavoidable impact on every scientific discipline and human society. Almost each and every human activity is responsible for the present scenario of climate change. After so many years of research, atmospheric scientists realize that the climate change process is much more complex than initially thought, and has revealed inter-links among different dynamic processes within the Earth's atmosphere. Aerosols, the tiny micron sized particles floating in air, can cause significant perturbation in the Earth's radiation budget, which plays an important role in the global warming and thereby, these aerosols directly and indirectly participate in the climate change processes. Aerosols come into the atmosphere in the two ways, natural and anthropogenic. Therefore, it is very difficult to control their emission. Although several mitigation activities have been implemented to control them, nothing has provided an ultimate meaningful result that can be highlighted. Still atmospheric scientists continue their endless efforts to achieve a concrete solution to this problem. Aerosols are distributed all over the globe but unevenly. Such uneven distribution makes the job harder. As a result, many innovative investigations have been conducted involving very challenging field-works with expertise from different fields of basic as well as applied sciences. In this talk, I will share a few challenging research works in difficult environmental conditions, especially marine and the Himalayan campaigns, the Indian Expedition to Antarctica.

## **A personal view of the state of engineering education in India**

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### **Abstract**

Much research and development is happening in our country today in technology and engineering. While this is perhaps desirable, it is not an end in itself. These disciplines are by nature immensely practical and 'hands on,' which is natural considering that engineers build the man made world. However, in our system of education, their study is more and more being confined to the classroom as if memorizing a few formulas and passing exams is all that there is to engineering. There is an unwillingness, indeed inability, to apply the principles learnt there to understand the wider world and solve its problems. The rot starts at the level of the primary school and grows upwards. Unless this gap between precept and practice is addressed, all the research that we may do will bear little fruit in terms of advancing our engineering capabilities.

## **Application of GIS and Web-GIS in Environmental Issues Monitoring and Strategy Development**

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### **Abstract**

Geographical Information System (GIS) is a system that enabled user to creates, manages and analyzed maps and which become easy to understand the interpretation of spatial data. In the era of modernization GIS play a significant role in environmental monitoring as well as resource management. The application of GIS made decisions more easily, reduce costs and increase efficiency, visual format of data improved the communication between involved organizations, easy to record large amount of data, correlate with the space etc. Now days, various types of application of GIS have been conducted, such as visualization of groundwater, mineral resource identification, prediction of land use land cover, natural hazard susceptibility mapping, disaster monitoring etc. Despite such a large usage of GIS, unfortunately everyone does not have access to GIS nor able to spend the time necessary to use it efficiently. This lacuna of curriculum can be solved through the application of Web-GIS. The Web-GIS is an easy and cheap way to disseminating spatial information and processing tools through internet technology. Many organizations like to sharing the geospatial information (maps, data, etc.) and processing tools (disseminating spatial information as per requirements of scientists) with the user without time and location restrictions. The visualization of spatial information through Web-GIS through internet server improved the decision making processes more simple and addresses some of the preliminary difficulties in performing geosciences evaluations. Web GIS can be implemented a modern GIS powered by web services-standard services that deliver data and capabilities, and connect components. A variety of commercial and open source software options are available for setting up GIS servers. Examples include GeoServer, MapServer, and Esri ArcGIS Enterprise etc. Bhuvan, is an Indian web based utility which allows users to explore a set of map based content prepared by Indian Space Research Organization (ISRO). This server provides spatial information about land use land cover, land degradation, wasteland, lineament, flood hazard, etc. It also provide web based own GIS layer creation system as per information needed by user. Another programmer by introduced Government of India is India Water Resources Information System (India-WRIS). It allows users to search, access, visualize, understand and analyze comprehensive and contextual water resources data for assessment, monitoring, planning and development. Web GIS is much more than a new trend, it's the new paradigm for implementing a modern GIS and it makes GIS more accessible, more affordable, and more pervasive.

## ZOOLOGY AND SUSTAINABLE DEVELOPMENT

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### **Abstract**

Zoology is one of the most important discipline of biological sciences that has existed for thousands of years, though not in the form today. It is a field that specifically focuses on the study of animals. The concept of zoology was recognized as single coherent subject in the works of Aristotle and Galen in the ancient Greco-Roman world. During the European Renaissance and early modern period, zoological thought was revolutionized in Europe by a renewed interest in empiricism and the discovery of many novel organisms. The prominent contributions in this field were made by Vesilius, William Harvey, Carl Linnaeus and Buffon, who started studies on development and behavior, classification of organisms and opened up micro- world of zoology with discovery of crude microscope. In the late 1800s, modern zoology emerged from the classical study of animals and became increasingly professional scientific discipline. In 1859, Charles Darwin placed the theory of organic evolution on a new footing. Later, zoology was developed as the modern era when cell theory provided a new perspective on the fundamental basis of life with more specialized scientific disciplines - cytology, bacteriology, morphology, embryology, geography, and geology. Researches on zoology gradually transferred the history of the subject with the more and more developed disciplines like ecology and molecular biology. The zoological studies are now considered with the origin and development of animal species, the habitats and behavior of animals, and the interaction between animals and their environment. The subject zoology has a great value in the societal economy and welfare of human beings. It may also be mentioned that the study of zoology offers the opportunity to consider ways to face global challenges such as climate change and food security, trying to find solutions to help both animals and human alike.

The main objective of sustainable development is to foster the kind of growth, which reduces the issues of the environment. It also aims to provide the present generations with needs without compromising ecological sustainability for the coming generations. Zoology is intricately related to the four pillars of sustainability. There are definite roles of zoology in successful implementation of United Nations '17 Sustainable Development Goals'.

## **Application of Machine Learning in Medical Imaging**

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### **Abstract**

The identification of disease from medical imaging requires considerable expertise and time. Expert radiologists to view and interpret medical images can be a bottleneck, especially in remote and deprived areas. To address this issue machine learning is a very promising domain in image processing, especially for medical image analysis. Machine learning is the most effective way to analyze low-cost imagery systems for efficient diagnosis and a quick response to results. The subset of machine learning is deep learning. As part of our research, we have extensively studied and reviewed state-of-the-art methods for treating COVID-19 related to deep learning and other AI-related traditional approaches. Nowadays, deep learning has proven to be efficient at handling both spatial and temporal data. Our team has developed a CNN framework for identifying COVID-19 from pneumonia, normal lungs, and lungs with higher opacities. We also extracted deep features from standard frameworks like VGG-19, Inception Resnet V2, and Mobile Net V2 and classified them using machine learning algorithms. Ensemble-based prediction was proposed to assess the performance of our system from individual, standard, and custom CNN as well as their different stacks, such as two stack, three stack, and four stack. To ensure efficient storage and computation performance, we used a U-Net-based ensemble stacked framework to segment the lung region. Furthermore, we are developing advanced vision transfer models (ViT) frameworks, as well as GANs and diffusion architectures for creating synthetic medical images to minimize data scarcity.

## **Modification of CRISPR Cas9 system for targeted genome editing**

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### **Abstract**

Clustered Regularly Interspaced Short Palindromic repeats (CRISPRs) and CRISPR-associated (Cas) proteins technique, a RNA dependent targeted genome editing technique, emerged as a fast, efficient and cheap method for genome editing and it out played other methods like Zinc Finger Nucleases (ZFNs), Transcription-activator-like effector nucleases (TALENs). But owing to its significant off-target activity of the Cas endonucleases, its clinical application is still limited. There are certain methods to deter this off-target effect like using high fidelity Cas proteins, truncating the 3' end of the sgRNA and using lesser amount of Cas9-sgRNA for genome editing etc. Our lab involved using of paired nickases to deal the off-target effects. Moreover, we also performed the mechanistic studies to check who the sequence mismatches at the distal end of the guide RNA can be tolerated.

## **Techniques for invigouration and conservation of crop seeds**

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### **Abstract**

Seeds are the most vital and basic input in agriculture. Modern agriculture, with its bias for technology and precision, demands that seeds should be of high vigour and can germinate expeditiously to produce vigorous seedlings. Post harvest storage of seeds without losing their desired quality is a difficult task in tropical and subtropical countries like India where high temperature and high relative humidity prevail during the major part of a year causing faster storage deterioration. To get rid of such a problem, strategies are being adopted throughout the world for storage invigouration and viability extension of crop seeds by employing some physical, chemical as well as biotechnological approaches. Conservation of crop seed biodiversity and prevention of the loss of gene pool is a crying need of the day as many crop species/varieties became extinct earlier. In the back drop of these problems, seed technologists are paying serious attention for enhancement of storage longevity, vigour and particularly conservation of all existing crop germplasm of the planet so that not a single variety is lost forever as happened earlier. We worked for invigouration and viability extension of some low vigour crop seeds mainly by using chemical and herbal manipulative methods and consequent hardening along with safe conservation of crop seeds under ambient and stressful storage conditions. Herbal and low cost chemical agents are much desired for seed invigouration for the farmers of resourcepoor countries like India, as these are mostly non-hazardous, ecofriendly, affordable as well as handy for management. A number of chemical agents belonging to growth retardant, growth inhibitor and antioxidant classes as well as herbal agents have been identified which are potential enough for hardening and prolongation of storage life-span of some selected seed species. Keeping in mind, that the loss of seed biodiversity happened silently over years, germplasm conservation centres/seed banks were established throughout the world. The prime objective of such centres is to keep in safe custody of gene pools of diverse plant species using their various propagules/seeds so that these are made available on demand. But such germplasm centres/seed banks may fail for supplying crop seeds due to some natural and manmade severe catastrophe or global dissolution. In such a case, the most valuable gene pool treasure of our crop may be severely threatened or may even be lost forever. In the event of such alarming situation and for saving invaluable gene pool of our crops, seed technologists, policymakers in consultation with the world leaders as well as United Nations decided to create a novel “doomsday seed vault” in the permafrost zone of Svalbard, Spitsbergen, Norway. This most desired location was identified to establish such a unique centre for prolonged (eternal?) seed conservation mainly due to the zero tectonic activity, permafrost area having ultralow temperature. In fact, when the germplasm conservation centres of the world will fail to keep the supply line of seeds due to extreme global catastrophe, only this novel “doomsday seed vault” may be able to meet the dire need and thus will act as a black box. This unique seed vault started its journey in 2008. It is the only one in the world which is committed for super level conservation of germplasms and to supply precious seed cultivars only in the event of destruction of seed banks/gene banks due to serious global disaster.



## **Traditional Food System and Nutritional Status of Particularly Vulnerable Tribal Groups of India**

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### **Abstract**

Traditional food systems of tribal people are defined as being composed of items from the local, natural, and culturally accepted items. Food studies have proved an important arena for debating the cultural and symbolic explanations of human behaviour. Any nutritious substance that people eat or drink to maintain life and growth can be defined as food. The way in which humans use foods can be referred as food habit which includes how they are selected, obtained, stored, cooked, distributed and even discarded. Humans use food symbolically and thus, for humans, food is more than just nutrients. Cultural identity is an essential symbolic function of food. Tribal people strictly adhere to such practices to maintain their group identity. This study has tried to explore the traditional food practices of Particularly Vulnerable Tribal Group (PVTG) of West Bengal, India. Their daily dietary pattern, including normative aspect of daily food, festive and ceremonial food and way of the collection, and the preparation and consumption of their fermented beverages involve complex networks of individual bonds, collective management of resources, and group decisions. Primary data on different food items were collected by interview with pre-structured questionnaire and focus group discussions. Food recipes and their documentation, from collection to preparation has been done. Their consumption depends on economic ability and availability of food stuffs, beliefs, customs, tradition, social connotations etc. All parts of Indigenous food systems are inseparable and ideally function in healthy interdependent relationships to transfer energy. Understanding a culture through food is an exciting process because its answers obtained go beyond culinary learning. In these answers, food tells us something about a culture's approach to life. But the impacts of globalization and admixing with other cultures is a great threat to the very existence of cultural food practices of these tribal peoples because of the voluntary surrender to the modern ways of life. Hence it is the need of the hour to protect such tribal food systems before they are lost and or forgotten.

## **IPR and its impact in society**

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### **Abstract**

A future society that India should aspire to, called “Society 5.0.” The term refers to a new society that represents the next stage after the hunting society (Society 1.0), agricultural society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0). It is defined as a human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace (virtual space) and physical space (real space). All people and things will be connected through IoT (Internet of Things) in Society 5.0, enabling us to share various kinds of knowledge and information while creating new values, and giving us the ability to overcome issues and difficulties.

Knowledge conversion will lead to a desired society of 5.0. The present knowledge conversion will need sophisticated and barrier free knowledge infrastructure in terms of access to knowledge and its use. The knowledge infrastructure should be based on three pillars i.e. convergence of the knowledge, knowledge management, and protection and commercial use of the knowledge as a property.

Convergence of knowledge is pre-eminent in Internet based society. Today’s knowledge may be secured from formal or informal sources and from depth and breadth of various subjects. For example, an online custom garment selling company requires understanding of fabric; culture and ethnicity; physiology and body type; climatic condition; personal finance and ambition of individuals; technologies related to manufacturing, Internet of things; and artificial intelligence for error free processes. The future manpower should be trained in this barrier free knowledge domain. And the future universities should create infrastructure towards that.

Inter-disciplinary and trans-disciplinary knowledge management should be the object of future research. An Integrated knowledge management system will provide a solution to the future challenges within the society, economy and business. For example, artificial intelligence (AI) will allow us to obtain information when needed, and technologies such as robotics and autonomous cars will help us overcome issues such as a decreasing birthrate, ageing, population, local depopulation, and the gap between the rich and poor.

Knowledge protection and commercial use of the knowledge as property will be the fuel of the future economy. The value of intellectual property (or information goods) will increase further with society of 5.0. Through social reform (innovation), Society 5.0 is expected to create a forward-looking society that breaks down the existing sense of stagnation, a society whose members have mutual respect, transcending the generations, and a society in which every person can lead an active and enjoyable life.

## **Algal diversity and its utilization through modern technology**

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### **Abstract**

Modern approach to systematics with the help of ultrastructural and molecular features has established that the informal taxonomic group “Algae” is extremely heterogeneous and polyphyletic. This concept has further been supported as the origins of major algal divisions are traced by primary, secondary and tertiary endosymbioses. Horizontal genetic transfer during the process of endosymbiosis developed a genetic chimera in many algal species. In this discussion, I will also include Cyanobacteria which have been placed in the Kingdom – Eubacteria. Utilization of diversified algal species, representing various classes and divisions, for human welfare is being practiced for centuries. The spectrum of areas where algal organisms and their products are used is getting wider day by day as newer biochemical and genetic features are being revealed as a result of continued research. The characteristics of algae that are considered suitable for biotechnological purposes are – high growth rate, secretion of many natural products like vitamins, organic acids, polypeptides and polysaccharides. Additionally, their life-cycle and pigment production can be controlled, rarely do they produce toxins, and harvesting methods are very simple. We can therefore, define the integration of Phycology with the latest developments in cellular and molecular biology, chemical engineering, aquaculture and other related disciplines for specific commercial uses as Phycotechnology. Algal species are targets of genetic engineering to improve productivity, broaden environmental tolerance limits or increase pests or pathogen resistance. DNA sequences are introduced into algal cells with the goal of modifying biochemical pathways either by changing expression of existing genes or by adding genes that yield new or different products. Promoter systems have been developed for linkage to the genes of interest and that will allow expression after the DNA has been incorporated into the host genome and appropriate marker genes have been selected. Use of algal species in nanotechnology and 3-D printing is also discussed.

## **Prospect of biowaste derived biomaterial for human health care**

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### **Abstract**

Rapid industrialization and urbanisation have generated massive quantity of biowastes posing adverse impact to our ecosystem. Novel and sustainable conversion technologies are needed for proper management of such wastes. Development of low cost and value-added biomaterials from a variety of biowastes including food waste, agricultural waste and industrial waste, has been considered as a promising strategy while converting waste to wealth. Biowaste derived biomaterials have some remarkable properties in association with environmental friendliness, economic values, optimum processing and also provides a sustainable solution to waste management by reducing biowaste disposal in landfills. Such biomaterials offer enormous opportunity for future investigation into their utilization in the field of biomedical engineering because of their favourable qualities and potential. As for example, pectin extracted from jackfruit peel was utilized to synthesize a bio-nanocomposite by combining with hydroxyapatite, and the resultant biomaterial was found to be suitable for developing tissue graft for orthopaedic and orthodontic tissue engineering applications. Similarly, bio-composite sponges, gels, and films have been prepared from collagen isolated from tanning waste which have been investigated for skin tissue engineering applications. Silk fibroin membrane based biomaterial developed from *Bombyx mori* silk cocoon may be used for bone regeneration. This lecture will discuss about the potential biowaste that can be explored for the development of biomaterial and their possible application in human health care including the tissue regeneration, wound healing and drug delivery in future. This lecture will also provide a thorough understanding and guidance to the researchers who are working in the related fields.

## **Exploring angiogenin as a potential target for protein-ligand binding studies**

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### **Abstract**

Angiogenesis is the natural and physiological process of growing blood vessels from pre-existing ones. There is a crucial balance between pro and anti-angiogenic factors and any imbalance leads to disease. A limited number of anti-angiogenic synthetic drugs are known but a search for alternative options particularly natural compounds obtained from plants, have demonstrated extraordinary ability in the treatment of angiogenesis-related pathologies, The use of natural compounds as potential angiogenesis modulators is thus a promising field of research. Human angiogenin, a factor causing angiogenesis belongs to the ribonuclease superfamily and thus possesses ribonucleolytic activity in addition to its ability to induce blood vessel formation. Any disruption in the ribonucleolytic property of angiogenin will also decrease its angiogenic potential. The binding of natural polyphenols, aminoglycoside antibiotics and reducing sugars are known to affect the ribonucleolytic/angiogenic activity of human angiogenin at the molecular level. The interaction of dietary polyphenols, (-) epicatechin gallate (ECG) and (-) epigallocatechin gallate (EGCG) from green tea and curcumin with human angiogenin have been investigated. Complications related to delivery have been overcome by using polyphenol capped gold nanoparticles and curcumin encapsulated  $\beta$ -cyclodextrin forms. The results indicate that there is increased efficiency towards angiogenin inhibition when conjugated or encapsulated. The presence of a cooperative type of binding for polyphenol capped gold nanoparticles towards angiogenin causes increased inhibition efficiency compared to bare polyphenols.

## **In vitro and in vivo evaluation of non-mulberry silk protein sericin based hydrogels and nanofibrous matrices in skin regeneration and wound healing.**

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### **Abstract**

Impairment of skin tissue is an incessant and frequent occurrence. Towards the need of millions of people affected throughout the world skin tissue repair makes multi-billion-dollar expenditure per annum. Limitations associated with the available grafts such as inflated production cost and inability to lead to functional repair along with angiogenesis drives the researchers to explore more options and ways to construct an affordable, efficient and effective skin graft. Silk protein sericin (a by-product of textile industrial) is an established constituent of cosmetic industry attributing to its beneficial properties including anti-oxidant, anti-UVB, anti-apoptotic, antibacterial and hydrophilicity, which reflects its significance in providing the protection and aiding the process of skin repair. Nonmulberry Indian tropical tasar *Antheraea mylitta* silk sericin based hydrogels and nanofibrous matrices have been prepared and shown to provide the necessary physical and biological cues required to promote the adhesion and proliferation of skin cells (keratinocytes and fibroblasts) *in vitro* and *in vivo*. The porous and robust hydrogels enhance the production of extracellular matrix components *in vitro* and repair of dermal tissue along with the dense collagen bed and formation of mature blood vessels *in vivo*. The glycosaminoglycans (GAGs) are vital components of the extracellular matrix and these hydrogels are further improved by incorporation of GAGs and growth factors. The *in vitro* and *in vivo* experiments show that the presence of both sericin and GAGs with growth factors enhances the cellular growth and the reconstruction of the lost dermal tissue. Antibiotic-loaded nanofibrous matrices accelerate the rate of wound closure, restores the epidermal layer along with the appearance of skin appendages and blood vessels *in vivo*. Both these fabricated matrices offer fundamentals of an artificial tissue (epidermal and dermal) and exhibit a minimal inflammatory response *in vivo* marking their biocompatibility and prospects in the skin regeneration and wound healing.

**ABSTRACT OF  
ORAL PRESENTATION**

**Bioconversion of poultry wastes using Keratinolytic bacteria  
*Bacillus wiedmannii* SAB10 for their possible application as  
biofertilizer in agriculture.**

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**Abstract**

A potent Keratinolytic bacteria *Bacillus widemanni* SAB10 isolated from feather dumping area at Debra, Paschim Medinipur, West Bengal, Highest amino acid production was shown after 48 hours in solid state fermentation condition at 37°C at pH 10. This bacterium can degrade waste chicken feather completely by using poultry litter as a sole media, and produced feather hydrolysate used in rice plant in pot trial condition. After using this feather hydrolysate the length of plant and rice straw increased 1.1 fold, chlorophyll content, and IAA content also increased than control plant due to feather hydrolysate rich in essential plant amino acid, micro nutrients. This also enhanced soil micro biota after application of feather hydrolysate in comparison to control. Feather hydrolysate applies to the plant in different mode soil application and spray condition. This feather hydrolysate can be introduced as bio organic plant inducer in near future which can be developed the economic strategy of rural India.



**Seasonal length-weight relationship and condition factors of  
*Pachypterus atherinoides* (Bloch, 1794) in two habitats**

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**Abstract**

The present study aims to analyse the relationship among length, weight, condition factor (K), and relative condition factor (Kn) of *Pachypterus atherinoides* (Bloch, 1794) with emphasis on seasonal variation of growth patterns, productivity, stocks, and conservation in two contrasting ecosystems pond, and river in the Paschim Medinipur and Jhargram districts of West Bengal, India. The result reveals that the species showed allometric growth patterns in all seasons and did not strictly abide by the intended cube law. The regression parameter (b) values ranged from 1.98 to 3.13; the condition factor varied between 0.34 to 0.78; relative condition factor ranged from 0.51 to 1.17 for *P. atherinoides*, in the study area. The average values of regression parameter (b), condition factor (K), and the relative condition factor (Kn) were highest during the post-monsoon season. The regression coefficient ( $r^2$ ) values depict a strong relationship between the length and weight in both habitats and all seasons. The Post Hoc test represents a significant ( $P < 0.05$ ) seasonal relationship between length, weight, condition factor, and relative condition factor. However, there is no significant habitat-based relationship between the same parameters. The present findings will help fishery managers to develop effective methods for the sustainable management of *P. atherinoides* in their habitats.

AS-26696381

**Study of Relative Length of Gut and Length-Weight Relationship of *Lepidocephalichthys guntea* (Hamilton, 1822) from Kangsabati river, Paschim Medinipur, West Bengal, India**

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**Abstract**

A study has been carried out to estimate the relative length of gut & length-weight relationship, condition, and relative condition factor (Kn) of the fresh fish *Lepidocephalichthys guntea*, from Kangsabati river in the District Paschim Medinipur, West Bengal, India. A total of 161 species were collected between August 2019 and July 2020 and considered for examination. The fish ranged from 5.4 to 10.7 cm in total length and 0.72 to 9.73 g in weight. The relative length of the gut was observed to be less than one (average RLG value = 0.510905) and the height and lowest values are 0.567814 and 0.453026, respectively. So, the RLG value inferred the carnivorous nature of feeding habits. In the length-weight relationship study, the female category is observed to show a higher “b” value (3.452, P<0.05), which is greater than 3. The parabolic equation among total length and weight of *L. guntea* is labeled as  $W = 0.008744991 L^{2.7496}$  for males,  $W = 0.002153098 L^{3.452}$  for females, &  $W = 0.007575793 L^{2.8155}$  for the combination of male and female species. Height  $r^2$  (0.859, P<0.05) value was observed in the category of the combination of male & female. The mean condition (K) & relative condition factor (Kn) values found to be height in male category with “K” value 0.654 & “Kn” value 1.174 respectively. Through complete analysis of the calculated data, it was inferred that, this species does not strictly follow the cube law & shows a well status of health condition in their natural habitat.

**A preliminary study of Toxicological effect and behavioural response of locally available three fresh water predatory fish, exposed to fresh leaf extract of *Antigonon leptopus* Hook & Arn**

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**Abstract:**

Predatory, unwanted fishes create great nuisance in the pond-based aquaculture system by preying on desirable commercially cultivated young fish or fry competing for food and space. For this reason the present investigation has been carried out to study the effect of phyto piscicide on three locally available fresh water predatory fishes e.g., *Clarias batrachus* (Linnaeus, 1758), *Mystus tengara* (Hamilton, 1822), *Oreochromis niloticus* (Linnaeus, 1758) against single concentration derived from aqueous leaf extract of *Antigonon leptopus* Hook & Arn for 24-hrs of exposure. During experiment it is observed that lethal time for LC50 is greater in *Oreochromis niloticus* and followed by *Clarias batrachus*, *Mystus tengara*. Such type of toxicological study of this botanical piscicide on these three predatory fishes has yet not been done. Behavioural responses due to toxicological effect of this phyto-piscicide with various mortality percentages against lethal concentration has been recorded. Physicochemical parameters of water like Temperature, pH, TDS, DO, salinity have been recorded before and after using of plant extracts. This preliminary study reveals that *Antigonon leptopus* Hook & Arn. (Family-Polygonaceae) is a potentially good herbal piscicide due to its efficacy, eco-friendliness, bio-degradability and easy availability. It also may be an important industrially used herbal piscicide for commercialization.

**Freshwater ichthyofaunal diversity and sustainable socioeconomic developmental status around three states of the local fisher-folk of the River Subarnarekha, India**

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**Abstract**

The river and streams are the main source of freshwater fish production and have a great impact on the livelihood of fisher folk. The Subarnarekha river is a rain-fed river; within 395 km of total length, about 269 km in Jharkhand, 64km in west Bengal, and 62 km in Odisha state respectively. The study deals with freshwater fish and fisheries data collection, data access and data submission, and the distribution and diversity of this river. Ten sampling stations were identified for consideration of the data collection in 3 states (Jharkhand, Odisha& West Bengal). These are namely S1- Galudi, S2- Ghatsila and S3- Jamsola of Jharkhand state, S4- Gopiballavpur, S5- Mahapal, S6-Bhasraghat, S7- Dantan ferrighat and S8- Sonakonia Mirjapur of West Bengal, S9- Rajghat and S10- Chowmukh, Talsari of Odisha state. From the study total 90 fish species were reported from the 10 sampling stations, which belong to the 20 orders, 40 families, and 63 genera. Among the 90 species, the most dominant order is the cypriniformes which contribute 33.3% of the total fish species. The Simpson's index diversity (1-D) shows the highest diversity value at station S4 (0.987) and lowest at S1 (0.976). Therefore, the study deals on the basis of river-based livelihood strategies and faunal diversity , landless local fisher-folk individuals among the fish dependency especially tribal people and other backward classes helpful for sustainable socioeconomic development and formulate the future policy for conservation and management of the fish diversity in this river.

AS-76843376

## **Restoration of Natural Colour of Goldfish in Glass Aquaria using Palash Flower Powder through Fish Feed**

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### **Abstract**

Experiment was conducted to restore natural colour in Goldfish (*Carassius auratus*) using Palash Flower (*Butea mono sperma*) powder in formulated feed. Control diet was prepared by using fishmeal, soyabean meal, groundnut oil cake, rice bran, wheat flour, starch powder, soya oil and vitamins & minerals. Experimental diets were prepared by supplementing palash petals powder at four concentrations viz. 2%, 5%, 10%, and 20% of the control diet replacing the same amount of rice bran. The experiment feeding trial was conducted for 30 days. At the end of feeding trial significant increase of total carotenoids concentration is observed in the muscle and skin of goldfish, highest being in 2% level. The weight gain and survival rate was significantly higher in 2% palash petals powder supplemented diet. The result revealed that inclusion of palash flower powder in diet at 2% rate can give a fruitful impact on retention of Goldfish's natural colour in aquaria.

**Morphomeristic characteristics, length-weight relationship, and condition factors of one stripe spiny eel, *Macrogathus aral* (BLOCH and SCHNEIDER, 1801)**

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**Abstract**

The present study revealed complete information on length-weight relationships (LWRs), length-length relationships (LLRs), and meristic counts (covering different fin rays and ocellies) of a total number of 150 *Macrogathus aral* species collected from lotic water bodies and fish markets. The total length of the male and female species results from a range of 18.3cm to 32.5cm and 15.7cm to 29.0 cm while body weight varies from 21.35g to 156.6g and 29.9g to 138.9g, respectively. The parabolic equation between the total length and the total weight of *M. aral* is as  $W = 0.177000982 L^{2.4837}$  for male species and  $W = 0.105737 L^{2.9929}$  for female species. A strong relationship between length and weight shows a 93% ( $P < 0.05$ ) correlation in females and 82% ( $P < 0.05$ ) correlation in males. The values of 'b' showed negative allometric growth ( $b < 3.0$ ) in both sexes. The mean values of Fulton's condition factors ( $K_s$ ) shown in male and female species were 0.378 and 0.558 respectively, while on the other side the values of Modified condition factors ( $K_p$ ) shown in male and female species were 1.875 and 0.571, respectively, which indicates good health condition of the species in their natural habitats.

## **Introduction of Nylon Mosquito Nets in Traditional Fishing Practice: A Rising Threat to Indigenous Fish Diversity**

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### **Abstract**

Presently increased use of mosquito-nets in fishing practice have caused a drastic change in the traditional fishing gears and are of global concern. Traditional bamboo-stick made Ghuni (Box-trap used for fishing throughout lower Bengal floodplains having slitwidth of e”3mm) is seen to be replaced by Ghuni made up of non-biodegradable nylon Mosquito-nets with smaller mess size (d”3mm). These modern Ghunis are easier to make and cheaper, thus number of Ghuni used by people have also increased than earlier. This study was conducted to identify if there is any significant difference in the number, size and species of fishes and other organisms caught in traditional and mosquito-net Ghuni. 30 samples (24 hours each) by both type of Ghuni keeping other factors constant, indicated that mosquito net Ghuni traps more smaller fishes (high juvenile capture rate), shrimps, juvenile molluscs, crabs and occasionally snakes whereas traditional bamboo-stick Ghuni only traps comparatively bigger fishes and shrimps. Market survey proves people prefers economical mosquito-net Ghuni more, making the traditional bamboo-stick Ghuni obsolete, to expedite the overharvesting of juvenile indigenous shrimps and fishes and other organisms at the breeding grounds hampering the local biodiversity risking the future food security of the community.

## **Fish waste utilization for the development of social economy**

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### **Abstract**

Fishery technology of West Bengal now has reached in global scale. The livelihood of people basically depends upon fishery followed by agriculture in southern part of West Bengal. Our main focus basically depends on fishery waste utilization. Fish leftovers and their processed byproducts as well as their disposal impacts highly on environment and has economic value too. The utilization of waste as raw materials for biofuel production and high-value chemicals, which is also known as “biorefinery”, is gaining interest on circular economy and has zero waste policies. Besides, huge amount of processed vannamei products have been exported to different countries. Even an uncountable variety of fishes as well as shell fishes can be utilized for the production of many value-added materials like animal feed, biodiesel or biogas, chitosan, some natural pigments, cosmetics (i.e., collagen, gelatine), enzymes, bio-fertilizer, fish oil, soap making industries, ornaments, medical purposes etc. Thus fish wastes recovery process is expected to uplift the economy of local people on one hand and opens up new avenues for effective waste utilization. This present research has attempted to highlight the current status and future prospect of using fishery products from coastal regions of Eastern India with high commercial value.



**Freshwater Mollusc Collection And Sale Of Molluscan Meat –  
The Women-based Trade At Mecheda, Purba Medinipur**

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**Abstract**

Cooked meat of *Bellamya bengalensis*, *Pila globosa* and *Lamellidens marginalis* is 'low-priced poor family's protein source'. Learned middle- and high-income grade people in sub-urban areas and towns are accepting it as health food. The women-based practice of both collection and retail selling of molluscan meat for income generation was documented during July 2022. This medium-scale trade is concentrated near Mecheda Railway Station, Purba Medinipur, which begun in 1978-1980. Poor ST women of Polanda and Demari villages, Sahid Matangini Block, Purba Medinipur and other places collect freshwater molluscs from lentic water bodies. At Mecheda point, 6-9 collectors bring and sell fresh whole-bodied molluscs to 12-15 SC women of Akandi-Mondolpara village of same Block almost daily. The buyers sell soft extracted-out meat to general customers at retail markets in Howrah Sadar sub-division, Howrah district. Method of fresh mollusc collection, time, amount obtained/day/woman, selling price, extraction method of meat from three species before sale, meat amount sold/day/woman, its rate, hardwork of elderly women for a living, interest in *B. bengalensis* farming, ITK about their medicinal values; such aspects will be discussed in this paper.

**Study the Gut Microbiota of Indigenous Ornamental fish, Indian Rosy Barb (*Puntius conchoni*us Hamilton, 1822)**

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**Abstract**

Like most of the animals, all the fish categories irrespective of indigenous species, marine species, table fishes, ornamental fishes possess a set of well settled micro-organisms whether beneficial or inimical. The present work has been performed to study the gut microflora of popular indigenous ornamental species Indian Rosy Barb (*Puntius conchoni*us). Samples were collected from various portions of the gut and from the content and all the samples were allowed for serial dilution at a gradation of 10<sup>-1</sup> to 10<sup>-6</sup>. Inoculum from each dilution was taken further for culture on nutrient agar media and different agar media viz: Mac Conkey, Vibrio agar, Aeromonas agar etc, incubated properly, followed by basic Gram staining for the identifications of Gram(+)ve and Gram(-)ve bacterial colony. At preliminary level each dilution showed the prevalence of Gram(-)ve bacterial colony. From particular media based culture revealed the presence of *Vibrio sp.*, *Aeromonas sp.*, *Lactobacillus sp.*, *Lactococcus sp.*, *Streptococcus sp.* etc. at phylum level all the above mentioned organisms mostly belong to Proteobacteria, Bacteroidetes, Firmicutes and Actinobacteria. The exact role of these group of micro-organisms in fish health is yet to be known fully.

AS-98384627

***Bacillus wiedmanni* SAB10, a hidden hero as plant probiotics:  
Assessment of its potential on the growth of *Amaranthus viridis***

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**Abstract**

This study was navigated to examine the effectiveness of *Bacillus wiedmanni* SAB10 as a plant growth-promoting rhizobacteria (PGPR) that produced secondary metabolites for enhancement of growth, antagonistic to fungal pathogens and recycling of essential nutrients. Bacterial strain was examined non-symbiotic nitrogen fixation, indole-3-acetic acid production, tri-calcium-phosphate solubilization, ammonia production, siderophore production and biofilm production. This strain can also tolerate high level of NaCl concentration (14 %, w/v), seed application of bacterial strain promoted the overall dry biomass of *Amaranthus viridis* by 11.57 % and overall length by 75.43 % after 30 days of showing as compared to non-treated controls and its growth performance was similar to inorganic fertilizer applied plants. From this study it conclude that *Bacillus wiedmanni* SAB10 is an effective plant probiotic that can colonize on the root and liberated active metabolites which exerted beneficial effects for the growth of *Amaranthus viridis* and protected it from fungal pathogens.

**Present status and potentiality of biofloc technology based on  
catfish culture in India**

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**Abstract**

Catfishes are popular for their taste, less muscular spines, small gut, medicinal use, and air-breathing nature. They make better fillets for export than other fish species, and most of them are carnivorous in nature. Catfish production in India in 2001 was 2.54% and in 2010 it was enhanced up to 4.18%, and the production remained more or less similar or a little bit declined to 4.13% in the 2019-20 financial year (4.32 lakh tonnes). The main objective of the present study is to culture indigenous catfishes, *Heteropneustes fossilis* through the modern Biofloc system. This technology also helps fish farmers to reduce the costs of feeding and conservation of indigenous catfish through rearing and grow-out production. Biofloc is mostly heterotrophic bacteria causing recycling of waste material to feed and hence causing reduction of feeding cost. During the present study, Everfresh Pro probiotics were used for the growth of heterotrophic bacteria in the culture of Indian stinging catfish, *H. fossilis* during May to Aug 2019. The result reveals that a 400 times weight gain was achieved in 4 months. The result is also compared to the normal culture system (without biofloc application) and 22% more fish mass production is recorded within the same time period. Therefore, the biofloc culture of catfish is a commercially viable and Eco-friendly technology to enhance the potential production of catfish and will certainly be helpful for the livelihood of rural youth.

AS-15368415

**Penaeid & Palaemonid prawn diversity in Subarnarekha estuary,  
the east coast of India**

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**Abstract**

Subarnarekha is the one of the most important river in Odisha where it traverse 50 km out of 460 km of the river basin from Jaleswar to Bay of Bengal constitutes 10% of the total length of the river. Local people of the river basin are fully dependent on the fishery resource for their livelihood. Therefore, diversity of fishery resource of the river is very essential. Prawns are the lucrative fishery resource of the Subarnarekha estuary. So, the main objective of the present study is to know the species composition of prawn resource of the area under study. Present study reveals the existence of 16 Species under 3 Genera of Family Penaeidae and 5 Species under 3 Genera of Family Palaemonidae in Subarnarekha estuary is found up to date. Among the identified penaeid prawns *Metapenaeus elegans* De Man, 1907, *Parapenaeopsis stylifera* (Milne Edwards, 1837), *P. uncta* Alcock, 1905, *Penaeus japonicas* (Bate, 1888), *P. monodon* Fabricius, 1798 are most common species and among Palaemonids, *Exopalaemon styliferus* (Milne Edwards, 1840), *Macrobrachium rosenbergii* (De Man, 1879) are common to Subarnarekha estuary. Present work will certainly be helpful to the fishery managers and researchers on the group.

**Induced breeding and embryonic development of indigenous ornamental fish, *Puntius chola* (Hamilton, 1822)**

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**Abstract**

*Puntius chola* (Hamilton, 1822) is a small freshwater indigenous fish with food and ornamental value belonging to the family Cyprinidae found in Pakistan, India, Nepal, Bangladesh, Myanmar, and Sri Lanka. The species have gradually decreased in India due to the culture of Indian major carp and selective exotic species. The current study aims to examine the optimum dose for induced breeding and embryonic as well as larval development of *P. chola*. The optimum dose was selected through the trial-and-error method with the application of five doses (0.25 ml/kg, 0.50 ml/kg, 1 ml/kg, 1.5 ml/kg, 2 ml/kg body weight) of synthetic hormone ovatide to both sexes. The study reveals that the optimum dose of synthetic hormone ovatide @ 1.5 ml/kg body weight for females and males is effective for induced breeding of *P. chola*. At the optimum dose, fecundity, fertilisation and hatching rates were  $106308 \pm 3075$ ,  $79.28 \pm 0.589$  %, and  $78.03 \pm 0.495$  %, respectively. The present findings will help *P. chola* better ornamental planning and help to protect it by causing it to breed and sustain itself in nature. The study will also help generate income for the local people.

**Income from flower and vegetable cultivation in Pre-COVID-19,  
COVID-19-Induced Lockdown and Post-Lockdown situations –  
An own experience**

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**Abstract**

Perennial crops red rose, betel leaf, tomato, ladies finger and cucumber are cultivated by us as means of livelihood – first two in large-scale and vegetables in medium-scale. We have experienced their less demand, low price at Kolaghat and Panskura markets and our low income in COVID-19-induced lockdown and post-lockdown periods in comparison to normal pre-COVID-19 situation. We sold rose @ INR 600-800/100 nos during 2018 and 2019, INR 1400 during January-February 2021, INR 250-400 during March-October 2021 and INR 70-150 during April-September 2022. Betel leaf sold @ INR 900-2500/1000nos during 2019, INR 400-1400 during 2020 and 2021 and INR 200-600 during February-September 2022. During presentation, we will discuss the observed market rates and monthly income we got from five crops individually in different times of year in afore-mentioned three periods, cultivable areas, weekly amounts harvested individually. Croplands weren't maintained properly with fertilizers-medicines with less money in hand during lockdown period, very less buyers for harvested farm produce in markets. Since early 2022, transportation and markets are normal but price has fallen unexpectedly with reduced production capacity of lands.

**Penaeid prawn diversity with special reference to seasonal variation in Digha coast**

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**Abstract**

Prawn communities of the coastal habitat of the Digha coast were dominated by family Penaeidae. Seasonal variation in the relative abundance and species diversity of Penaeid prawns was derived from sampling of 3599 individuals representing twenty species under seven genera. The most abundant species of Penaeid prawn were *Parapenaeopsis styliifera coromandolica* (14.36%), *Metapenaeus lysianassa* (13.08%) and *Helleropenaeopsis sculptilis* (10.16%), *Parapenaeopsis styliifera styliifera* (8.44%), *Penaeus monodon* (6.89%), *Alcockpenaeopsis unta* (6.83%), respectively. Relative abundance varied seasonally within the species between the seasons. Highest species richness in the Digha was observed in the period of postmonsoon and the lowest in premonsoon, whereas diversity was found to be highest in postmonsoon season. Temperature, Salinity, pH and dissolved oxygen influenced both the abundance and the diversity of prawn in the Digha coast. Present study will be helpful to the prawn fishery managers and researchers of the study region.



## **Immuno biochemical characterization of leptin protein from different animals representing biodiversity**

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### **Abstract**

Leptin, a cytokine-like protein hormone is one of the best physiological markers for body weight, food intake, energy expenditure and reproduction. Information of molecular characteristics of leptin protein in different animal species is scarce. To characterize leptin protein of diversified species, it was isolated from three different types of terrestrial and aquatic animals viz. i. Bengal goat, ii. Mithun & iii. Rohu. Subsequently, immuno biochemical characterization of the leptin protein was done at molecular level. Presently, different techniques were used for isolating leptin protein. Purification of the protein was performed by affinity column chromatography. The molecular, biophysical and serological characterization of leptin was carried out by 2D-gel, SDS-PAGE, Circular dichroism, Mass spectroscopy and Western blot. The SDS-PAGE and 2D gel analysis showed that native leptin from all the species possesses molecular mass of 16 kDa. Western blot analysis confirmed its sero-reactive property. MALDI-TOF mass spectroscopy and peptide analysis revealed the exact molecular mass of goat, mithun & rohu leptin as 15948.72 Da, 17214.26 Da & 16283.38 Da. The sero-reactive property of leptin might be exploited while preparing sero-diagnostic tool(s) to measure leptin concentration in blood that might be effective to select specific animals(s) for selective breeding purpose to augment biodiversity conservation.

**Rare sighting of *M. f. thunbergi* from eastern part of India in West Bengal**

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**Abstract**

Western yellow wagtail (*Motacilla flava*) occurs both in the breeding and non breeding seasons in an extensive diversity of moist or semi-moist habitats. This bird shows noticeable and multifaceted geographical variation, mainly in head pattern, in male summer plumage. The vocalizations may often be confusable with those of Citrine Wagtail. Subspecies *M. f. thunbergi* Billberg, 1828 is commonly known as dark-headed wagtail or grey-headed wagtail.

During our survey on 19<sup>th</sup> of February in 2022 we have spotted two birds with dark grayish head and yellowish body. After a close observation we found it as dark-headed wagtail or grey-headed wagtail. Bird is characterized by having dark grey crown and nape and darker, blackish-grey lores, grey forehead and anterior ear-coverts (Alstrom, 2010). Pictorial records are there from western part of India in Maharashtra and few from southern part of India in Karnataka, Tamilnadu and Kerala.

**BOT-21060873**

**Extraction, Screening and Seasonal Variation of Phytoestrogen  
Analysis of *Cassia occidentalis* Linn. Pods and *In-silico* Evidence  
for PPAR- $\alpha$  Binding Efficiency**

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**Abstract**

Phytoestrogen testing of *C. occidentalis* was carried out utilising hydro ethanol solvents to screen for the presence of phytoestrogen bioactive components in the plant. The goal of this study was to find potential medicinal components in *C. occidentalis* pods and their concentrations over two seasons (prewinter and winter) using the solvent hydroethanolic. Furthermore, in the current work, molecular docking is used to confirm potent compounds for future neuroprotective activity. The crude extracts obtained from the mature fresh dry pods of *C. occidentalis* in hydro ethanol extract and crude extracts were subjected to phytochemical testings. Chemical testing based Phyto-constitutional examination confirmed the presence of flavonoids and saponin, tannin and glycoside, alkaloid in fresh juice, both methanolic extracts and aqueous extract respectively. The confirmation of phytochemicals in pods of *C. occidentalis* gave the positive directions for its medicinal uses that may serve as new therapeutic agent in neuroprotection, bacterial infection, constipation, pain and diabetes. Kaempferol and Naringenin bioactive compounds were analyzed for neuroprotective activities with their protein targets using Molecular docking studies. Docking results showed best Glide energy, docking score, H-bonding interactions compared with molecular targets and has the potential to prevent or treat neuroinflammation and related disorders.

**BOT-85760816**

**Phytochemical Screening and Antioxidant Activity of Wild Fruits  
*Diospyros melanoxylon* L. and *Flacourtia indica* (Burm.f.) Merr.  
of Lateritic West Bengal**

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**Abstract**

Fruits contain fibres, polyphenols, carotenoids, and vitamins C and E which play important roles in the prevention of different diseases through their antioxidant and free radical scavenging activities. Non-conventional fruits are consumable to human beings but relatively less palatable than other fruits like mango, apple, banana etc. *Diospyros melanoxylon*, *Flacourtia indica*, *Phyllanthus emblica* etc. are some of the wild edible fruits cultivated or grown mainly by ethno-communities in India. The genus *Diospyros* belonging to the family Ebenaceae has several uses such as edible fruits, valuable timber, and ornamental uses etc. It is also known as ‘Kend’, ‘Kendu’ or ‘Tendu’. *Flacourtia indica* (Burm.f.) Merr. (belonging to the family Flacourtiaceae and commonly known as ‘boichi’) is also an important plant which is used to treat a range of ailments and served as the foundation for ethnomedicine. Fruits of *Diospyros* sp. and *Flacourtia* sp. displayed potent free scavenging properties and are used in the treatment of diarrhoea, dyspepsia, dysentery and stomach disorders. The leaves of *Diospyros* sp. are used as ‘biripata’. The fruits of *Flacourtia* sp. are used as appetizing and digestive, diuretic, in jaundice and enlarged Spleen. The antioxidant study revealed that the methanolic extract showed more significant antioxidant activity than the other solvents. Here we have tried to screen the phytochemical characteristics and antioxidant activity of *Diospyros melanoxylon* and *Flacourtia indica* fruits of lateritic West Bengal.

**Analysis of the Taxonomic Position of the Members of  
Dioscoreaceae and Taccaceae Based on Their Morphological and  
Molecular Characters**

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**Abstract**

Angiosperm Phylogeny Group (APG) II included Taccaceae within the family Dioscoreaceae in 2003. But our study wants to know the actual taxonomic position of the Taccaceae and Dioscoreaceae based on morphological as well as molecular characteristics. Among the two families, we only focused on the type genus *Dioscorea* and *Tacca*. The morphological characters were subjected to phylogenetic relationship, cluster and multivariate analysis and molecular characters taken from some genes such as *rbcL*, *matK*, *psbA-trnH&trnL-trnF* are employed for the investigation of variable sites, parsimony informative sites, transition/transversion rates, nucleotide diversity( $\delta$ ), Tajima test statistic(D), nucleotide segregating sites (S), nucleotide frequencies and phylogeny. After the analysis of molecular data, we suggest that the *rbcL* gene is a suitable candidate for DNA barcoding of both the families. But based on both morphological and molecular characteristics the results indicate that the species of *Dioscorea* and *Tacca* show poly phylogeny. The poly phylogenetic relationship between the two genera suggested that the species of Dioscoreaceae and Taccaceae differ from each other and they carry different lineages. So, it would be better if the family Taccaceae is separated from the family Dioscoreaceae.

## **Species Identification of the Genus *Ocimum* Based on DNA Barcode**

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### **Abstract**

*Ocimum* is a highly medicinal plant belonging to the family Lamiaceae. In India, there are 9 species that have similar morphology. For proper identification of *Ocimum*, DNA barcode is more efficient, rapid and robust rather than traditional taxonomy. To investigate the best DNA barcode, we chose different molecular marker genes such as-psbA-trnH, matK & rbcL. These marker genes were collected from NCBI for the construction of NJ, MP, and ML phylogenetic trees with the help of MEGA. The nucleotide sequences of all the genes were calculated to prepare the Intra and interspecific distances, taxon DNA analysis and BLAST in with NCBI. From the whole analysis, we conclude that out of three DNA barcodes psbA-trnH is the best DNA barcode for *Ocimum sp* identification.

## **Ribosomal Protein Genes Mediate Stress Tolerance in Crops**

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### **Abstract**

Ribosomal proteins play important roles in mRNA and tRNA recognition, ribosome subunit assembly, transport, and stabilization. Not much was known about the stress-responsive roles of RP genes until our research group identified activation of two ribosomal protein large subunit genes (*RPL6* and *RPL23A*) while screening activation tagged mutant populations of rice for high water use efficiency. This led us to shortlist some of the potential candidate RP genes with high expression patterns under most of the stressed conditions. We have also observed the salt tolerant behaviour of *RPL6* in independent transgenic plants overexpressing *RPL6*. Furthermore, we performed differential expression patterns of all the RPL and RPS genes in susceptible (BPT-5204) and resistant (RPNF05) *indica* rice genotypes challenged by two major insect pests, BPH and GM. Subsequently, we identified the candidate RP genes that could be involved in plant-insect interaction. Based on our extensive analysis of expression pattern of RP genes under various stress conditions, we could come up with a hypothesis that some of the RPL and RPS genes that were remarkably upregulated can be considered as significant RP genes essential for maintaining the integrity of the ribosomal machinery, ensuring sustained and undisturbed protein synthesis even under stress.

**Plant Extracts as Biocontrol Agents for Seed-Borne  
Mycopathogens: A Pilot Survey**

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**Abstract**

In this era of globalization, seeds are the major transporter of phytopathogens worldwide which result in significant economic losses. Mycopathogens cause contamination of grain crops [e.g rice, wheat, maize etc] at either the pre-harvesting or post-harvesting stages. Seed borne fungal pathogens produce mycotoxins [*Aspergillus*, *Penicillium*, *Fusarium*, *Alternaria*, *Claviceps* and *Stachybotrys*] that cause the deterioration of grain quality, elimination of germination capacity, reduced vigour as well as health problems to humans and animals. Seed treatments tend to prevent plant disease epidemics caused by seed-borne mycopathogens and can be practical in alleviating the proportion of pesticides necessary to manage a disease. Various plant extracts [*Azadiracta indica*, *Aloe vera*, *Datura stramonium*, *Emblica officinalis*, *Eucalyptus globules*, *Acacia nilotica*] can serve as alternative sources for biopesticides and help to control seed-borne mycopathogens. The present pilot study is to review the various plant extracts that have been used to control seed-borne pathogenic fungi biologically.



**Generation of value added anthocyanin in *Melissa officinalis* L.  
leaves upon postharvest treatment**

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**Abstract**

*Melissa officinalis* L., an aromatic herb is commonly known as lemon balm due to its lemon fragrance. Experiments with the detached leaves of this plant in our temperature-controlled glasshouse (temperature: 24±2°C, humidity: 60-70%, photoperiod: 16h light: 8 h dark with light intensity of around 7000±500 lux) showed accumulation of anthocyanin when inserted in a glass vial containing deionized water. Temporal changes of colour from green to red was confirmed by the quantitative distinction of colouration and L\* a\* b\* colour value plots. This anthocyanin accumulation was found to be the highest (1156.72 ± 36.92µg/g) at 49 days of postharvest treatment. HPLC-DAD analysis revealed this anthocyanin as some glycosides of cyanidin which was further confirmed by acid hydrolysis. Degradation of photosynthetic pigments were seen during the postharvest treatment. The content of citral (marker compound) in lemon balm leaves remained unchanged during the process. These anthocyanic leaves were shown to have higher tyrosinase, elastase and free-radical scavenging activities. Attempts are also made for low-cost isolation of anthocyanin from these leaves for possible use as food colorant and/fortification in idly, curd, cake and green tea. Therefore, the above-mentioned new technology holds a promise for large scale application in food industry and traditional medicine.

**Characterisation of exopolysaccharide from endophytic  
*Fusarium* sp. and evaluation of its antioxidative potentialities**

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**Abstract**

Endophytes are a class of microorganisms that live in mutualistic relationship with plants for at least a part of their life cycle and infect the interior tissues of plants without creating any apparent signs of infection. The aim of this study was to isolate and characterize exopolysaccharide (EPS) along with an analysis of its antioxidant activity. In this investigation, *Fusarium* sp. GloS2, an isolate from *Globba marantiana* L. was used for optimization of EPS production. One variable time (OVAT) and response surface methodology (RSM) were adopted to find out best culture condition and medium composition for maximum EPS production. The organism produced maximum EPS (5.52g/l) in potato dextrose broth medium (pH 7.0), fermentation temperature at 35<sup>o</sup>C after 8 days of incubation. EPS showed significant free radical scavenging action when assessed with DPPH free radical, H<sub>2</sub>O<sub>2</sub>, ABTS free radical, and reducing power assay. The observed IC<sub>50</sub> values were 29.21±0.41µg/ml, 15.05±0.51µg/ml, 25.35±0.086µg/ml and 73.44±1.32µg/ml respectively. GCMS analysis explored the presence of pyranose (55.2 min), xylose (57.31min), and fructose (57.61min) as the major monosaccharide components of this exopolysaccharide. This heteropolysaccharide from endophytic *Fusarium* sp. is found to be a potent in-vitro antioxidative agent.

**BOT-12131609**

**Flowering phenology and pollination ecology of indian snap melon *Cucumis melo* L. var. *momordica* (Roxb.)**

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**Abstract**

Indian snap melon [*Cucumis melo* L. var. *momordica* (Roxb.)], member of Cucurbitaceae is an important economic vegetable crop used by the inhabitants of tropical Asia. In this study, the flowering phenology and pollination ecology are observed to judge the efficiency of pollinators in yield enhancement of the crop. The flowers are unisexual. In case of male flowers, flower opening is completed by 7.30 am in the morning while opening of female flowers is accomplished by 7.00 am. The flowers are of one day longevity. Anther dehiscence reaches its peak during 12 noon to 2.00 pm. Simultaneously, receptivity of stigma reaches its zenith at about the same time. Here, the transfer of pollen grains to the stigma is aided by ten species of insect visitors. Among those, six are Hymenopteran members, three species belong to Lepidoptera and one belongs Diptera. Among the visitors, the efficient pollinators are from Hymenoptera viz. *Halictus*, *Andrena*, *Ceratina*, *Tetragonula iridipennis* and *Apis cerana*. Though, two eusocial bee species (specifically *Tetragonula iridipennis* and *Apis cerana*) assist in the pollination of the crop species, however, solitary bees play the most important role for fruit set and yield enhancement in snap melon than colony forming bees.

**A Dual Application of Indigenous Arbuscular Mycorrhiza (AM) and Associated Plant Growth Promoting Pseudomonas Enhance Productivity of *Capsicum frutescens* and Improve Non-Agricultural Lateritic Soil Quality**

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**Abstract**

A field experiment was conducted with *Capsicum frutescens* (chilli), used as a test crop in the experiment, grown in less-fertile acid lateritic soil to study the efficacy of the plant growth, productivity and soil quality. The indigenous arbuscular mycorrhizal fungi (AMF), *Acaulospora* sp. DSM8 and the plant growth-promoting bacteria (PGPB), *Pseudomonas* sp. KGF3 were isolated from the lateritic forest zone of Medinipur, West Bengal. The experiment was conducted in both separated and combined randomized block treatments, and compared for AM spore count, root colonization, plant growth and productivity, and physico-chemical properties of rhizospheric soil were measured before and after cropping to determine the primary impact of bio-inoculants on chilli plant growing in the acid lateritic soil. AM spore count, root colonization and mycorrhization intensity were found maximum in the dual treatment of *Acaulospora* and *Pseudomonas*. The dual application showed maximum productivity in chilli, along with enhancing soil phosphorus and overall quality. It may be due to the plant showing better dependency on indigenous *Acaulospora* species in soil, and the associated *Pseudomonas* act as mycorrhiza helper. Hence the dual application of AM along with PGPB may present better productivity in low fertile lateritic soil.

**BOT-18206294**

**Corticolous algae and cyanobacteria from non forest and avenue trees**

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**Abstract**

The algae inhabit a wide variety of terrestrial environments and substrates; however the taxonomic knowledge for South Bengal regions is still scarce. This survey was conducted in local tree plantation of Nadia, Hooghly and Purba Medinipur in West Bengal. Visible growths of algae were collected and studied. Results reveal the occurrence of nine green algal species, distributed through the class Trebouxiophyceae and Charophyceae. The most frequent cyanobacteria found in the areas pertain to Oscillatoriales and Nostocales represented by species of *Lyngbya* and *Scytonema*. Total 29 species of algae and cyanobacteria were identified. Habitats of epiphytic terrestrial algae are mostly characterized by aridity, and/or levels of temperature and light intensity. On the basis of results found, it is recommended that such communities receive more attention in future investigations to improve the knowledge about this important group of primary producers.

**BOT-91118084**

**Isolation of single active allelochemical from *Alternanthera tenella* Colla. Leaves through HPLC and study its effects on Mung bean seeds germination**

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**Abstract**

*Alternanthera tenella* Colla. possesses numerous phytochemicals with diverse structural functionality and having significant allelopathic potential. The qualitative phytochemical analysis of leaf extracts of *A. tenella* applying standard protocol of extraction using different polar and non-polar solvents indicates the presence of allelochemicals such as phenolics, terpenoids, alkaloids, flavonoids. In current study, different fractions of the shade-dried leaves of *A. tenella* have been extracted by four different organic solvents such as Hexane, Chloroform, Acetone and Methanol. The Mung bean seeds (*Vigna radiata* L.) were treated with each fraction and the inhibitory effects were being observed. The methanolic extract reveals highest inhibition among other prepared extracts. The allelochemicals available in methanol extract have subsequently been analyzed through column chromatography followed by high performance liquid chromatography (HPLC). The bio-efficacy of isolated allelochemicals has been studied. Allelopathic effect of *A. tenella* aqueous leaf extract has also been accomplished on germination, growth and physiochemicals parameters of mung bean seeds and seedlings and the active allelochemicals have primarily been determined.

## **Impact of Changing Air Temperatures on the Growth and Phytochemical Contents in Two Mint Species**

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### **Abstract**

*Mentha spicata* (spearmint) and *Mentha rotundifolia* (false apple mint), two commercially available mint species from the Lamiaceae family, have huge economic importance in the field of herbal medicines, food flavourings and condiments industry because of their bioactive properties, unique aroma and flavour. Several studies have been conducted to understand the impact of different temperatures and photoperiods on the volatile profile of mint essential oils but no proper study has been undertaken on the internal pool of leaf volatiles. In this study, impact of five different temperatures on the growth, photosynthetic pigment profile and internal pool of leaf volatiles of the two species were investigated. The vegetative growth of the aerial parts was best at the warmer temperatures (28°C, 32°C). The photosynthetic pigment contents were highest at 24°C in both species. In case of the internal pool of leaf volatiles, a total of 38 compounds were identified by GC-MS, with unilateral dominance of monoterpene ketones due to very high concentrations of carvone, the marker compound. Other compound classes were monoterpenes, monoterpenoids (ethers, alcohols, esters of monoterpenes), sesquiterpenes and sesquiterpenoids. 32°C was found to be a good temperature for enhancement of carvone and limonene content in both the plants.

**Micro-Morphology of Calcium Oxalate (CaOx) Crystals and  
Idioblast: A Taxonomic Tool**

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**Abstract**

In many plants, crystallization is a common phenomenon. Only in the family Araceae, CaOx crystals are very abundantly present in different plant parts within parenchyma or aerenchyma cells to form the crystals idioblast. These crystals idioblast contain the composition of calcium and oxalic acid to form different crystal diversity like- crystal sands, prismatic crystals, pyramidal crystals, druses and raphides. The present study investigates the type of idioblast, the micromorphology of the druses and the raphides. The main outcome of this study is the meaningful raphide characters like the bridge of raphides, grooves of raphides and termination of the raphides. Bridge of raphides are of three classes, grooves of raphides are of two classes and termination of the raphide are of five classes. Based on these micro-morphological characters, we constructed a dendrogram for a better taxonomic position in the genus as well as species level.



**BOT-92690490**

**Growth performance of aromatic plant Patchouli (*Pogostemon cablin*) under photoselective shading with different shading percentage**

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**Abstract**

Patchouli (*P. cablin*), a shade loving aromatic species belonging to Lamiaceae, is known to produce essential oil with a rich woody aroma and having huge economic and medicinal importance. In an attempt to introduce photoselective shade netting - a modern agricultural practice to protect crops from various biotic or abiotic hazards, it was revealed that different spectral filters along with varying shading percentage affected plant morphology as well as physiology. Vigorous growth in terms of leaf count, leaf size, stem length, stem diameter, fresh and dry weight, was shown to be highest under green nets (75% shading) followed by brown (82% shading) and blue (80% shading) while least under black shade nets (90% shading), after completion of the experimental duration of 90 days (August- October). A similar trend was shown by the total chlorophyll and carotenoid contents under the shade nets. GC-MS analysis of the internal pool of volatile compounds showed that concentrations (/g of fresh tissue) of major sesquiterpene patchouli alcohol and italicene were highest under black nets and lowest under green nets. Also different degree of variation in concentration of other compounds like  $\alpha$ -pinene,  $\beta$ -pinene, caryophyllene, seychellene and squalene suggests alteration of physiology of the plant under different spectral treatments.

## **Agricultural Pollution Control through Mycovirus for Sustainable Management**

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### **Abstract**

Countries worldwide are struggling to expand strategies for control of agricultural pollution. Agricultural activities are the foremost foundation of human civilization. During agricultural activity agro-chemical pollution are major threats of terrestrial and aquatic ecosystems. Therefore, it is mandatory to raise new agricultural techniques to improve soil fertility, favor optimal growth of crop plants, and increase crop durability and resistance to various types of pathogens and pests. Sustainable agricultural productivity is a way to multiple sustainable development goals (SDGs) which means zero hunger (SDG2), no poverty (SDG 1), good health and well-being (SDG 3)". In this economically critical situation, mycovirus has opened up new vistas on the possibility of the development of a mycoviral based novel bio-control methods (i.e. RNA silencing, autophagy and vegetative incompatibility) for effective, eco-sustainable and low cost agricultural activities on a largescale, which may be helpful in maintaining healthy conditions of agricultural soils. This research also focused on the pros and cons of the multidimensional milieu on the possibility of standardizing this eco-friendly biotechnological phenomenon to solve the problems of pest attacks and thereby to lessen herbicides and pesticides pollution.

## **Lichens diversity and role as air quality indicator**

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### **Abstract**

India is one of the mega-diversity countries in the world with many floristically rich eco-regions. Lichens are one of the important constituents of Indian flora however also a neglected component of our biodiversity. Lichen has been recognized as a sensitive biological indicator of environmental condition specifically to air pollution. The decline of lichens around urban region due to air pollution was well studied throughout the world. NO<sub>x</sub> and SO<sub>x</sub> are two toxic agents for lichen health. The distribution of lichens is largely influenced by microclimatic factors such as topography, land cover, water and substratum. In the present communication, lichen diversity and distribution from the district of Nadia, Kolkata and Purba Medinipur were reported. The present study reveals the occurrence of 37 species of lichens, represented by 12 genera and 10 families in selected substratum like tree bark and building wall. Mango, Jackfruit and Supari tree exhibited the maximum diversity of lichens by 19 species. Species distribution across the air quality is also noted sharply.

**BOT-65708364**

**Heterotrophic microorganisms: Generate your own Practical specimen from Classroom atmosphere**

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**Abstract**

Air borne bacteria and fungi are two important component of air microflora. The present study was conducted in the class room of Panskura Banamali College where we conduct our practical classes. Using Suitable universal media for bacteria and fungi solid culture plate based assessment of air quality conducted in fumigated and non fumigated room. *Mucor* and *Aspergillus* were dominant fungi followed by gram positive coccus bacterial group. All these were class practical material for botany and microbiology students. Household fruits and vegetable wastes are also preferable substratum for fungal growth like orange skin is suitable for *Penicillium* and rotten ginger for *Fusarium*. Present communication will empower biological science students to generate their own practical class material and assess their classroom air quality by their own practices. The pure culture of these organisms may be used as raw material for further research on secondary metabolites.

**BOT-92665953**

**Role of a botany student for online and Digital database  
creation: Practice and prospects**

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**Abstract**

Digital aids in plant science are one of the upcoming technologies for learners. In this communication we are tried to focus on such few platforms for plant identification and database preparation. You may create database for your locality flora in front of the world. This will help you to develop virtual laboratory, online identification based on android system. Example of such platforms is Pl@ntNet, Plant.id and PlantSnap plant identification. All three apps are using cloud based system and artificial intelligence and empower a student for machine learning. Here a student can contribute for global initiative and virtual learning. Among these apps Pl@ntNet is a good tool to identify plants with pictures. It is organized in different thematic and geographical floras. In the present communication, we will highlight our operational findings for LOCAL PLANT DATABASE PREPERATION from Panskura, Purba Medinipur with zero rupee cost. This technology aided field project may encourage other students group to prepare their own database and indirect conservation of plant natural resources.

**BOT-82913956**

**Mangrove plantation: A crucial fact sheet for strategy makers**

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**Abstract**

Ecosystem service is one of the key factors for human sustainability. Mangrove ecosystem is essential for their valuable services like coastal protection or fisheries enhancement. Mangrove restoration is necessary specially in West Bengal coastal districts. Majority of planting efforts fail to restore functional mangrove forests across the world. Present case study focusses on the Balughata mangrove plantation, situated at 21° 82' 72.09" N and 87° 85' 74.77" E under Haldia subdivision, Purba Medinipur district. Application of Ecological Mangrove Restoration Principles is important for successful restoration. Mangroves restored in this way generally survive and function better. In this practice most important is optimization of species to site matching resulting in better survival, faster growth, and more diverse and resilient mangrove forest which help mangroves to grow back naturally. In Balughata plantation, optimal natural algalization is key indicator for mangrove species plantation keeping in view estuarine floods and root architecture of selected species. Plantation practices in Balughata may be a model for Ecological Mangrove Restoration like Social forestry Arabari Model of Medinipur.

**BOT-46739541**

**Understanding the mechanism of Collar Rot Tolerance in Lentil  
(*Lens culinaris* Medik)**

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**Abstract**

Lentil is a highly valued, high protein containing self pollinating annual cool season food legume with chromosome number  $2n=14$ . Lentil has an average national productivity of 675 kg per ha which is much less than its yield potential. Diseases caused by fungi are of prime importance which reduces plant vigor, and ultimately yield. Collar Rot of lentil caused by *Sclerotium rolfsii* Sacc can cause up to 50% yield losses at farmers field. Collar Rot occurs in almost every region where lentil is grown. No tolerant lentil genotypes are reported which can be used as donor parent in lentil breeding program for collar rot resistance. Our group screened 200 genotypes for collar rot tolerance and few tolerant lines were identified. Among them LL-56 was further used to validate and confirm the disease tolerance. Morphological, biochemical and molecular studies were performed on tolerant and susceptible cultivars to confirm the tolerance. Different biochemical assays of antioxidant enzymes and other stress markers indicated the tolerant nature. RT-qPCR of candidate disease resistance genes showed significantly high expression in tolerant and low expression in susceptible line. Our finding will help in developing collar rot tolerant Lentil line which can also serve as parent in breeding program.

***In silico* Identification & Characterization of GPI-anchored  
Proteins from the Rice Blast Fungus *Magnaporthe oryzae***

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**Abstract**

Rice is the most consumed staple food throughout the world. In order to ensure global food security, it is necessary to think seriously about all the possible threats toward rice production. The filamentous fungal pathogen, *Magnaporthe oryzae* is one of the major threats to rice cultivation as it causes 10 to 30% global rice yield loss each year. This pathogen causes the blast disease of rice resulting in rot and necrosis in several plant parts. Thus, the first step toward hassle-free rice production is to understand the pathogen life cycle, disease cycle, processes involved in disease development, and the mode of action of all the proteins involved. Though very little information about the pathogen is available to date, researchers are continuously uncovering new insights about the pathogen. In different fungal systems, glycosylphosphatidylinositol (GPI)-anchored proteins are found to play very important roles in maintaining the fungal morphology and even in pathogenicity. GPI-anchored proteins are known to be involved in maintaining fungal cell walls, synthesis and assembly of beta-glucan, production of conidia, and in pathogenicity. In this paper, I have identified three GPI- anchored proteins from *M. oryzae*, MoGA1, MoGA2, and MoGA3 by the *in-silico* method. I have also predicted and validated the three-dimensional structure and also predicted the probable functions. Further wet-lab works are still required to uncover the remaining mists about this system.



**Reproductive ecology of *Saraca asoca* (Roxb.) de Wilde, an important medicinal plant of tropical Asia**

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**Abstract**

Ashoka is a perennial, evergreen tree valued for its ornamental flowers and medicinal values. The aims of this work were to examine the reproductive biology and pollination behaviour of *S. asoca* under ex situ circumstances. The IUCN has designated this species as “vulnerable” due to its declining population. The flower is bisexual, flower opening is completed by 2 am to 5 am in the morning. The flower is of 5-day longevity, anther dehiscence reaches its peak during 6 am to 8 am. The length of the stamen and pistil reveals if the male and female components are compatible for pollination. Post-anthesis, pollen viability peaked in two days as well as stigma receptivity in 48 hours. Flower colour changes from petal base to apex among 4 days, 1<sup>st</sup> day flower colour is light orange, 2<sup>nd</sup> day colour change from light orange to reddish orange, 3<sup>rd</sup> day colour is red then 4<sup>th</sup> day colours deep red. Cross-pollination behaviour, which limited the production of self-seeded seeds, was indicated by the floral biology and breeding system observations. The efficient pollinators are *Apis cerena*, *Apis dorsata* and Trigona. This species produces a large number of seeds, showing that it can sustain its progeny in wild populations.

**Antifungal Activity of Bio-active Cell Free Metabolites, and Volatile Organic Compounds Synthesized by Endophytic Fungal Isolates of Garden Nasturtium**

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**Abstract**

Increasing resistance of fungal pathogens against antifungals is a serious threat. Solutions can be found from novel natural sources and endophytes are the predominant contributors. Here, four endophytic fungi (*Colletotrichum aenigma* TML3, *Curvularialunata* TML9, *Fusarium oxysporum* TML11 and *Alternaria arborescens* TML14) were isolated from leaves of *Tropaeolum majus* and the endophytic metabolites were broad spectrum antifungal against eight phyto and human pathogens. Fungal culture extracts hampered the biofilm formation, central carbohydrate metabolism, ergosterol synthesis, membrane permeability, haemolytic effect and cause lethal leakage of necessary macromolecules of *C. albicans*. The VOCs inhibited the growth of phytopathogens up-to 89% and can be utilized as a mycofumigator, a potent tool for sustainable agricultural practices. Volatile and non-volatile compounds were detected from the TML3, TML14 and TML9 endophytic fungi. MFC was found to be in a range of 300-640  $\mu\text{g mL}^{-1}$ . In short, endophytic volatile and non-volatile metabolites of *T. majus* are potent in-vitro antifungal agents.

**BOT-56104434**

**Insights Into Haustorial Mycobiome Of Hemi-parasitic  
*Macrosolen cochinchinensis* (Lour.) Tiegh. For Biologicals**

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**Abstract**

Over the course of modernization, bohemian life style swiftly increases oxidative stress, subsequently leading to increased risk of disease susceptibility and rapid progression of disease. Another major concern is evolving multiple drug resistant microbes due to unregulated usage of antimicrobials. The imperative need to find novel biologicals, led to shift our attention to explore microbial treasure box. In this work, we investigated the fungal endophytic assemblage from haustoria of *Macrosolen cochinchinensis* associated with *Mangifera indica*. A total of five isolates were found from different haustoria fragments. Ethyl Acetate extract of culture filtrate from all isolates were primarily screened for their antibacterial potency against two gram positive and two-gram negative bacteria. *Diaporthe* sp. MCH3 emerged as a leading producer of antibacterial with 17 mm and 12 mm clear zone of inhibition (ZOI) against *S. aureus* and *S. flexneri* respectively. Radical scavenging ability of five endophytic fungi were also tested through DPPH assay. IC<sub>50</sub> value was 57.04 µg mL<sup>-1</sup>, which is higher for *Diaporthe* sp. MCH3 culture extract than other isolates. This fungal endophytic isolate can further be subjected to bioprospection.

**BOT-15950939**

**Oxygenic photoautotrophic life in extreme biotopes: A field to laboratory approach**

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**Abstract**

Cyanobacteria are cosmopolitan primary oxygen evolving colonizers and responsible for the present day's oxygenic environment. Thermal spring and cave are two unusual habitats and often dominated by cyanobacteria. In present communication, cyanobacteria from thermal and cave biotopes were characterized using culture independent and dependent approach based on growth, biomass nutrition and molecular phylogeny. Seven cyanobacterial strains of the genus *Phormidium*, *Scytonema*, *Fischerella* and *Chlorogloeopsis* were isolated from three hot springs and two caves. pH, temperature and light were limiting factors of these habitats. Thermal *Fischerella* was fast grower and all cave strains were slow grower. Phototropic, heterotrophic and photoheterotrophic growth were observed among isolated strains. Cave strains showed better growth under photoheterotrophic condition. Metagenomic approach was applied to reveal thermal spring microbes-Cyanobacteria association. Molecular phylogeny indicated unique thermal cyanobacterial strains with molecular chaperon (HSPs) activity. These organisms are valued scientifically for their analogy to the ancient life forms on earth and as a source of stable biocompounds for possible biotechnological exploration.

**BOT-43857755**

**Documentation of campus Angiospermic Flora of GGDC,  
Keshiary, Paschim Medinipur, West Bengal**

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**Abstract**

A survey was made to identify the angiospermic flora present in the campus of Government General Degree College, Keshiary, Paschim Medinipur, West Bengal, India and the work was undertaken during June-2021 to July-2022 as a project to incorporate student participation thought to be essential for the longevity and expansion of botany and give them a proper hands-on outdoor field work. The aim of the present study is to make a proper documentation of the identified 68 dicot species belonging to 33 families and 14 monocot species belonging to 4 monocot families and to make a proper database of their medicinal uses. Here, I want to specify that *Drosera*, a carnivorous species, listed as threatened and endangered, are found here frequently. The college campus is situated in the lateritic zone of Paschim Medinipur and near the Belda Forest range. The survey was completed with the expectation that this study will help the forthcoming plant science understudies of this institute and assist them to be empowered in the field of natural science.

**BOT-39291288**

**Secretory structures of *Cinnamomum verum* J. Presl. leaves from two different geographical regions with reference to histochemistry and essential oil composition**

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**Abstract**

The ‘ceylon cinnamon tree’ (*Cinnamomum verum*), a tropical Lauraceous species, is one of the oldest known spices used since ages. The distinguished aroma of this plant is due to the presence of oil cells containing oil droplets, known as the primary site of oil biosynthesis. The essential oil composition of a plant is known to be influenced by its geographical origin and seasonal variation. This study elucidates the differences in internal volatiles pool, essential oil composition, yield, and oil cell morphology of *C. verum* plants grown in eastern (Kharagpur, West Bengal) and north-eastern (Mamit, Mizoram) region of India during different seasons. The leaf essential oil profile of Kharagpur, with a higher yield, was dominated by phenylpropanoids (81.98%) while the highest monoterpenoids (48.42%) content was noted in Mamit essential oil. The major components of the leaf essential oils were eugenol and linalool respectively in Kharagpur and Mamit grown populations. To assess the oil cell morphology and histochemistry, an extensive study was undertaken by using bright field and fluorescent microscopy. It confirmed the localization of various metabolites present in the essential oil (e.g. lipids, terpenes) as well as deposited on the oil cell wall (e.g. aldehydes, lignins). Due to substantial differences in essential oil composition, these two populations can be considered chemotypes.

**BOT-86280166**

**Production and optimisation of tannase from endophytic  
*Colletotrichum gloeosporioides* SC5 under SSF using waste tea  
husk**

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**Abstract**

Tannase (tannin acyl hydrolase, EC 3.1.1.20) hydrolyzes the ester and depside linkages present in the tannins and releases gallic acid and glucose as byproducts. Tannase has several industrial uses including the production of instant tea, gallic acid, and wine. Gallic acids also have immense applications in cosmetics, food processing, and pharmaceuticals industries. In current study, we have isolated endophytic fungi from *Syzygium cumini* L. and analyzed their tannase production ability. Out of twelve isolates, endophytic *Colletotrichum gloeosporioides* SC5 showed highest tannase producing ability of 1.86 U/ml in submerged fermentation condition. SC5 showed tannase activity of 3.26 U/ml under solid state fermentation (SSF) using waste tea husk as substrate (collected from local tea vendor). Maximum tannase production was detected at pH of 5.5; temperature of 37°C and incubation period of 96 h. Partially purified tannase was stable at pH range of 3.5 - 8.0 at temperature below 45°C.

**Plant growth promoting activity of endophytic *Daldinia eschscholtzii* CIN9, isolated from *Clerodendrum infortunatum* Linn.**

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**Abstract**

Endophytes are defined as a highly promising and complex system of kinship with diverse groups of plant taxa worldwide. They are naturally occurring microbiota of plant-integrated tissues and are co-evolved with the hosts. Endophytes altered micro-environmental conditions while balancing the host's internal defense mechanisms. Here, we have isolated thirty endophytic fungi from the plant *Clerodendrum infortunatum* Linn. The isolates were evaluated for plant growth promoting assays and isolate CIN9 produced significant amounts of IAA (28.09 $\mu$ g mL<sup>-1</sup>). Crude extract was run on thin-layer chromatography at 254 nm wavelength. GC/MS analysis of the extract detected indole-3-glycolic acid (retention time - 7.69 min) as the major compound which validate the presence of indole components as the dominant one. Direct and foliar application of culture extracts improved shoots (10.4  $\pm$  0.87 cm) and root lengths (11.06  $\pm$  4.69 cm). The outcome of the study suggests that fungal endophytes could be used as a plant growth promoter.



**Setting Proper Working Conditions of a Test Station for  
Electrochemical Impedance Spectroscopic Investigations of a  
Polymer Electrolyte Membrane Fuel Cell (PEMFCs)**

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**Abstract**

This study demonstrates the application of Impedance Spectroscopy Genetic Program (ISGP) for the investigation of a polymer electrolyte membrane fuel cell (PEMFCs). It further demonstrates procedures to optimize operating conditions of a single cell in a test station. To do that, the effects of temperature, hydrogen/air, and dew point temperatures (DPT) on the cell were examined, using an Arbin test station. ISGP followed a two-iterations procedure. First, finding an out-of-range peak (at high frequencies) that corresponds to the Ohmic (series) resistance of the system. Second, finding the models after subtracting the Ohmic resistance from the real part of the measured spectrum. This two-step procedure allows solving a Fredholm equation of the second kind in a reasonable accuracy. The resulting peaks making the distribution function of relaxation times (DFRT) were partially assigned for different physical processes in the PEMFCs. ISGP seeks for a distribution of relaxation times that has the form of a peak or a sum of several peaks, assuming the Debye kernel, where each peak is represented by a known analytic function. As a part of the analysis, the peak areas, which correspond to the contribution of the relevant process to the total impedance, were calculated obtaining tendentious behavior depending on the changing environmental parameters. ISGP of PEMFC results in three peaks. The optimized conditions were found to be: ratio of gas flow fuel to air rates 1:7, fuel cell temperature 60 °C, and dew point temperatures 50 °C.

**Synthesis and crystal structure of two new novel Cu(II) Schiff base metal Complexes and one Ni(II) Schiff base metal complex along with their biomedical approach towards DNA Binding, HSA Binding and, Anticancer efficacy: A combined theoretical and experimental approach**

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**Abstract**

Three newly designed novel Cu(II) / Ni(II) complexes [CuL(N<sub>3</sub>)<sub>2</sub>(DMF)<sub>2</sub>] (**1**), [NiL(N<sub>3</sub>)<sub>2</sub>(DMF)<sub>2</sub>] (**2**) and, [Cu(HL)(bpy)ClO<sub>4</sub>] (**3**) have been developed by utilizing an N, N, O donor piperidine based Schiff base ligand (**HL**) [(Z)-4-bromo-2-(((piperidin-2-ylmethyl)imino)methyl)phenol], developed by the simple condensation reaction of 5 – bromosalicylaldehyde and 2 – aminomethyl piperidine. The ligand and the corresponding complexes are characterized by implementing several spectroscopic techniques. Single X-ray crystal structural analysis reveals that Complex **1** and **2** both are bis azido-bridged binuclear distorted octahedral complexes where each metal center is coordinated by one deprotonated **HL**, one solvent molecule (DMF) and two azide moieties which act as a bridge among two metal centers. Complex **3** is a mononuclear distorted square pyramidal complex where Cu(II) is coordinated by one deprotonated ligand **HL** and one bipyridyl (bpy) unit and also one ClO<sub>4</sub><sup>-</sup> as a secondary anionic residue. After extensive characterization, the complexes are used to inspect their binding efficacy towards DNA and Human Serum Albumin (HSA). Both complexes demonstrate remarkable binding efficiency with CT - DNA and Human Serum Albumin (HSA) protein which is confirmed by several biophysical studies like electronic titration, fluorescence titration, circular dichroism titration, etc. In addition, to visualize the contact location and to measure the energy, theoretical analysis in terms of molecular docking has also been introduced to support the experimental results. The complexes are then evaluated for anti-cancer activity using the HeLa (cervical cancer cell) and PA1 (ovarian cancer cell) and HEK (normal cell) cell lines by in-vitro MTT assay technique and the results show that Complex **1** and **3** are more susceptible to show effective anticancer property with low toxicity to a normal cell. Finally, using nuclear and cellular staining techniques the fact is unveiled that the complexes can kill the cancer cell via an apoptotic pathway.

**A novel Rhodamine-based biocompatible Schiff base Off– On” chemosensor for selective and colorimetric recognition of Zn(II) and Al(III): Illustration to the molecular logic gate and live cell images study**

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**Abstract**

5-chlorosalicylaldehyde appended novel Rhodamine-based Schiff base chemosensor **HL** has been fabricated for easy, selective, and accurate detection of the Zn(II) and Al(III) among several metal ions in MeOH: H<sub>2</sub>O (9:1 v/v) medium at pH 7.40 via turn on fluorescence. Interestingly under UV light ( $\lambda_{\text{ex}} = 365 \text{ nm}$ ) after the successive introduction of Zn(II) to colorless **HL**, the color of the solution changes to greenish-yellow color whereas after the introduction of Al(III) a deep orange color is seen. After that, the optically sensitive sensing phenomena have been spectroscopically monitored. During fluorometric titration, an impressive large difference of 130 nm is observed among  $\lambda_{\text{em-Zn}}$  and  $\lambda_{\text{em-Al}}$  [ $\lambda_{\text{em-Zn(II)}} = 455 \text{ nm}$ ,  $\lambda_{\text{em-Al(III)}} = 583 \text{ nm}$ ]. In probe-analyte, strong bonding can be confirmed from high binding constant values, obtained from fluorometric and UV metric titration. The 1:1 stoichiometric addition of **HL** with Zn(II) / Al(III) has been validated from the analysis of the result obtained from fluorescence lifetime measurement, mass, and NMR spectral study. The probe can detect Zn(II) and Al(III) as low as in the below micromolar region. By implementing the Density Functional Theory (DFT) the structures of the host-guest complexes have been theoretically optimized. The bio-sensing activity of **HL** has been confirmed by implementing the fluorescence live cell imaging study for Zn(II), and Al(III) sensing. By utilizing the presence of reversibility during cation sensing the molecular logic gate formation has been carried out. Finally, the sensing phenomena of the chemosensor for effective cation detection are further utilized to detect these cations in some daily-use practical samples.

**Designing and Synthesis of Coordination Complexes to Remove Toxic Metals (Cd, Hg) Resulting a Novel and New Series of  $\mu$ -oxo Hetero-nuclear Coordination Complexes: An Application in Dye Degradation and Fabricated Schottky Device**

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**Abstract**

By utilizing hexadentate Schiff base ligand (**H<sub>2</sub>L**) and FeCl<sub>3</sub> two mononuclear Fe(III) metal complex 1(**MC1**) [FeL(H<sub>2</sub>O)N<sub>3</sub>] have been developed that can successfully detect and remove Hg(II) and Cd(II) among several competitive toxic metal ions results in two new unusual novel hetero nuclear  $\mu$ -oxo bridged metal complexes having the molecular formula [ $\{\text{Fe(III)}\}_2(\mu\text{-O})\text{L}_2\text{Cl}_4\{\text{Hg(II)}_2\}$ ] (**MC2**) and [ $\{\text{Fe(III)}\}_2(\mu\text{-O})\text{L}_2\text{I}_4\{\text{Cd(II)}_2\}$ ] (**MC3**). Thorough spectroscopic characterization and single crystal data analysis reveal that the mother complex **MC1** has a mononuclear octahedral geometry with azide as a secondary anionic residue. Interestingly in the two structurally similar complexes **MC2** and **MC3**, each asymmetric unit contains deprotonated H<sub>2</sub>L, one Fe(III) and Hg(II)/Cd(II) metal center, two Cl/I and one Fe(III) is connected by  $\mu$ -O bridge with other Fe(III) forming tetranuclear complexes. Since the values of band gap energy for complex **MC 2**, and **MC 3** ( 2.69 eV and 2.55 eV respectively) lie within the visible region, so after the structural determination of the two complexes have been exposed to investigate their potentiality towards heterogeneous catalytic activity in the aqueous medium in term of methylene blue (MEB) dye degradation under visible light irradiation as well as their efficacy to be a semiconductor. After a solid inspection, it can be concluded that complex **MC 3** shows highest methylene blue degradation potentiality than complex **MC 2** in presence of H<sub>2</sub>O<sub>2</sub>. At the same time the values of the device performances, conductivity, and device parameters of **MC2** and **MC3** have been measured, highlighting the better potentiality of complex **MC3** in comparison to **MC2** which can be correlated with the lower band gap value along with the presence of Cd(II)-Fe(III) bond in complex **MC3**.

**Impact of Different Stabilizers on the Physiochemical Behavior of Methanolic Extract of *Acorus calamus* Rhizome Loaded Nanostructured Lipid Carriers.**

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**Abstract**

Nanostructured lipid carriers (NLC) are novel biocompatible drug delivery systems. Methanolic extract of *Acorus calamus* rhizome, known to possess anti-allergic activities, was loaded in four different NLC formulations, prepared using stearic acid, tripalmitin and soy lecithin (1:2:2, M/M/M) by cold homogenization and ultrasonic dispersion technique, where poloxamer-188, polyvinyl alcohol (MW 31000), polyethylene glycol (MW 2000) and tween-60, were separately used as stabilizers. Bare and extract loaded formulations were characterized with UV-VIS spectroscopy, FTIR spectroscopy, dynamic light scattering, X-ray diffraction, atomic force microscopy and electron microscopic studies. Comparative studies on different formulations were assessed. Further studies to explore anti-allergic activities, an animal model are under consideration.

## CO<sub>2</sub> Fixation by Dimeric Tb(III)-complexes: Synthesis, Structure and Magnetism

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### Abstract

Two dinuclear [Tb<sub>2</sub>(L<sup>1</sup>)<sub>2</sub>(piv)<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>].H<sub>2</sub>O (**1**) and [Tb<sub>2</sub>(L<sup>2</sup>)<sub>2</sub>(CF<sub>3</sub>CO<sub>2</sub>)<sub>2</sub>(H<sub>2</sub>O)<sub>4</sub>].2NO<sub>3</sub> (**2**) complexes have been prepared and characterized by single crystal X-ray diffraction, where each metal ion is doubly phenoxido-bridged by the two phenolato oxygen atoms of the tetradentate Schiff-base ligand. Previous magnetic studies of **1** show it is not an SMM, while AC magnetic measurements of **2** show that it relaxes quite fast with muSQUID measurements revealing the presence of an interaction operating between the Tb ions. Through the DC, muSQUID and CASSCF calculations it can be quantified the strength of the interaction in **2**, which is of dipolar origin. Both the complexes showed efficient catalytic activity towards the carbon dioxide insertion reaction into epoxides for the formation of organic cyclic carbonates. Catalytic synthesis of organic cyclic carbonates smoothly occurred at 60°C temperature under 1 bar carbon dioxide pressure and neat conditions. Exocyclic as well as endocyclic epoxides produced respective cyclic carbonate product with moderate to high yield (43-100%). Moreover, high turnover number (7300-10000) along with high turnover frequency (537.5-5000 h<sup>-1</sup>) is found in this catalytic reaction.

## Versatile Reaction of an Ambidentate and Flexidentate *o*-Phenylenediamine-Thiophene Derivative

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### Abstract

The versatile redox activities of  $(R_1)CH=N-(C_6H_4)-NH-C(H)(Ph)(R_2)$  ( $L_1H$ ), an *o*-phenylenediamine derivative where  $R_1$  = thiophene and  $R_2$  = pyridine functions, that exhibits flexidenticity and ambidenticity towards ruthenium(II) ion and undergoes oxidative dehydrogenation (OD), *cis* and *trans* isomerisation, C-H activation for Ru-C bond formation, Ru-S bond formation, imine  $\rightarrow$  imidic acid conversion and also affords dinitro and  $[RuNO]^7$  complexes are reported. Reaction of  $L_1H$  with  $[Ru^{II}(PPh_3)_3Cl_2]$  ( $Ru^P$ ) in boiling toluene in air promotes OD reaction affording *cis*- $[Ru^{II}(L_2^{NNN^0})(PPh_3)Cl_2]$  (*cis*-**1**), where  $L_1H$  has been modified to  $(R_1)CH=N-(C_6H_4)-N=C(Ph)(R_2)$ , a neutral  $[NNN]$  donor *o*-phenylenediimine derivative ( $L_2^{NNN^0}$ ). The same reaction at room temperature furnishes the *trans* analogue, *trans*- $[Ru^{II}(L_2^{NNN^0})(PPh_3)Cl_2]$  (*trans*-**1**). Conversion of *trans*-**1**  $\rightarrow$  *cis*-**1** has been achieved in boiling xylene. Reaction of *cis*-**1** with  $I_2$  and  $PPh_3$  in toluene produces  $[Ru^{II}(L_2^{NNNS^0})(PPh_3)Cl]I_3$  ( $3^+I_3^-$ ), where  $L_1H$  has been modified to  $(R_1)CH=N-(C_6H_4)-N=C(Ph)(R_2)$ , a neutral tetradentate  $[NNNS]$  donor ligand ( $L_2^{NNNS^0}$ ), where the thiophene coordinates to ruthenium(II) ion. Reaction of  $L_1H$  and  $Ru^P$  in boiling ethanol promotes a C-H activation reaction generating a thiophene metallated complex, *trans*- $[Ru^{II}(L_2^{NNNC^-})(PPh_3)_2]^+$  (*trans*-**2**<sup>+</sup>), where,  $L_1H$  has been modified to a tetradentate  $[NNNC]$  donor ligand ( $L_2^{NNNC^-}$ ). The same reaction in presence of excess  $NaNO_2$  promotes OD and chloride substitution reactions affording a *cis*-dinitro complex, *cis*- $[Ru^{II}(L_2^{NNN^0})(PPh_3)(NO_2)_2]$  (*cis*-**4**), while the same reaction in presence of  $HClO_4$  promotes OD and the oxidation of the imine to imidic acid producing a  $[RuNO]^7$  complex of the type  $[Ru^{II}(L_{OH}^{NNN^0})(PPh_3)(NO)Cl]^+$  (**5**<sup>+</sup>), where  $L_1H$  has been modified to  $(R_1)(OH)C=N-(C_6H_4)-N=C(Ph)(R_2)$ , *o*-phenylene-imine-imidic acid derivative ( $L_{OH}^{NNN^0}$ ). The molecular and electronic structures of the complexes were confirmed by single crystal X-ray crystallography, EPR spectroscopy and DFT calculations.

**AIE active a novel Piperazine-based new biocompatible Schiff base chemosensor for easy and selective detection of Zn(II), Mg(II), Cl<sup>-</sup>ions, and Picric acid in different solutions with their live cell image study**

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**Abstract**

Aggregate-induced emission (AIE) active chemicals are fascinating due to their special ability to control intramolecular rotation and have wide range of uses. The present study demonstrates the development and the characterization of 5-Chlorosalicylaldehyde appended a novel Piperazine-based new Schiff base chemosensor **HL**((Z)-2,4-dibromo-6-(((2-(piperazine-1-yl)ethyl)imino)methyl)phenol). The AIE characteristic of **HL** has been monitored in CH<sub>3</sub>OH/H<sub>2</sub>O mixtures at different volume percentages of water and the probe shows the highest aggregation-induced emissive (AIE) response in MeOH: H<sub>2</sub>O (10:90%) medium. The morphology of the aggregated particles is investigated by DLS and SEM studies. The proposed analytical system with a clear AIE mechanism demonstrates a potential outlook for on-site practical applications such as picric acid (TNT) detection. **HL** can be conveniently applied on test strips for visual detection of picric acid. The detection limit of this approach can be as low as 23.2 nM by fluorescence measurements. Simultaneously, this probe can selectively detect bio-relevant Zn(II), Mg(II), and Cl<sup>-</sup> ions over other competitive cations and anions in MeOH: H<sub>2</sub>O (9:1 v/v) at pH 7.40 via turn-on fluorescence response. One noticeable fact is that the chemosensor **HL** exhibits very low luminescence properties in the solution state but exhibits significant luminescence in the solid state. Under uv light ( $\lambda_{\text{ex}} = 365 \text{ nm}$ ) rapid color changes are observed after separate inclusion of Zn(II), Mg(II), and Cl<sup>-</sup> to the bare probe. All the sensing phenomena have been spectroscopically monitored. The association of the cations and the anion remains unaffected in the presence of several competitive analytes. The probe can significantly detect Zn(II), Mg(II), and Cl<sup>-</sup> below the micromolar region. The four 1:1 stoichiometric host-guest binding is established by jobs plot determination and mass spectral analysis. Density Functional Theory (DFT) study theoretically optimized the structure of the probe-analyte complex structures. The bio-sensing activity of **HL** has been confirmed by implementing the fluorescence live cell imaging study for the aforementioned analytes.



**A Size controlled green synthesis of silver nanoparticles by using Sour Spinach extract and their HSA binding efficacy and anticancer property study**

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**Abstract**

A variety of plant extracts have been used for the green synthesis of silver nanoparticles having several biomedical applications. However, the present work demonstrates the synthesis of AgNPs by utilizing the Garden Sour Spinach extract, which has antioxidant, anti-inflammatory, and anticancer activities. Herein we have illustrated an easy and eco-friendly technique to develop sour spinach AgNPs. The UV-visible, IR spectrum, XRD data, and dynamic light scattering (DLS) analysis disclose that the size of AgNPs is controlled by the concentration of Ag nitrate. The FE-SEM study shows the morphology of the nanoparticles. The nanoparticles can effectively interact with Human Serum Albumin (HSA) protein and this is confirmed by several spectroscopic studies. Finally, the anticancer study of the AgNPs has been tested against HeLa cancer cells and HEK normal cells. The IC<sub>50</sub> values for these two lines unveil the fact that this nanoparticle has an effective anticancer property with low toxicity to a normal cell. These results confirmed that the *locally available sour spinach* could be a low-cost, nontoxic and eco-friendly natural resource for the synthesis of AgNPs, having effective protein binding and anticancer properties.

## Electronic structure and electrocatalysis by fused corrole dimer

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### Abstract

A minor modification of the reported procedure for the synthesis of a corrole dimer (H<sub>3</sub>tpfc)<sub>2</sub>COT that is fused by the cyclooctatetraene (COT) unit allowed for its isolation in 18% yield. The corresponding bis-gallium(III) complex was prepared as an entry into the potentially rich coordination chemistry of (H<sub>3</sub>tpfc)<sub>2</sub>COT. Both X-ray crystallography and DFT calculations disclosed that the COT moieties are essentially planar with very unusual non-alternating and non-delocalized C-C bonds. The same holds true for the bis-gallium(III) complexes [(Ga-tpfc)<sub>2</sub>]COT(py)<sub>2</sub> and [(Ga-tpfc)<sub>2</sub>]COT(py)<sub>4</sub>, obtained with one and two pyridine molecules coordinated to each metal ion, respectively. The electronic spectra of both the free base and the gallium(III) complexes display an extremely low energy band ( $\lambda_{\text{max}}$  of 720-724 nm), which points towards extensive  $\delta$ -delocalization through the COT bridge. Another potentially redox active metal (Fe) demonstrated efficient Proton reduction electrocatalytic activity.

**Selective Zn(II) and Ni(II) sensing in pure aqueous and semi-aqueous medium via turn-on fluorescence response by a new Schiff base chemosensor: results to mononuclear Zn(II)/Ni(II) complexes having ATP detection ability in aqueous medium**

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**Abstract**

The current study demonstrates the successful application of a new Schiff base chemosensor, HL, as a selective chemosensor for Zn(II) and Ni(II) among other competing cations in purely aqueous and semi-aqueous media. The receptor responds to UV light in a methanol water (9:1) HEPES buffer by altering its colour to cyan in the presence of Zn(II) and blue cyan in the presence of Ni(II). Surprisingly, the chemosensor can only accurately detect the presence of Zn(II) in pure aqueous medium by causing a change in colour to bright yellow. To keep track of this Zn(II) / Ni(II) recognition phenomena, UV and fluorescence experiments are used in both aqueous and semi-aqueous conditions. The high host-guest binding constant values, obtained from electrical and fluorescence titration, give us confidence that HL and Ni(II) / Zn(II) will form a strong connection. Complex 1 and Complex 2 are produced by the independent reactions of HL and Zn(II) / Ni(II), and both complexes have a modest luminosity due to the presence of chelation-enhanced fluorescence (CHEF). According to the single crystal structure, both complexes' asymmetric units are made up of two deprotonated chemosensor units and one Zn(II) / Ni(II), which together form two octahedral complexes. The projected LOD for Ni(II) and Zn(II) sensing is in the nanomolar range. Both complexes 1 and 2 are fluorescence active and exposed to test their capacity for ATP detection, but intriguingly, only complex 2 is able to detect ATP in a whole aqueous solution. The examination into live cell imaging confirms the two sensor's biosensing ability.

## **Inhibitory effect of natural alkaloid berberine on the lysozyme fibrillar assembly formation**

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### **Abstract**

Protein fibrillation or aggregation is the cause of innumerable neurodegenerative diseases like Alzheimer's disease, Type II diabetes, Friedreich ataxia, Parkinson's disease etc. Any potential drug compound that inhibits protein fibrillation can act as remedial medicine for these type of diseases. In this study, we uphold the anti-amyloidogenic potency of naturally occurring bioactive alkaloid Berberine using various photophysical and imaging analysis. Influence of Berberine on chicken egg white lysozyme (HEWL) amyloid fibrillation process was studied using Thioflavin-T (Th-T), 8-anilino-1-naphthalensulfonic acid, Congo red and Nile red assay. The kinetics of relative amyloid fibril formation in presence and absence of Berberine were analyzed by Th-T assay. The surface hydrophobicity changes were monitored using NR assay. Visual observation through Atomic force microscopic imaging testified in favor of the strong inhibitory influence of Berberine over amyloid fibril formation of HEWL. All supporting data reveals that Berberine has more than 84% anti-amyloidogenic influence on HEWL fibrillation. Detail italic molecular docking was performed for the theoretical investigation of interaction between Berberine and HEWL. Binding constant was determined from spectrofluorometric study and it was concluded that high binding ability of Berberine for HEWL was the main driving force behind fibril inhibition.

## **Benzophenanthridine alkaloid sanguinarine inhibits lysozyme fibrillation**

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### **Abstract**

The naturally occurring alkaloid Sanguinarine (SNGR) exhibits wide range of medicinal activities due to its remarkable biological potency and relatively low toxicity. Here, we studied the interaction and inhibitory potential of SNGR on a model protein, Hen egg white lysozyme, fibrillation in the quest for developing new drugs for treatment of amyloid and protein aggregation related ailments like type II diabetes, Parkinson and Alzheimer's disease. The interaction between quaternary isoquinoline alkaloid sanguinarine iminium (SNGRI) form and lysozyme (Lsz) was initially investigated by fluorescence quenching. A further study for identification of static or dynamic quenching effect of SNGRI on Lsz was performed using time resolve fluorescence spectroscopy. The result showed that there was no distinct change in fluorescence life time values of free Lsz and HEWL complexed with SNGRI steadily supporting that the fluorescence quenching of Lsz is static in nature due to ground state complexation. The secondary structural changes of protein was further deciphered by absorbance, 3D-fluorescence and synchronous fluorescence spectroscopy. This data indicated that SNGRI was bound near the Trp-62/63 residues of Lsz. The inhibitory effect of SNGRI on Lsz fibrillation was investigated using ThT fluorescence assay followed by AFM imaging.

## Physicochemical studies on the interfacial and aggregation behavior of imidazolium -cholate and -deoxycholate in aqueous medium

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### Abstract

Two bile salts sodium cholate (NaC) and sodium deoxycholate (NaDC) were converted into salt-free surface-active ionic liquids (SAILs), 1-butyl-3-methylimidazolium cholate ([bmim]C) and 1-butyl-3-methylimidazolium deoxycholate ([bmim]DC) by double decomposition technique. Synthesized SAILs were characterized by FTIR, <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, thermogravimetric analysis-differential thermal analysis, and X-ray powder diffraction studies. Interfacial and aggregation behavior of synthesized surfactants were investigated by tensiometry, conductometry, fluorescence emission spectroscopy, dynamic light scattering, and isothermal titration calorimetry (ITC). Critical micelle concentration (CMC) was evaluated by tensiometry, conductometry, emission spectroscopy, and ITC methods. CMC of synthesized SAILs was lower compared with precursor surfactants; NaC>NaDC> [bmim]C > [bmim]DC. Lower surface excess values of SAILs were due to electrostatic interaction between IL cation and bile salts anion. Negative Gibbs free energy of micellization and a higher fraction of counter ion binding values further support the proposition. Aggregation number (*n*) and size (*d<sub>h</sub>*) of the micelles were determined by fluorescence quenching and dynamic light scattering studies respectively; both '*n*' and '*d<sub>h</sub>*' values were higher for SAILs than precursor surfactants ([bmim]DC>NaDC>[bmim]C >NaC). SAIL aggregates, although larger in size with a higher aggregation number, were more compact than NaC and NaDC micelles. Enthalpies of micellization, being exothermic in nature, were higher for SAILs although the micellization processes were entropically controlled. SAILs are considered to have dual advantages of surfactant and IL.

**CH-71515561**

**Aggregation-induced emission–based highly selective ‘turn-off’  
fluorogenic chemosensor for robust quantification of explosive  
picric acid in aqueous and solid states**

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**Abstract**

An exclusive fluorescent probe, N, N2 -di-[2-hydroxy-3-methoxy-benzylidene]-benzene-1,4-diamine (DBA), has been well designed and synthesized. Intriguingly, it displayed attractive aggregation-induced emission (AIE) phenomenon in aqueous media. Based on its interesting AIE characteristic, the fluorescent hydrosol has been used as a sensor with swift sensitivity and excellent selectivity toward nitro-explosive picric acid (PA) and the limit of detection (LOD) as low as 72 nM and 2.3 ng in aqueous and solid states, respectively. The recognition event occurs absolutely within 10 s after the addition of PA, demonstrating a promising ‘zero-wait’ recognition method. Fluorescent paper strips were prepared for instant trace recognition of PA by naked eye in solid state, making the protocol fast, inexpensive, and practical for on-site solid-state detection.

**Structure–Properties Relationship for the Gas Transport  
Properties of Semifluorinated Poly(ether amide)s Containing  
Bulky Moiety**

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**Abstract**

A family of reported aromatic polyamide (PA) polymeric membranes were prepared by direct polycondensation reaction with a diacid monomer namely, 2,6-bis[3'-trifluoromethyl-4' (4''-carboxyphenoxy)benzyl] pyridine and four different bulky diamines monomers. The polymer structures were confirmed by FTIR and NMR spectroscopy. The polymers showed high molecular weight and tough membranes were obtained from their solution in N, N-dimethylacetamide (DMAc). The PAs showed good mechanical properties, with tensile strength up to 90 MPa and good thermal stability. Single gas permeation tests (CH<sub>4</sub>, N<sub>2</sub>, O<sub>2</sub> and CO<sub>2</sub>) showed higher permeability coefficients (P<sub>CO<sub>2</sub></sub> up to 81 and P<sub>O<sub>2</sub></sub> up to 20 barrer) without significantly sacrificing selectivity (P<sub>CO<sub>2</sub></sub>/P<sub>CH<sub>4</sub></sub> up to 47.50 and P<sub>O<sub>2</sub></sub>/P<sub>N<sub>2</sub></sub> up to 6.9). This can be reasonably explained and supported by the fractional free volume and molecular dynamics (MD) simulation. Prepared membranes showed excellent performance in terms of Robeson upper bound for O<sub>2</sub>/N<sub>2</sub> separation.



## **Production of Biosurfactant from Microorganism**

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### **Abstract**

Biosurfactants are active compounds that are produced at the microbial cell surface or extracted from microorganism. Biosurfactants are potential replacements for synthetic surfactants in several industrial processes such as lubrication, wetting, softening as well as in food, biomedical and pharmaceutical industry. Biosurfactants have advantages compared to chemical surfactants in having lower toxicity, higher biodegradability, pH levels and abilities to be synthesized from renewable feed stocks. Very often the growth of microorganisms on hydrocarbons is accompanied by the production of emulsifying agents that causes emulsification of hydrocarbon sources in the culture medium. Three microbial strains have been used for the production of biosurfactants *Rhizopus Nigrificans*- SB12, S1 (tentatively *Fusarium*) and A1 (unidentified). The microbial lipid collected from these microorganism have shown surface properties. The interfacial tension of the chloroform solution of these lipids are 17.3 mN/m (*Rhizopus Nigrificans*- SB12); 13.6 mN/m (A1) and 18.4 mN/m (S1 *Fusarium*) and the critical micelle concentrations (CMC) of these microbial lipids are 2.5gm/lit, 1.9 gm/lit and 1.0 gm/lit respectively.

## **Spectroscopic Analysis of the Interaction Between 2D-Layered Nanomaterials and Dyes**

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### **Abstract**

Layered transition metal dichalcogenides possess novel physical phenomena in reduced dimension and the spatially confined electronic and optical properties. This work endeavours to investigate the molecular interaction between Molybdenum disulphide (MoS<sub>2</sub>), layered materials and three dyes 1. Rhodamine-b (cationic) 2. Congo-red (anionic) and 3. Pyrene (non-ionic) separately by UV-VIS absorption and emission spectroscopic studies. Change in the absorption/ emission spectral pattern with the variation of MoS<sub>2</sub> concentration were recorded. Spectral data were analysed to determine the interaction constant between MoS<sub>2</sub> and dye molecule. Interaction between the dye and MoS<sub>2</sub> was found to be electrostatically driven process. Further studies on the binding affinity between MoS<sub>2</sub> and dye molecules by isothermal titration calorimetric (ITC) studies are under consideration.

**Pd Nanoparticles Supported Novel Quaternary Bi<sub>2</sub>O<sub>2</sub>CO<sub>3</sub>/  
Bi<sub>2</sub>MoO<sub>6</sub>-CuO Heterojunction for Enhanced Photo-  
electrocatalytic Ethanol Oxidation**

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**Abstract**

Recently, photo-electrooxidation of fuel using a Noble metal-semiconductor junction has been one of the most promising approaches in fuel cell systems. Herein, we report the development of Pd-supported Bi<sub>2</sub>MoO<sub>6</sub>-Bi<sub>2</sub>O<sub>2</sub>CO<sub>3</sub>-CuO novel quaternary heterojunction for ethanol oxidation in alkali in the presence and absence of visible light. Various spectroscopic and microscopic techniques were used for the characterization of synthesized catalysts. The photo electrocatalytic activities of synthesized catalysts were investigated by CV, CA, and EIS. The CV study reveals that the forward peak current density (in mA mg<sup>-1</sup> of Pd) of synthesized quaternary heterojunction was about 1482.5 which is 2.4, 4 and 4.6 times higher than Pd/CuO (608.3), Pd/ Bi<sub>2</sub>MoO<sub>6</sub>-Bi<sub>2</sub>O<sub>2</sub>CO<sub>3</sub>(368.3) and similarly synthesized Pd catalyst (321.5) under visible light radiation. The quaternary electrode shows 2.21-fold higher peak current density in visible light compared to its dark. The 500 cycles CV operation shows quaternary catalyst loses only 9.8% and 7.7% of its maximum current density in dark and light respectively indicating light energy is more beneficial in establishing stability. The lower semicircle arc of the quaternary electrode in EIS measurement reveals the higher conductance of photogenerated charges in the junction. Ex-situ FTIR spectroscopy and HPLC technique help understand the EOR mechanism.

## RESPONSE OF GLOBAL REACTIVITY DESCRIPTORS IN SOME PROTEIN MOITIES: A COMPUTATIONAL STUDY

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### Abstract

KRSFIEDLLFNKV is a highly conserved epitope of SARS-CoV and SARS-CoV-2 Spike Protein. Where K = Lysine, R= Arginine, S = Serine, F = Phenylalanine, I= Isoleusine, E= Glutamic acid, D = Aspartic acid, L = Leucine, N = Asparagine, V = valine. Density functional theory (DFT) has been found to be successful in providing theoretical insights into the chemical reactivity and selectivity, in terms of popular qualitative chemical concepts like electronegativity ( $\chi$ ), hardness ( $\eta$ ), softness(S), electrophilicity index( $\omega$ ), ionization potential(I.P),electron affinity(E.A),chemical potential( $\mu$ ). A quantum chemical study thus has been carried out in order to determine the global reactivity descriptors of Serine (S), Phenylalanine (F), Isoleusine (I), Serine- Phenylalanine (SF), Phenylalanine- Isoleusine (FI) and Serine- Phenylalanine- Isoleusine (SFI) moieties at different level of theories using G-09 package of programme. Global reactivity descriptors attain their optimum value at the Serine- Phenylalanine- Isoleusine (SFI) moiety.

**Unveiling the catecholase activities and DNA binding interaction  
of mono-, di, polymeric Cu(II) complexes derived from  
heterogeneous Schiff Base ligands**

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**Abstract**

A comparative study of catecholase activities and DNA binding of three Cu(II) complexes has been presented in the current paper. The general formula of these complexes are  $[\text{Cu}(\text{L1})\text{Cl}_2]$  (1),  $[\text{Cu}_2(\text{L2})_2(\mu\text{-1.1-CH}_3\text{COO-})_2]$  (2) and  $[\text{Cu}_2(\text{L3})_2(\mu\text{-N3})(\text{N3})]_n$  (3) where L1, L2 and L3 are the heterogeneous Schiff base ligands. All the three complexes can effectively catalyze the oxidation of 3,5-ditertiarybutylcatechol (3,5-DTBC) in methanol to its corresponding quinone in the presence of aerial oxygen with first order reaction kinetics which follow Michaelis-Menten enzymatic kinetics with turnover numbers  $5.1 \times 10^5$  (1),  $4.52 \times 10^5$  (2) and  $4.66 \times 10^5 \text{ h}^{-1}$  (3). Moreover, absorption, fluorescence and viscosity studies prove the partial intercalative binding capabilities of the three Cu(II) complexes with CT-DNA having significant binding constants and potentiality as components of pharmaceutical drugs.

## Vesicular self-assembly of metal salts of natural triterpenoid corosolic acid

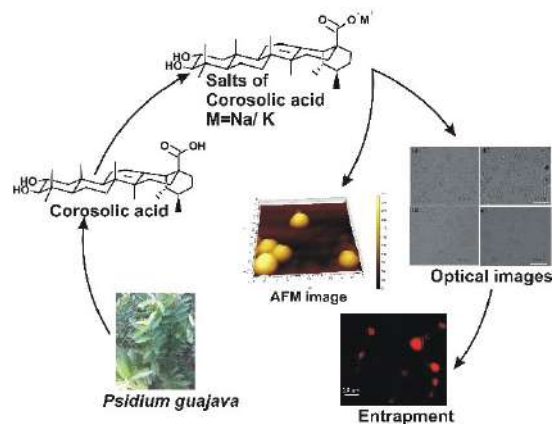
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### Abstract

Corosolic acid, a natural ursane type 6-6-6-6-6 pentacyclic dihydroxyl triterpenic acid extractable from leaves of *Psidium guajava*. It also contains extraordinary antidiabetic property. But due to presence of rigid hydrocarbon backbone along with several polar functional groups solubility of this compound is very low in aqueous and common organic solvents. So, to increase its solubility in aqueous solvents we convert the compound to its metal salts and characterized. The self-assembly property of the salts have been studied in different aqueous binary liquid mixtures. Vesicular morphologies were produced by self-assembly of the salts which were characterized by optical microscopy, AFM study and HRTEM studies. The ability of vesicular self-assemblies towards entrapment of fluorphores has also been demonstrated here.



**Graphical Abstract:** Representation of extraction of corosolic acid, synthesis of metal salts and their vesicular self-assembly.

**Designing of a Calixarene based drug carrier for Anagrelide anti-thrombocytic drug**

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**Abstract**

The blood coagulation process in our body is regulated by Platelets in our blood. An abrupt growth in platelet count can cause clotting inside the blood vessels forming a blockage. The medical condition caused due to high platelet count can be referred as thrombocytopenia and this condition can sometimes be referred as essential or primary thrombocytopenia. Sometimes it is difficult to get exact symptoms of thrombocytopenia, for such condition CBC test, Blood smear test or biopsy can be done. In this condition, an imidazoquinazoline oral agent named Anagrelide has been taken into consideration for anti-cyclic AMP phosphodiesterase activity which prevents platelet function. This drug intake is done with a regular dosage schedule according to the increase in platelet number. Through our computational study, we have seen that a macrocycle Calixarene can act as a drug carrier for Anagrelide. We choose Calixarene as a host molecule for its water solubility, good biocompatibility, less toxicity and also it helps for sustained release of the drug. We have investigated Anagrelide-host Calixarene complex activity using DFT analysis to be a pain-free and less toxic solution for thrombocytopenia.

## Anticancer Activity of Organometallic Ruthenium Half Sandwich Complexes with Nitrogen & Sulphur containing Heterocyclic Ligands

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### Abstract

Neutral half-sandwich organometallic ruthenium(II) complexes of the type  $[(\eta^6\text{-cymene})\text{RuCl}_2(\text{L})]$  (H1–H10), where L represents a heterocyclic ligand, have been synthesized and characterized spectroscopically. The structures of five complexes were also established by single-crystal X-ray diffraction which confirm a piano-stool geometry with  $\eta^6$  coordination of the arene ligand. In these complexes, hydrogen bonding between the N-H group of the heterocyclic ligand and a chlorine atom attached to Ru stabilizes the metal–ligand interaction. Complexes coordinated to a mercaptobenzothiazole framework (H1) or mercaptobenzoxazole (H6) showed high cytotoxicity selectively against several cancer cells. In vitro studies depicts the inhibition of cancer cell growth involves primarily G1-phase arrest as well as the generation of reactive oxygen species (ROS). In addition, the complexes are found to bind DNA in a non-intercalative fashion and cause unwinding of plasmid DNA in a cell-free medium. Surprisingly, biophysical studies shows H1 and H6 differ in their mode of interaction with DNA. H1 causes a biphasic melting of the DNA while H6 inhibits topoisomerase IIa activity. Substitution of the aromatic ring of the heterocycle or adding a second hydrogen bond donor on the heterocycle reduces the cytotoxicity of the complexes.



## A Short Review on Sulfur ylides mediated Stereoselective Synthesis of Aziridines

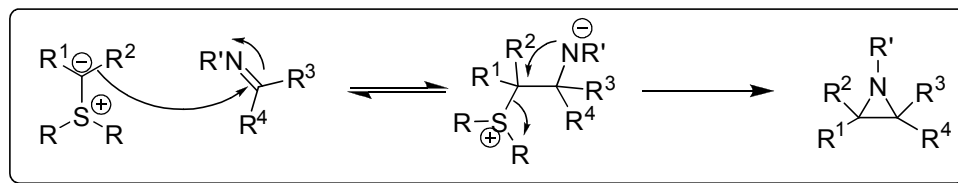
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### Abstract

Aziridines, the smallest nitrogen-containing heterocycles, are useful building blocks in synthesis, as well as important synthetic targets. Aziridines are among the most fascinating heterocyclic intermediates in organic synthesis, acting as precursors of many complex molecules as well as active pharmacophore of many biologically active compounds due to the strain incorporated in their skeletons. The past few decades have witnessed tremendous activity in the area of discovering new routes for the synthesis of aziridine as well as developing novel transformations of these heterocycles. Several strategies are available for the synthesis of aziridines; however, the main routes involve transfer of a suitable nitrogen source to olefins, transfer of a suitable carbon source to imines, reduction of azirines, and intramolecular cyclization of amine derivatives. The aziridination by addition of sulfur ylides to imines is the aza analogue of the highly successful Johnson Corey Chaykovsky reaction<sup>2</sup>, and it has proved to be particularly useful for the synthesis of aziridines, with excellent levels of enantiocontrol and moderate to good diastereoselectivity. This mini-review focuses on some of the most important Sulfur ylides mediated stereoselective synthesis of substituted aziridines illustrating new methodologies, mechanistic insights, and the scope and limitations of each strategy.



## Effect of Different Stabilizers on the Physicochemical Behaviours of Gemcitabine-Loaded Nanostructured Lipid Carriers

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### Abstract

Nanostructured lipid carriers (NLC) have enormous possibilities as potential drug delivery systems. Gemcitabine is a potent anticancer drug towards the treatment of testicular cancer, breast cancer, ovarian cancer, non-small cell lung cancer, pancreatic cancer, and bladder cancer. Four different NLC formulations were prepared by hot homogenization and ultrasonic dispersion technique using a mixture of stearic acid, soy lecithin and tripalmitin (2:2:1; M/M/M) with four different stabilizers, viz., tween-60 (T-60), poloxamer-188 (Polo-188), polyvinyl alcohol (PVA-31000) and polyethylene glycol (PEG-2000). Bare and drug-loaded formulations were characterized with dynamic light scattering, FTIR spectroscopy, X-Ray diffraction, transmission electron microscopy, scanning electron microscopy and atomic force microscopic studies. Comparative studies on the effect of stabilizers were also investigated. Location of the drug was assessed with UV-VIS spectroscopic method. Entrapment efficiency studies of the drug using different stabilizers were also performed. Further investigations will be made to inspect activities of the formulations against breast cancer cell-line.

**Identification of Ground Water Potential Zones in Midnapore, Kharagpur in Paschim Midnapore district, West Bengal – with the use of AHP method and Remote Sensing & GIS Approaches**

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**Abstract**

A case study was conducted to find the ground water potential zones in Paschim Midnapore and Kharagpur in Paschim Midnapore District. This area is located on the south west part of the West Bengal. Ground water potentiality of an area entirely or partially depends on lithology, geomorphology, slope, soil, lineament density, drainage density, and land use land cover are used separately and collectively for the purpose of creating various ground water prospect maps of an area. In this study we use DEM 30m for drainage density and use Landsat 8 OLI (2021) for LULC classification. After that we were assigned with a weight, of all the factors, depending on their influence on groundwater potentiality, using multi criteria decision analysis (MCDA). Also, the potential of study area is identified with the assistance of the Analytic Hierarchy Process (AHP). These techniques have resulted in the division of the groundwater potential areas into four zones: low, medium, high, and very high potential. Areas with the low to moderate drainage density are considered excellent ground water potential zones and areas with high and very high drainage density are considered as low ground water potential zones. In order to improve groundwater resource planning in this study area, hydrologists, planners, decision makers, local authorities will get benefit from this finding.

## **Assessment of Diversity in Landscape Ecology in Parts of the Purba Medinipur Coastal District, West Bengal, with Geospatial Technology**

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### **Abstract**

The study of landscape ecology illustrates the significant relationship between spatial patterns and ecological processes, and it comprises ecological flows in landscape mosaics, land use/land cover change, scaling and describing landscape pattern analysis with ecological processes and landscape preservation and sustainability. In this present study, the chronological development of the coastal landscape incorporate quantitative methods, multi-temporal remotely sensed data analysis and reviewing the existing literature that links spatial patterns and ecological processes at broad spatial and temporal scales. The result shows that the present studied coast is under the coastal plain topography of alluvium surface with beach ridge chenier and swales, which formation has been executed during the Early Holocene, Middle Holocene, and Late Holocene periods extending from 7,000 YBP to 500 YBP and sub-recent stage. After minutely consideration of the acquired field data related to the floral species, the Hierarchical Cluster Analysis, Shannon Weiner Diversity Index, and Sorenson Coefficient have been used to understand the species' homogeneity and diversity. The study reveals that the vegetation belongs to relatively homogeneous groups of species communities and the relationships between vegetation and landform units of the coastal chenier plain surface. The study also examines morphological characteristics of the landscape instability and put forward some functional approaches which can be very effective in dividing the total studied area into different response zones and habitat conservation zones to formulate the appropriate management strategies for ensuring the sustainable development of tropical landfall-induced low-lying coastal stretches.

**Assessment of Land use Land cover dynamics and environmental impacts on the hard laterite soil zone of Jhargram District using Geo-spatial techniques**

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**Abstract**

This study employed Landsat satellite imagery from selected years (1991, 2005, and 2021) to evaluate Land Use and Land Cover (LULC) change across the study area. The Normalized Difference Vegetation Index (NDVI) has been utilized for analysing the vegetation status and Normalized Difference Bareness Index (NDBaI) was applied to support long-term studies of the land cover classification in the study area. For observing temperature and precipitation fluctuation during the selected time period, Land Surface Temperature (LST) and Climatic Research Unit gridded Time Series (CRU TS) data were used. The maximum likelihood classifier was used to classify the five LULC classes: agriculture land, vegetation, water bodies, settlements, and fallow land. The distribution of LULC classes was produced to assess land alteration over the last three decades (1991-2021). The results revealed that agricultural land decreases by 73 sq. km and transformed mostly into settlement, fallow land, and vegetation. On the other hand, by predominantly occupying agricultural land and water bodies, vegetation and settlement increased by 32 sq. km and 21 sq. km, respectively. Therefore, the transformation of land, mainly driven by anthropogenic activities, requires the utmost concern. The findings of present study help in properly integrating LULC and resource management, planning, and sustainable development.

**Tidal Flat Wetland Ecosystem under threat of the Mangrove forest in the estuarine Coast of the Lower Ganga Delta with the application of Geospatial technology**

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**Abstract**

The Sundarban is a biogeographical region of the lower Ganga delta that extends from the Hugli estuary to the Meghna estuary from west to east along the Bay of Bengal shoreline with dense mangrove forests, evergreen trees and brackish to seasonal fresh water wetlands towards north. Tidal flats of the estuarine coasts are classified as supratidal flats, inland flats, intertidal flats, and subtidal flats under the complex systems of tidal ranges, sediment accumulation rates, location, and energy conditions varying in the lower Ganga delta. The current study depicts the various effects of coastal hazard on tidal flats caused by extreme weather and sea level rise. The tidal flat wet land ecosystem of the region is vegetated by mangroves, saltmarshes, and other sedge plants under a setup of complex natural dynamics of sediment accumulation, erosion, tidal inundation, and the impact of marine hazards in the region. Thus, restoration of mangrove ecosystem through afforestation on the emerged islands and bars of the inner parts of estuaries or tidal rivers, maintenance of the ecological buffers on the river side and country side of the embankments, the application of ecological engineering methods on the bare surface of the hyper saline blanks should be down. Sentinel 2A and Cartosat 2A DEM are used to classify the tidal flats mangrove wetland ecosystems in the region. The present study also considers how human interventions have created disturbances to the natural processes to enhance or accelerate the achievement of natural coastal defence.

**Retrieval of the Chla and TSM from Sentinel 3 OLCI of the adjacent areas of Digha and Rasulpur river mouth in the south-eastern parts of Bay of Bengal: A Geo-statistical and Geospatial approaches**

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**Abstract**

Ocean color analysis refers to a method of indicating the “health” of the ocean, by measuring oceanic biological activity by optical means. The study aims to examine the spatio-temporal seasonal variation of the Chla and TSM in the shallow coastal water of the south-eastern parts of the Bay of Bengal using the normalised water leaving radiance from the Sentinel-3(OLCI) data. A lower significant amount of concentration of the Chla and TSM was observed toward the south-eastern sector of the study area, with a gradually increasing concentration toward the western sector of the deep-sea region. The present study reveals that the biological and biogeochemical dynamics in the nearshore marine waters of the east coast of India (north-eastern Bay of Bengal) are very complex and dynamic, as local circulation and mixing affect the deposition of organic matter, seasonal fresh water discharge, high magnitude cyclonic impact, upwelling in the sea, and tidal water mixing, thereby controlling the estuarine and coastal nutrient budget. The study demonstrated the application potential of Sentinel-3 in assessing the biological conditions of coastal waters. However, such a database provides valuable information to the fishery department for management in the aquatic marine environment and also provides information to local fisherman.

## **Assessment of groundwater potential zone in Kangsabati River Basin using Fuzzy-AHP and Frequency Ratio models**

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### **Abstract**

Groundwater is one of the most precious renewable water resources which helps us to sustain our livelihood. The presence of groundwater is very significant for irrigation, agricultural practices and drinking purposes. Over-exploitation of groundwater and climate change have placed enormous stress on the world's groundwater resources over the years. As the worldwide need for potable water for human use, agriculture, and industrial expansion grows, so does the need to estimate groundwater potential and aquifer productivity. Geographic Information System and Remote Sensing-based applied geospatial studies have grown in importance in recent years in groundwater research because they are efficient and provide first-hand information on the resource for future initiatives. Rapid population growth and ever-increasing dependence on groundwater leads to fluctuation of groundwater level in the study area. Stress on groundwater in the semi-arid tropical locale, especially in the Kangsabati river basin is very high due to ever increasing demand and overexploitation. Delineation of groundwater potential zone is one of the most vital processes for the sustainable management of groundwater resources. For delineating the groundwater potential zone mapping integration of GIS & RS, Geospatial Techniques along with statistical MCDM Fuzzy-AHP and Frequency Ratio models have been used in the present study. Parameters including Geology (GE), Geomorphology (GM), Lineament Density (LD), Elevation (EL), Slope (SL), Land use Land cover (LULC), Drainage Density (DD) and Annual Rainfall (RF) are used to generate Groundwater Potential Zone (GWPZs) map of the present study area. Two models have been validated using Receiver Operating Curve or ROC curve, where ROC curve of Fuzzy-AHP model shows the accuracy of 78.7% and ROC curve of Frequency Ratio model shows the accuracy of 86.0%. Therefore, it is concluded that the Frequency Ratio model is more reliable than Fuzzy-AHP model for the assessment of groundwater potential zone.



**Application of deep learning and benchmark machine learning algorithms for landslide susceptibility modeling in the part of Garhwal Himalaya**

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**Abstract**

The Garhwal Himalaya is the worst effected landslide prone region in Indian subcontinent mainly due to its complex geological settings and active tectonic activities. In the current study, we have mapped the landslide susceptibility zones in the segment of the Garhwal Himalaya using robust machine and deep learning algorithms. In this study total five models i.e., SVM (Support Vector Machine), RF (Random Forest), bagging, ANN (Artificial Neural Network), DLNN (Deep Learning Neural Network) have been used along with twenty landslide controlling factors. Here, the principal objectives are to precisely delineate landslide susceptibility zones of the Garhwal Himalaya. The previous landslide points have been taken as training (70%) and testing (30%) dataset. According to area under curve value (AUC), the DLNN technique has high capability (AUC=0.92) and accuracy regarding landslide area demarcation. The approach of integrated physical and social factors creates more accurate and appropriate landslide susceptibility output that can support landslide management and also prediction. These high precision models identified the most of the part of Rudraprayag and Tehri Garhwal as very high landslide susceptibility area. The generated maps can assist to policy makers for micro scale landslide management and sustainable land use planning particularly in Himalayan terrain.

## **Nano-based geotextile can impart innovative ways of dam repairing**

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### **Abstract**

Geotextile is a permeable geosynthetic material that is becoming a necessary supplement for road construction to dam repair. It is usually made of polypropylene or polyester or any chemically synthetic material, which are not sustainable for the natural ecosystem. Although it has high potency and long half-life. Now most countries around the world have shown interest in environmental protection and sustainable development based on renewable resources and waste recovery and recycling. The economic condition of India mainly depends on agriculture. Agricultural waste like straw, husk of coconut etc. are the causes of environmental pollution due to its unnecessary burning. Some regions of India produce ropes from coconut husks which are also used as natural geotextiles. But it is expensive the use geotextile production because of their short half-life and easy biodegradability in nature. On the other hand, coconut rope is composed of lignin, cellulose, hemicelluloses, and some biological components which provide nutrients to the microbes. The objectives of this research work are to produce natural geotextiles by coating nanodots with antibacterial and antifungal activity. Nanodots are one of the most important chemicals that not only have high porosity but are also capable of inhibiting the growth of microbes. It is noticed that synthesizing Ca or Cu or Fe nanodots can easily inactivate the adhesive microorganism of geotextile and increase the shelf life of geotextile. In this way, the reuse of geotextiles on the same site along with nanomaterials can enable plant growth in the river bank and estuarine embankments. After the Amphan disaster, several NGOs and the government are mainly emphasized on riverbank construction as well as a plantation in the coastal areas including Sundarbans area. In this situation, coastal site restoration using nano-added geotextile can be a cost-effective suitable solution, which not only ensure low cost site restoration but also allows the sustainable usages of cultivation wastes.

## **Variability of Meteorological Drought in South Western Part of West Bengal using Satellite Based Merged Rainfall Data**

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### **Abstract**

Drought is a slow-onset, creeping natural hazard and a recurrent phenomenon in different regions of our country. It occurs due to deficiency of rainfall and affects the agriculture, ecological and socio-economic sphere of a region. The present study aims to assess the spatio-temporal variability of meteorological drought in four drought prone districts of West Bengal. In the present study, three meteorological drought indices viz. Standardized Precipitation Index (SPI), Effective Drought Index (EDI) and Rainfall Anomaly Index (RAI) have been used for meteorological drought assessment. These indices are being used for its simplicity and wider acceptance in different parts of the world. In the present study, long term daily CHIRPS rainfall data for the past 20 years (2000-2019) were used to derive fortnightly SPI and EDI, and for fortnightly RAI calculation, daily gridded rainfall data were collected from India Meteorological Department. The fortnightly SPI and EDI derived maps indicate the spatio-temporal pattern of meteorological drought and its severity during typical drought and wet years of the study area and fortnightly RAI used for result validation. Moreover, comparative analysis was also done to evaluate usefulness of SPI and EDI to assess spatio-temporal variability of drought in the study area.

## **Landslide Hazard Mapping using GIS at Kalimpong District**

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### **Abstract**

Landslide, mass movements and slope instability are common and serious geo-environmental problems in highland ecosystems, particularly in seismically active regions. Kalimpong suffered intensely from incidence of random landslides due to composite lithological setting, rain fury and intense seismic shaking. In the present study, Landslide Susceptibility Zonation (LSZ) study is carried out through regression method on Geographical Information System (GIS) platform by integrating different landslide causative factors i.e. geology, lineament density, soil, geomorphology, rainfall, slope, aspect, drainage density, Normalize Differences Vegetation Index (NDVI), Landuse/landcover (LULC), epicentre proximity and distance to road defining the proneness of the terrain in terms of low, moderate, high and severe. It is observed that some parts of the Kalimpong District lay under the high to severe hazard zones. Receiver Operating Characteristics (ROC) places 80% confidence level thus predicting a correlation between LSZ and landslide inventory dataset. This study provides landslide Hazard scenario of Kalimpong District, a landslide infested region requiring a roadmap for effective mitigation and management.

**Estimation of Environmental Degradation with Remote Sensing  
and GIS Analysis: an application in the Medinipur city area**

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**Abstract**

Urbanization refers to the population shift from rural to urban areas, the corresponding decrease in the proportion of people living in rural areas, and the ways in which societies adapt to this change. And Environment means anything that surrounding us, it can be living and non-living things that is vegetation health, land surface temperature, agriculture areas etc.

This paper uses Remote Sensing and GIS methods in order to determine the effects of environment in the province of Medinipur city. With this aim, the surface temperature and vegetation health are considered from medium spatial resolution remote sensed image.

The main results of the paper are of a geographical kind. The remote sensing methods showed that, in the area studied, there are highly affected environment between higher temperature and major areas are polluted and the absence of vegetation.

**The urban built-up land suitability analysis using MCDM techniques and different geo-statistical models: a study on Siliguri Municipal Corporation area**

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**Abstract**

Site selection for sustainable urban development is one of the most important and difficult concerns in urban planning now. In this purpose, the present study is initiated to identify the suitable zone for urban built-up area development in Siliguri Municipal Corporation (SMC) area based on ten most significant influential factors. Different geophysical data, office data, and open street data were used to assess the land suitability for future urban growth by integrating MCDM techniques and different geo-statistical models namely Multi-influence Factor, Frequency Ratio, Weights of Evidence, and Evidential Believe Function. Based on the land suitability assessment (LSA) outcomes, four different zones were identified such as zone of very high suitability, high suitability, moderately suitable and low suitable. The findings of this study revealed that the 1/3<sup>rd</sup> of the area in SMC has low suitability (32%-38%) mainly the central-western part of the study area, while areas with the high to very high suitability are very less (13-24%). Moderately suitable areas are found to be 32%-36% of the total area, which is composed of well-connected regions. The northernmost and eastern parts of the SMC region have a high proportionality of new residential and built-up area sites for future sustainable urban development.

**Analyzing the Urban Ecological Security of Kolkata Metropolitan Area: A new approach to forecasting the ecological health of the city**

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**Abstract**

Due to rapid urbanization, Indian cities have faced serious environmental problems, including pollution, loss of urban green space, increasing heat island phenomena, and destruction of the urban ecosystem, over the past few decades. Urban ecological security (UES) measures the degree of urbanization pressure and level of ecological sensitivity. Currently, urban ecological security assessment (UESA) is an important aspect of sustainable urban development. Accurate assessment of ecological security status has become a real problem because of differential evaluation methods producing variable results. The present study aims to address these shortcomings using integrated DEMATEL-ANP model to select the influencing factors and assess ecological security of Kolkata Metropolitan Area (KMA). Moreover, a combined cellular automata and Markov chain model was applied to simulate land-use/land-cover change and predict the future state of UES in KMA. The result shows that land use land cover change rate, built-up density, green area change intensity index and landscape connectivity index are the most influencing factors in UES. The present study can enrich the methods in the field of UESA and the findings of this study can provide valuable and scientific guidance to optimize land-use planning and potentially improving the ecological security of an urban area.

## **Assessment of Contamination Risks and Spatial Distribution Patterns of Arsenic and other Heavy Metals in the Surface Soil**

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### **Abstract**

Arsenic (As) and other heavy metals contamination in the topsoil, as well as other ecosystems at toxic levels, is a worldwide concern that has been widely recorded in all South Asian and Latin American nations. The distribution of As and other heavy metal (Cd, Co, Cr, Cu, Fe, and Pb) concentrations in the surface soil around the Cerrito Blanco area in Matehuala, San Luis Potosi, Mexico was evaluated in this study. The contaminated site is near an abandoned mining area, which is surrounded by cultivated maize farmland. This study was carried out by focusing on three main objectives: (i) measuring heavy metal concentrations in the surface soils, (ii) determining the spatial distribution of heavy metals in the soils with GIS interpolation techniques, and (iii) evaluating the potential ecological risks of heavy metals in the soil of the study area. It was observed that high amounts of As were transported into the Cerrito Blanco area through As-contaminated groundwater for maize cultivation purposes. Additionally, industrial wastes, construction debris, and post mining activities also added to the problem. This study concludes that a regular assessment is needed to estimate the risk level of heavy metal contamination in the soil.



## **Climate Risk analysis of Bengals Dry-land area under Projected Climate Conditions**

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### **Abstract**

Drylands are some of the most sensitive areas to climate change and human activities around the globe. Assessment of future climate trend scenarios provides valuable practical information for dryland management decision-making. According to Huang et al. (2017), more than 50% of global drylands will expand by this century, with a maximum (78%) of newly expanded dryland occurring in developing countries. To understand the potential for expansion of drylands and desertification, we examine critical predictor variables (temperature and precipitation) of Bengal dryland expansion to guide early actions to mitigate and prevent desertification. Using trend analysis of bias-corrected CMIP6 projected climate change data for temperature and precipitation (2022-2041), results indicate future dryland expansion is possible for increases in temperature and declines in monsoonal precipitation. Over the next two decades (2022-2041), Bengal dryland areas will be 0.1-0.5°C warmer, and rainfall will decrease by 2.57-13.43cm total during the monsoon period. Given these variables are critical predictors of dryland expansion because of their role in driving evapotranspiration and soil moisture deficits; we anticipate an increase in the population affected by water scarcity, land degradation, and desertification. Our work provides information critical for effective dryland management, biodiversity conservation, and land-use planning under future climate conditions.

**DSAS and CA-Markov model-based prediction of river bank erosion-accretion and LULC change**

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**Abstract**

Erosion-accretion is a significant geomorphological process that involves the channel migration and meandering of an alluvial river channel within its floodplain region. In present study, we assess the riverbank migration and LULC change pattern of the Kaljani River buffer area of Himalayan foothill region using DSAS and CA-Markov models. This study demonstrated the capability of RS and GIS technology and generated a detailed evaluation of temporal and spatial changes in river channel processes and adjustment of LULC classes. Past, present, and future data analysis reveal that the Kaljani River is significantly changed its bankline positions from extensive erosion-accretion processes and modified its buffer area LULC pattern. During 1998-2008, a very high rate of erosion has been taken place on both the bankline, which are about -4.48 m/y (left bank) and -3.48 m/y (right bank), respectively. The overall result of the predicted bankline represents that the bulky expansion will occur along the left bank, and sediment accretion will take place at the right bank. Moreover, the long profile, hypsometric curve value and the Soil Conservation Service Curve Number (SCS-CN) value have a significant help in understanding and identifying consequences reasons. The accuracy level is validated by the actual bankline positions (2020) with predicted bankline (2020) and actual LULC (2020) to predicted LULC (2020) empirically with RMSE and statistical test. Therefore, the prediction output serves as the spatial guidelines for monitoring future trends of channel shift and land use planning management.

**Assessment of LULC using Optical and SAR data and Random Forest model: A case study of Jhargram C.D. block, West Bengal**

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**Abstract**

The LULC approach using Remote sensing imagery for Ecosystem services modeling (ESM), valuation and Reduced Emissions from Deforestation and Forest Degradation (REDD+)Remote sensing imagery are used as tools in recent days. Optical imagery is occasionally ineffective by reason of cloud and smoke coverage. These limitations of optical imagery give rise to an alternative, SAR (Synthetic Aperture Radar) images, which could be used exclusively or in combination with optical images. The need for more precise LULC classification products using optical and SAR imagery is becoming increasingly important, to monitoring Earth's surface. In this sense, we aimed to select the best LULC classification approach for the study area using Sentinel-1 and Sentinel-2 products to develop a machine learning classification through a Random Forest (RF) classifier. By leveraging Sentinel-1 (Se-1) and Sentinel-2 (Se-2) products to create a machine learning classification through a Random Forest (RF) classifier, we attempted to choose the optimal LULC classification strategy for the study area. Additionally, we incorporated vegetation indices and Se-1textural image analysis (Se-2). Six LULC classes in total were created. Results showed that the integration of Se-1and Se-2data (92.37%) seemed to have the highest overall accuracy, followed by Se-2 alone (86.32%) and Se-2 with radiometric indexes (88.52%) respectively.

## **An analytical study on urban liveability of Howrah Municipal Corporation using Geoinformatics**

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### **Abstract**

Urban liveability is simply quality of life in cities, but because cities are different and quality of life has a broad definition, the concept of urban liveability is complicated. The degree to which a city can meet the physical and psychological needs and demands of its dwellers is what urban geographers refer to as urban liveability. They concentrate on the relationship between human behaviour and the environment. By examining contextual elements, geographers can explain liveability and evaluate dwellers' satisfaction using both objective and subjective indicators and information. Existing facilities and their utilities have been spatially parameterized as an objective indicator in this study to assess the feasibility of Howrah Municipal Corporation. Quality of life, however, have been characterised as a subjective indicator. Different facility dimensions and their utility have been analysed for the objective indicator analysis. On the other hand, in order to analyse the quality of living as a subjective indicator, the quality of housing, basic amenities, and asset availability have been analysed. The integrated satisfaction index, which reveals the liveability gradation for each ward, has been calculated by integrating both indicators using the multicriteria based spatial decision model.

## **Delineation of Flood Prone Zones in Keleghai Watershed, West Bengal: A Spatial Approach**

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### **Abstract**

Flood is one of the most devastating quasi-natural disasters in Keleghai watershed, is situated in the lower Gangetic flood plain of West Bengal. In this region frequent flood has damaged environment and synthetic structures every year. As changes of landuse practices continues at an unprecedented rate that may damage natural resources and affect livelihood. The present study is to evaluate flood prone areas through integrated field data and GIS modelling. To assess the flood prone areas considering nine flood contributing factors have been employed through weighted multi-criteria analysis. The above mentioned flood contributing factors such as elevation, slope, rainfall, geomorphology, drainage density, distance from river, LULC, stream power index (SPI) and topographic wetness index (TWI) have taken into consideration to integrate in ArcGIS environ by using weighted overlay method and finally flood hazard map have been generated. The prediction ability and performance efficiency of this model are validation measures by statistical techniques and receiver operating characteristic (82.5%). The result depicts the flood hazard zones viz. severe, high, moderate, low and very low, which can be helpful for better planning to prevent flood damages and management of flood in the study area.

**Around seven decades river course shifting and bank erosion  
susceptibility of river Mujnai**

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**Abstract**

River bank erosion is a destructive fluvio-hydrological hazard particularly inhabited flood plain of the dynamic Himalayan foreland basin. The principal objectives are (i) to identify the river bank erosion susceptibility through BES I (River Bank Susceptibility Index) model which has been modified from the Rosgen's (2001) BEHI model and historical reconstruction (1955 to 2021) of the river course and (ii) to examine the principal factors of river bank erosion particularly for the river Mujnai. Sedimentary bank facies analysis has also been done to ascertain the causes of river bank instability. Hence, rate of bank migration, changes of channel width, channel sinuosity index (SI), channel length, erosion and accretion of the river bank etc. have been measured through geospatial techniques. Result showed that the younger Quaternary sediments are prone to erosion and BES I result illustrated that around 28% areas are under high erosion zones. Average maximum width of the channel was recorded in 1980 (147.92m). Additionally, the lateral migration in case of left bank was around 141.08m (in the 1980) and 192.62m in right bank (in the 1980) while the shifting rate was 14.10m/y and 17.51m/y respectively. Soft engineering techniques should be implemented at high bank erosion vulnerable sites of river Mujnai.

**Quantifying heat island intensities over the urban surroundings:  
A case from a tropical urban-industrial area, India**

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**Abstract**

Urban Heat Island (UHI) is a very common micro-climatic event for the large metropolitan and rapidly growing cities worldwide. Therefore, it is indispensable to understand the impact of urban landscape changes in local climatic variation over the cities. This study mainly focuses on the seasonal variation of the UHI in relation to land use/land cover alterations during 1991-2020 over the Asansol Urban Area Agglomeration using geo-spatial techniques. The indices such as Dry Built-up Index (DBI), Dry Bare-Soil Index (DBSI), and Enhanced Built-up and Bareness Index (EBBI) are employed to differentiate the urban built-up lands (UBLs) from the dry lands effectively. Finally, the rural-urban boundary has been demarcated based on the UHI map. This study revealed that the dry and bare surface in the surrounding region of the study area is highly heated during daytime and the cooling effect is found in green and blue space over the study area. The high UHI index is observed in the three land classes such as built-up land, dry and bare land, and mining and industrial land, and the UHI intensity is observed in increasing trends for both the summer and winter seasons.

## **Dynamics of Meander Geometry and Formation of Neck Cutoff of River Raidak-I within Himalayan Foreland Basin, India**

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### **Abstract**

Tectonic activities and catastrophic flood events significantly assist to the process of channel avulsion and formation of river cutoffs on alluvial floodplain. The principal objectives of this research are (i) to examine the mechanism and causes of neck cutoff formation of river Raidak-1, India applying geospatial techniques and bank facies (1955-2019) and (ii) to investigate the dynamics of meander channel geometry using fluvio-hydrological techniques. The result showed that the river channel has been significantly shifted (during 1955-2019) owing to lateral channel migration resulting into formation of several neck cutoffs on the floodplain. Meander Geometry study revealed that radius of curvature, meander wavelength, meander amplitude and meander belt width have been fluctuated during the entire study periods. The threshold value (less than 5°) of apex angle of two tangents at meander loop and neck distance (less than 1 km) helps to form regular neck cutoffs. The results show that high sinuosity, threshold value of meander loops; major floods, high discharge and non-cohesive bank materials are responsible for the development of neck cutoffs. Moreover, probable sites of future cutoff formation have also been identified. Therefore, this study would give proper insights for river management approach particularly on dynamic Himalayan Foreland Basin, India.



**Modelling of Sustainable and Suitable Land selection for Future Urban Development: a study around Kolkata city, India**

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**Abstract**

Unplanned, uncontrolled and haphazard built-up expansion of the cities of developing nations is the results of unprecedented pressure of population. Such type of urban growth in the form of urban sprawl is increasing through the encroachment of natural resources (i.e. agricultural land and wet land) of the environment. In this sense, selection of appropriate place for future urban expansion which maintaining ecological balance an inescapable component of good planning. Kolkata city and its surrounding area have been chosen here to find out the most suitable location for future urban development. An integration of statistics and GIS techniques has been applied for analysis and total of nine factors have been taken to delineating the most prospect place for future urban development. AHP method has been used here to calculate the weights of the each criterion by using pair-wise comparison matrix. Weighted reclassified maps have been compiled by WOA through Arc Map to get final suitable map and which has been classified into five categories: High Suitable (S1), Moderately Suitable (S2), Marginal Suitable (S3), currently not Unsuitable (S4) and Not Suitable (N1). Only 3.37% (105.35 Sq. Km.) recorded as the high suitable (S1) zones for future urban development. Field visit shows there is no agricultural field or wet lands spotted rather than open space. This work has helped and suggested to all policy maker, stakeholders, planners and also government to adopt this technique or use the delineated region for new urban development project.

## **Severity and management of cyclone hazard: A study at eastern coast of India**

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### **Abstract**

Eastern coast of India is familiar with different types of hazard. Balasore coast of eastern India faces the problems of flood and cyclone hazard almost in every year. The local people residing at the Balasore coast face lot of difficulty during the event of hazard and also negatively affected in long term basis. Livelihood and economy are also adversely affected in every year due to the impact of cyclone. The present paper attempts to demarcate the cyclone hazard zone at Balasore coast, highlights the severity and impact of cyclone on the local people of the area and management of cyclone hazard in the area. Random sampling method has been considered in the entire work and total sample size is 698. Samples have been selected from two mouzas of Balasore district. People perceptions have been considered for finalizing the results. We have applied Arc-GIS software for map making and used cartographic techniques for analysis and inferences. Local economy i.e. ocean based fishing and business associated with it like hiring of fishing boats, marketing of fishing net, selling of ice blocks for preservation etc are affected badly by the cyclone. Residential households, agricultural plots, vegetation, communication system like road, electric post are also damaged by the cyclone. People face a lot of hurdle during and after the cyclone in the area to sustain on the earth. Proper land use management, maintaining the distance from the coast to construct the settlement and application of geospatial technology are needed to combat such natural disaster.

## **Estimation of surface soil moisture using multi-spectral and SAR satellite data: A case study of Bhagwanpur-I CD Block, Purba Medinipur, West Bengal**

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### **Abstract**

Information about Surface Soil Moisture (SSM) is one of the crucial variables that help to the hydrological processes between land surface and atmosphere. Precise determination of soil moisture is influential in the weather forecast, draughts monitoring, hydrological modelling, agricultural management and policy making. Hence, an attempt has been made in this study to estimate the Surface Soil Moisture (SSM) through high spatial resolution and different multi-spectral imageries Landsat OLI (Oriental Land Image), Sentinel-2A and SAR (Synthetic Aperture Radar), and **TVDI (Temperature Vegetation Dryness Index)** and **WCM (Water Cloud Model)** have been used the retrieved soil moisture from an agricultural of similar date. The thermal Infrared (TIR) (10.9 $\mu$ m) and short-wave infrared (SWIR) (2.2 $\mu$ m) band of the Landsat image and SWIR (2.19 $\mu$ m) band of sentinel-2A image were used to estimate the soil surface moisture at the spatial resolution of 30 m and 20 m respectively, whereas the Red and NIR band of both the images were used to estimate the dryness. The effect of crop canopy ( $V_1$ ) was incorporated in the WCM which are computed from the sentinel-2A satellite data. LWC was used as a vegetation descriptor parameter ( $V_2$ ) in the WCM. The model-based Soil Moisture was compared with the observed soil moisture obtained from the in-situ measurement. The ground-based soil moisture measurement was carried out in the 0 -10 cm depth. Two satellite-based indices, **NDVI** and **LST** were taken to derive the TVDI for the assessment of SSM. The correlation and regression analysis were performed between TVDI and in-situ soil moisture. The spatial patterns (-0.07 to 1.37) of TVDI show generally low distribution over the study area. The TVDI was also found adequate in the temporal variation of the SSM. The methods (TVDI) confers consistence appraisal of the SM situation and consequently can be used to evaluate the wet condition. The statistical tests of TVDI values and in-situ soil moisture show a good positive correlation with RMSE=0.17 for the date 23.04.2021. Also, the **WCM** model performance was evaluated through statistically test. The statistical test result shows a good correlation between observed and estimated soil moisture. The study proves the operational potentiality of satellite derived information for estimating soil moisture from crop field.

## **Copula-based Bivariate Probabilistic Approach to Analyse Meteorological Drought in Indian Gangetic Basin (1901-2021)**

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### **Abstract**

The Indo-Gangetic plain, the main backbone of India's food security, has experienced frequent droughts in recent years. In this study, drought characteristics (duration and severity) were investigated through the Standardized Precipitation Index (SPI), using the Indian Meteorological Department (IMD) gridded precipitation data (1901-2021). The bivariate copula method has been incorporated to combine two drought properties (severity and duration). Copula integrates multivariate distribution and considers the dependency rate among the variables. The five most widely used copulas from various copula families, Elliptical (Normal, t-copula) and Archimedean (Clayton, Gumbel, Frank), were estimated for modelling, and the best fit copula was selected. With increasing drought duration and severity, the drought return period raised, but the frequency decreased gradually. Most of the droughts occurred with less duration and severity, with a return period below ten years for the whole region. The Major 100+ years return period droughts were to be found after 1960 and even occurred more frequently after 2000. The most recent exceptional drought with more than 100 years of return occurred during 2008-2011 and 2016-2018 in the Upper and Middle Gangetic plain. Whereas in the Lower Gangetic plain, a hundred-year return period drought was occurred during 2010-2013.

**Hydro-geomorphological mapping of the Manbhum-Singbhum Plateau (Indian Plateau) for sustainable landuse planning and hazards management**

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**Abstract**

Hydro-geomorphological maps help to understand the types of landforms and landscape evolution. The development of geomorphological mapping techniques has been significantly advanced from classical to computer-based digital mapping through methodological development. Manbhum-Singbhum Plateau is located in the eastern section of the Precambrian-origin Chota Nagpur Plateau. Digital geomorphological mapping with hydrological aspects are highly required for the planning and hazard management of any region. In this connection, the main objectives of this study are (i) to classify the landscape and hydrological elements by applying the algorithms of the Topographical Position Index (TPI) and supervised Maximum Likelihood Classifier (MLC) and (ii) to comprehend the relationship between lithology with landforms through the evolution of time. The result showed that the maximum area is covered by high ridges and mid slope drainage with shallow valleys (36.90%) followed by mid slope drainage with shallow valleys (19.77%). Similarly, the smallest area coverage is under the upper slope zones with mesas (1.46%). Local and mid slope ridges and small hills in the plains are covered around 6.47%, where as plains occupy 11.81% of the Manbhum-Singbhum Plateau region. Results have been verified by collected way points of landforms and hills. This research is most helpful for proper land-use planning and applied geomorphology-related studies.

**Classification of Degraded Land and its Management,  
Purulia District, West Bengal**

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**Abstract**

The supply of land on the earth's surface is limited and practically closed. It is controlling the pivot mechanism of primary production systems. Over the years, the country's landmass has suffered from different types of degradations. Land degradation refers to a decline in the overall quality of soil, water or vegetation condition commonly caused by human activities; this is a serious threat to the world, not merely as an environmental issue, but also a socio-economic problem. Land in India suffers from varying degrees and types of degradation stemming mainly from unstable use and inappropriate management practices. The Purulia District of West Bengal represented as a distinctive nature of land which has hilly and undulating terrain. The nature of soil also has a tendency towards degradation. So, the primary objective of the present study is to distinguish, classify, evaluate, and interpret the present status of degraded land of Purulia district; from which its impact on the total geographical land can be assessed and the proper management procedures can be taken. In this regard, the present paper concerns an attempt to the ecological investigation, identification, status of distribution, extent and precise characteristics of different types of degraded land of Purulia district of West Bengal, with the help of modern methodology and interactive techniques.

## **Fishery Waste Utilization for Biofuel Production**

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### **Abstract**

There is a shortage of fossil fuels from all over the world. It is estimated that if fossil fuels are consumed at this rate, then all the fossil fuels will be exhausted by approximately in the year of 2060. Here biofuels have a role to play. Biofuels are pollution free and several ways already have been established for their preparation from bio-mass. Our target is reduction of pollution cum biofuel production in a cost effective way that should be more eco-sustainable. Biofuel means biologically derived fuel that may be liquid or solid. Huge amounts of fish waste is available in coastal region of India. The waste materials of fishery industry or fish by-products can be utilized for producing biofuel as these are non-toxic and biodegradable in nature. The process of converting fish wastes into biofuel or biodiesel involves extraction of fish oil from the waste of the fishery industry. The easiest way to convert fish oil to bio fuels is transesterification, using the base as a catalyst. Thus biofuel production from waste can benefit the social economy.

## **Hadoop in Data Science**

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### **Abstract**

With the increasing demand for Data Science applications, managing the huge data which is created in a continuous manner, is a big challenge for us. In this modern era, data plays an important role in the wellbeing and growth of any society. More than two quintillion bytes of data are created every day from various sources like web authoring, scientific instruments, social media, research and so on. There are many platforms available for managing this type of data. But Hadoop is a well-structured platform for managing the dynamic data in an efficient way under some circumstances. Sometimes, by adding some nodes to the Hadoop computation, the computation power will increase which gives good system performance. Here, we will see that the container allocation in a distributed manner, is a key factor of the system performance. This paper will focus on how we can access and manage the data remotely. It will also increase the performance of Hadoop by applying Apache Spark on it. It will give us better data management infrastructure and deal with node failure & data replication.



## **Process Selection for Hydroxyapatite Coated Prosthesis: an Emerging Technology in Biomaterials**

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### **Abstract**

Bone is a collagen-reinforced natural ceramic composite made of hydroxyapatite (HAP). This is why bioactive ceramic coatings, such as HAP coatings, are applied to metallic implants in the biomedical arena. For the preparation of HAP and HAP composite coatings on metal substrates such as Ti, Ti6Al4V, SS316L, etc., numerous methods have been reported, including macro plasma spraying (MAPS), micro plasmas spraying (MIPS), laser assisted processes, other thermal spraying techniques, sputtering, electro phoretic deposition (EPD) techniques, sol-gel (SG) derived techniques, biomimetics, electrohydrodynamic atomisations spraying, dip/slurry coatings etc. In order to achieve the best results, the selection of coating method must take into account the prosthesis's functional requirements. In this study, the optimal method for coating hydroxyapatite (HAP) was determined using a fuzzy-based soft-computing technique. An integrated algorithm has been used, taking into account the weights of the experts' opinions and the criteria. The criteria in this study include osseointegration, biocompatibility, and nano-tribological characteristics. However, in this investigation, the best functional outcome was found using microplasma spraying (MIPS) and other thermal spraying techniques. The proposed soft computing method is demonstrated to be a reliable method for selecting the best process for complex manufacturing process as well as material selection problems.

## **Efficacy of Deep-Learning approaches for Hyperspectral Image Classification**

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### **Abstract**

A Hyperspectral Image (HSI) captures a huge spectrum for a single pixel, instead of three spectrums found in RGB image. HSI classification is the process of assigning a class label to each pixel captured with hyperspectral sensors. Due to the special engineering and statistical properties of HSI with high-dimensional spectra-spatial data, traditional RGB, monochrome, and multispectral imaging methods cannot be directly applied to HSI. Therefore, machine-learning based methods are applied for HSI classification, which typically relies on applying engineering knowledge and domain expertise to design a variety of human-engineered fundamental features. Handcrafted features can represent various image properties, so they can work with the data being analyzed, but they may not work with real data. Because the optimal features vary greatly between data sets, balancing robustness and discriminability is difficult. To address these shortcomings of traditional models, Deep-Learning (DL) based approaches were developed, which can automatically learn features from data in a hierarchical fashion and construct a model with increasing semantic layers until the desired representation is obtained. DL architectures can learn the behavior of any data without knowing its statistical distribution and can extract linear and nonlinear features without any predefined information.

**ENG-38546846**

**Stresses and Temperature during the turning of Super Duplex  
2507 Stainless Steel: a Finite Element Analysis**

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**Abstract**

The project uses ANSYS software's Finite Element Analysis FEA method to simulate the cutting process circumstances and the state of a metal-cutting tool. The distribution of normal equivalent stresses, strain, and temperature generation in the workpiece material during turning of stainless steel super duplex 2507 was taken into consideration in the study. The output parameters, such as Total Deformation, Elastic Strain, Equivalent Stress and Temperature generation in cutting zone during turning of Stainless Steel 2507 Super Duplex by carbide tools with coatings of Al<sub>2</sub>O<sub>3</sub>, were researched based on the input parameters required for turning, such as cutting speed, feed rate, and depth of cut with the necessary time sampling of the process. The results acquired and the information gained by turning in ANSYS are mentioned together. The research took into account how these input factors would affect the simulation's output parameters for the examination of stress and temperature in a workpiece. The purpose of this study is to develop a finite element analysis simulation model to find solutions to stresses and temperatures occurring at various locations within the tool and workpiece contact region for a tungsten carbide (Al<sub>2</sub>O<sub>3</sub>) coated cutting tool under specified cutting conditions.

## Optimization of parameters for caffeic acid extraction from microalgae by supercritical carbon dioxide

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### Abstract

The *Spirulina platensis* is rich in different types of antioxidants including caffeic acid. Our target is optimization of extraction process parameters of caffeic acid from *Spirulina platensis* which is performed by supercritical green technology. The optimization of supercritical carbon dioxide (SC-CO<sub>2</sub>) extraction parameters was carried out by Box-Behnken design (BBD) and response surface methodology (RSM). The three levels of extraction parameters (extraction time, extraction pressure and temperature) have been fixed. As a response, the caffeic acid content of the extracts was determined by HPLC. The supercritical carbon dioxide extract of alga exhibited the maximum content of caffeic acid as 72.11 µg/g of *dw* at the optimized extraction conditions of 360.08 bar pressure for extraction time 57.13 min at temperature 38.31 °C. Besides that the extract has high total phenolic content (76.87 µg GAE/g *dw*), FRAP value (4.19 mM FeSO<sub>4</sub> equivalent/g *dw*), reducing power (2278 µg BHT/g *dw*) and IC<sub>50</sub> for DPPH activity (89.28 µg/mL). It has been concluded that supercritical fluid extract can significantly inhibit microbial growth in beverages. Ultimately, we can also predict that isolated SC-CO<sub>2</sub> antioxidant rich fraction would have use as food and beverage preservative.

## **IoT-based VANETs for disaster routing problems through Genetic Algorithm**

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### **Abstract**

Internets of Things (IoT)-based sensors have been successfully implemented in vehicular ad hoc networks (VANETs). In a VANET, finding the best path is crucial for establishing reliable communication in both the uplink and downlink directions. As a result, more effective and efficient optimal path finding without a loop-free route improves network communication. In this disaster routing problem, relief is distributed to all locations within feasible time and cost. The problem becomes more interesting while using the VANETs. Comparing the results with and without VANETs shows how effective the VANETs. This investigation mainly focuses on cost minimization for delivering relief materials with time constraints. The different scenarios are obtained while imposing the time limit constraints. Because of their simplicity and adaptability to various optimization issues, nature-inspired optimization algorithms are therefore used to address this obstacle. Researchers have developed many optimization algorithms to maintain the balance between intensification and diversification. We presented a novel genetic algorithm (GA) with probabilistic selection, cyclic crossover, and dynamic mutation to solve this issue.

## Verification of shanon decomposition theorem using multiplexer in digital electronics

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### Abstract

As per Shannon expansion or decomposition any Boolean function  $f$  can be expressed by ,

$$f = x \cdot f_x + \bar{x} f_{\bar{x}}$$

Where  $f \rightarrow$  any Boolean function ,  $x \rightarrow$  a variable,  $\bar{x} \rightarrow$  complement of  $x$

The terms  $f_x$  and  $f_{\bar{x}}$  are called positive and negative Shannon cofactors respectively with respect to the variable  $x$ . It has been very important theorem of Boolean algebra. In many applications  $x$  is treated as condition and the cofactors ( $f_x$  and  $f_{\bar{x}}$ ) are treated as branches. A positive shannon cofactor of function  $f$  with respect to a variable  $x$  is defind as the function with all values of  $x$  replaced by 1 and A negative shannon cofactor is the same, but replaces all values of  $x$  by 0.

A more explicit way of stating the theorem is:

$$f(x_1, x_2, x_3, \dots x_n) = x_1 \cdot f(1, x_2, x_3, \dots x_n) + \bar{x}_1 \cdot f(0, x_2, x_3, \dots x_n)$$

For 2 variables treated as condition,  $n = 2$  Shannon expansion theorem can also be written as ,

$$f(x_1, x_2, x_3, \dots x_n) = x_1 x_2 \cdot f(1, 1, x_3, \dots x_n) + \bar{x}_1 x_2 \cdot f(0, 1, x_3, \dots x_n) + x_1 \bar{x}_2 \cdot f(1, 0, x_3, \dots x_n) + \bar{x}_1 \bar{x}_2 \cdot f(0, 0, x_3, \dots x_n)$$

For 3 variables treated as condition,  $n = 3$  Shannon expansion theorem can also be written as ,

$$f(x_1, x_2, x_3, \dots x_n) = x_1 x_2 x_3 \cdot f(1, 1, 1, \dots x_n) + x_1 x_2 \bar{x}_3 \cdot f(1, 1, 0, \dots x_n) + x_1 \bar{x}_2 x_3 \cdot f(1, 0, 1, \dots x_n) + x_1 \bar{x}_2 \bar{x}_3 \cdot f(1, 0, 0, \dots x_n) + \bar{x}_1 x_2 x_3 \cdot f(0, 1, 1, \dots x_n) + \bar{x}_1 x_2 \bar{x}_3 \cdot f(0, 1, 0, \dots x_n) + \bar{x}_1 \bar{x}_2 x_3 \cdot f(0, 0, 1, \dots x_n) + \bar{x}_1 \bar{x}_2 \bar{x}_3 \cdot f(0, 0, 0, \dots x_n)$$

Multiplexer means many into one. A multiplexer (MUX) is a circuit used to select and route any one of the several input signals to a output. An simple example of an non electronic circuit of a multiplexer is a single pole multi position switch. Multi position switches are widely used in many electronic circuits. However circuits that operate at high speed require the multiplexer to be automatically selected. A mechanical switch cannot perform this task satisfactorily. Therefore, multiplexer used to perform high speed switching are constructed of electronic components. Multiplexer handle two type of data that is analog and digital. For analog application, multiplexer are built of relays and transistor switches. For digital application, they are built from standard logic gates.

The multiplexer used for digital applications, also called digital multiplexer, is a circuit with many input but only one output. By applying control signals, we can steer any input to the output. Few types of multiplexer are 2-to-1, 4-to-1, 8-to-1, 16-to-1 multiplexer.

## **An Image Steganography Technique Based on DNA Encryption and LSB Substitution for Color Images**

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### **Abstract**

Steganography is the practise of concealing data within a variety of media, including images, videos, text, audio, and more. This study suggests a new method for blending private information into a colour image using the least-significant bit (LSB) that is based on the DNA sequencing procedure. The four nucleotides that make up DNA are thymine, guanine, adenine and cytosine. Whereas, the private bits are encrypted within the DNA sequence which generates encrypted version of the DNA sequence. Moreover, the encrypted DNA sequence is transmuted into a binary stream and then concealed within the cover image. 3 bits are concealed within the three LSBs of a pixel of Blue, Green and Red channel, respectively. This process transforms the original image into a stego-picture, which is completely trustworthy in obstructing human sight and makes it difficult to recognise critical information. According to the experimental results, the suggested method is a potent picture steganography technique, producing 0.945 bpp of concealing power with an average PSNR of 54.72 dB.

**Screening, isolation and production of extracellular alkaline lipase from a marine bacterial Isolate *Bacillus* sp. SNSKU5**

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**Abstract**

Ten bacterial strains were isolated from oil industry soil samples and screened for lipolytic activity. *Bacillus* sp.(strain SNSKU5) was selected for lipase production due to its high lipolytic activity (4.2 IU mL<sup>-1</sup>). *Bacillus* sp. PD-12 lipase of *Bacillus* sp SNSKU5 was optimally active at pH 8.0 and at 40°C temperature. Maximum lipase production by this strain was obtained when grown under shaking conditions (250 rpm) at 30°C for 24 h. Optimization of carbon and nitrogen sources was studied for the increase lipase production. Maximum lipolytic activity (4.25±0.020 IU mL<sup>-1</sup>) was obtained with olive oil as a **carbon source** followed by coconut oil (2.5±0.030 IU mL<sup>-1</sup>). Among nitrogen sources, ammonium nitrate resulted in maximum lipolytic activity (15.6±0.036 IU mL<sup>-1</sup>). Lipase production by this strain was studied in a fermentor(3 litre capacity) with a working volume of 1.8 liter under optimized conditions resulted in lipolytic activity of 22 IU mL<sup>-1</sup> after 21 h. Thus, short fermentation time (20 h) makes this fermentation system a promising one in terms of lipase productivity and alkali-stable *Bacillus* sp. can be used in detergent industry.



**E-waste management by microbes through bioleaching process  
for reused of valuable Metal**

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**Abstract**

In our daily life, we can not avoid electronic goods. Most electronic goods are made of valuable metals. During the huge use of electronic goods, e-waste is generated and market prices are continuously increasing. Traditional E-waste management like acid digestion and incineration are applied to dispose of the E-waste. But that has a lot of disadvantages i.e. environmental pollution labour and chemical costs which can not earn revenue. In this situation, we can recover valuable metals from e-waste and earn a lot of money through the recovery of metals. As per the natural food web, different kinds of soil-born microbes are associated with dumping e-waste matter. For the research study, we found various types of actinomycetes, bacteria and fungus. Those are able to bioleach valuable metal from e-waste in liquid culture. After the separation of microbes, we can collect valuable metal for reuse. After several experimental analyses including SEM-EDEX and FTIR, we concluded that microbes are able to adsorb metals. After adsorption, we can collect specific metals by acid or alkaline solution. This innovative research can open a new door to bio-based metallurgy.

## **Foraging patterns of ants in semi-arid area of West Bengal**

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### **Abstract**

Foraging behaviour of the ants *Camponotus compressus* and *Oecophylla smaragdina* have been studied under natural conditions at Jhalda, Purulia, West Bengal during the period of last two years (2021-2022) in different seasons. It is revealed that these ants forage at large individually but are habituated to carry the food individually when the food item was manageable singly but in cases of individually unmanageable food item they followed the cooperative food transport strategies. These ants are apt to change food carrying devices in respect to the size, shape and weight of the food item in respect to climatic conditions. It is also noted that for transportation of large food item the messenger ant move to the nest to inform the nest-mates to follow the pheromone track to reach at the food source. Sometimes, a remarkable incident was came into the sight in respect to participation of individuals to ensure procurement of the targeted food item. Because, only required number of ants were seen to act as transporters while other who emerged out of the nest were seen to move here and there in the foraging ground, instead of going back to the nest. Both the ant species are highly adapted to utilize their energy effectively either to cross the hurdles or to protect the food from snatching by any means. Even competition both inter-specific and intra-specific in connection with the occupation of the foraging ground as well as for the snatching of food items is well marked.

**Green synthesis of silver nanoparticles by using  
*Terminalia arjuna* Bark Extract**

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**Abstract**

In the present investigation, we have explored a simple robust, inexpensive & eco-friendly method for the synthesis of silver nanoparticles (AgNPs) using *Terminalia arjunabark* extract (TA-AgNPs). Concentration of AgNO<sub>3</sub>, and *T. arjuna bark* extract amount were investigated. The antimicrobial activity of TA-AgNPs was investigated against *Escherichia coli* and *Staphylococcus aureus*. Comparable zone of inhibition was exhibited by TA-AgNPs. This study suggests that TA-AgNPs possesses significant antibacterial properties.

*Terminalia arjuna*, a known Cardio tonic phytotherapeutic Source have never been used for the Synthesis of nanoparticles and thus present work aims at characterizing it's nano forming ability- Silver nanoparticles were Synthesized from AgNO<sub>3</sub> using bark powder aqueous extracts of *Terminalia arjuna*. The bioreduction and Stabilization of the So formed Silver nanoparticles was monitored by UV vis-spectrophotometers and micrographs Nanoparticles are used in the delivery of drugs into the specific area of the human body, thereby reducing the Interaction with the Surrounding parts, Preventing harmful effects.

Recently, green Synthesis of AgNPs had gained so much attention. Green-Chemistry methods are more effective because eco-friendly, non-toxic, and cheap Biosynthesis methods. This review focused on the green-Synthesis of Silver nanoparticles using *Terminalia arjuna* Bark extract, and its antimicrobial activity.

## **Environmental Psychology: For a Convalescent Future Environment**

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### **Abstract**

Declining health of natural environment flag a relatively new branch of ecology, Environmental Psychology(EP). EP is that how we at individual level or as part of a population or group behave with physical environment, how we experience the environment and try to modify it up to our limit, and how we response according to our experiences influenced by the environment. The primary goal of EP is to realize individual's activities in relation to environments and sway the policies of sustainable behavior to make environment more green and livable. The main focus is on an individual's or group's concept, frame of mind and conduct to their environment, how our satisfaction and prolificacy correlated with work environment, connection between well-being and environment, relatedness of mental health and natural environment. Environmental psychologists seek to boost our governance of natural assets and the built environment, study everyday settings, making a difference for betterment, help to recognize one's environmental identity with respect to his/her nature, restoration, place attachment and finally way finding and enhancing building design. In countries like India it is the high time to take EP in consideration and also to make professionals by introducing it as a new discipline in academics.

## **Myco-remediation of heavy metals from waste water**

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### **Abstract**

Water pollution imposes great threat to basically aquatic ecosystem because of several anthropogenic activities. This myco-remediation emphasizes the ecological parameters [pH, time (h) and temperature (°C)] optimization for employing Box-Behnken design (BBD) experiments, in order to accomplish better bio-adsorption of a [lead (Pb II)] from the wastewater through the active roles of fungal exo-polysaccharide (EPS) of *Aspergillus penicillioides* (F12) (MN210327). The computing of statistical analysis (ANOVA) has enabled to record the optimized bio-adsorption (73.14%) of lead (Pb II) by EPS at pH (8.85), temperature (32.44°C) for duration of 5.74 h. Fungal EPS basically composed by trace amount of carbohydrate, that have flocculating activity (88.4%) in kaolin clay at the concentration of 0.5 mg/L of EPS and at the 50% emulsifying activity. This investigation has also opened up new vistas on the possibility of the development of eco-sustainable bioremediation of heavy metals by fungal EPS on an industrial scale. This research study not only focus on bio-adsorption of heavy metals from waste water but also collection of heavy metals for reuse in industrial scale.

**Changes in the channel morphology due to human intervention  
through construction of bridges in the Rupnarayan River,  
West Bengal**

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**Abstract**

The anthropogenic activities affect the river channel as well as the whole system in different magnitudes and dimensions. Rupnarayan River, in eastern India, is modified by several engineering structures. Floods are becoming riskier for human being day by day because of the population growth, intensification of flood plain use, and unplanned engineering practices. Hydrological parameters, such as monthly discharge, peak flow discharge and geomorphological factors, such as gradient, width–depth ratio, grain size, braid–channel ratio, sinuosity ratio, pool-riffle sequence, and stream power are taken into consideration to highlight the significant alterations of the river due to bridge construction. The alterations are assessed with the help of hydrological data, satellite images, and digital elevation data along with field survey. Through cross sectional survey, each cross section is determined and steady flow analysis, hydraulic design analysis is carried out. The effects of bridges on the Rupnarayan river morphology include an increase of gradient, altering in depth of the river channel at the downstream of the bridges. The construction of bridges influences pool-riffle sequences. Thereby, the pool depth spacing is greater than the riffle crest spacing. However, the integration of natural as well as human-induced factors can be the best approach to understand the anthropogenic alteration of the river.

**Electricity production from chicken waste using *Lysinibacillus sp.*  
as a biocatalyst in microbial fuel cell (MFC)**

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**Abstract**

Microbial fuel cell (MFC) is one of the green technology for the production of bioenergy from compounds or wastes. In the MFC microbes including bacteria used as biocatalysts in the anode chamber. Microbes oxidize the compounds and produce electrons in the anode chamber; electrons flow to the cathode to produce electricity and finally combine with oxygen and the final product is water. The bacterial strain *Lysinibacillus sp.* OM876241 isolated from soil (latitude: 22.36682; longitude: 87.2952). Two heat-resistant plastic containers were used as the anode and cathode chambers. Aluminium was used as the anode and graphite sticks were used as the cathode. The salt bridge was made with 1M NaCl and 3% agar. In the anode chamber, we used 1L of raw chicken meat waste with a concentration of 500 g/L. The whole setup was an H-type MFC. The maximum electrochemical potential in terms of open circuit voltage, current, and power produced by chicken meat waste was 642 mV, 1.7mA, and 1.09 mW respectively; with an internal resistance of 350 Ω. At this stage, Coulombic efficiency was 52%. Thus MFC in one way yields watts from waste and in another way used in bioremediation in terms of COD reduction.

**Production of ligninolytic enzyme of Fungal Origin and Evaluate  
Its Toxic Dye Degradative Potentiality**

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**Abstract**

The extensive usage of synthetic dyes in laboratories has led to releasing of effluents containing various noxious, persistent, and slowly biodegradable products, which severely deteriorate environment. Among the used toxic laboratories dyes, eosin was found to most toxic followed by phenol red, methylene blue, crystal violet and rhodamine since such dyes hampered the growth parameters of plant growth promoting microorganisms (PGPMs) and chickpea (*Cicer arietinum*). In order to biodegrade such pervicacious dyes, the current study aimed to produce laccase (1509.89 U/gds) from the solid-state fermentation of inexpensive agricultural remnant using an isolated fungal strain MSK3. The produced laccase was significantly decolorized and detoxified the harmful effects of rhodamine followed by crystal violet, methylene blue, phenol red and eosin.



**Isolation of heavy metal resistant bacteria from different industries (iron industry and thermal power plant) using soil and water**

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**Abstract**

The present study deals with isolation and identification of heavy metal resistance bacterial strains from thermal power plant (kolaghat) and iron industry (Santragachi) with the aim to assess possible heavy metal pollution and also in search of bacterial strains that can be utilized for bioremediation purposes. In a total of 8 isolates were obtained and 3 isolates were randomly selected for heavy metal resistance test using the following heavy metals -  $MnSO_4$  (manganese sulphate),  $FeSO_4 \cdot 7H_2O$  (Iron sulphate heptahydrate)  $K_2Cr_2O_7$  (potassium dichromate) and mercuric chloride ( $HgCl_2$ ). Isolates (1, 2 and 3) that displayed high heavy metal resistance tests were identified through Gram staining and various biochemical test. Isolates 1 were closely related to *Bacillus* and Isolated 2 were closely related to *Streptococci* respectively. Additionally, we investigated the effect of these metals on enzymatic activities of the metal tolerant strains isolated as well as antimicrobial resistance in some metal tolerant strains.

Our results showed that, despite the ability of metal tolerant strains to survive and grow in the presence of these elements, the interactions with these metals may result in metabolic or physiological changes in this group of bacteria.

**In-silico exploration of organophosphorus degrading bacterium  
*Brevibacterium frigoritolerans* GD44 in contaminated soil**

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**Abstract**

From more than 40 years, the usage of Organophosphorus pesticides (OPPs) in agricultural practice is common. This insecticide inhibits acetylcholinesterase enzyme, crucial for the transmission of the normal nerve impulse. One of OPPs, Phorate is a board range pesticide; it has been proved as a most active insecticide against most insect pest species. Phorate has been classified as a most hazardous insecticide according to the world health organization; so, its constant usage is a rising alarm. In the environment, microbial degradation is considered to be one of an essential factor to determine fate of organophosphorus pesticides. Bioremediation has received much consideration as an active biotechnological method to decontaminate polluted environment. *Brevibacterium frigoritolerans* has the ability to degrade phorate, reaching a degradation rate of more than 90%. Alkaline phosphatase in *B.frigoritolerans* GD44 has the ability to degrade organophosphorous and helps to reduce environmental pollution and toxicity to humans and animals. The genomic feature of *Brevibacterium frigoritolerans* GD44 makes it an excellent organism for soil bioremediation. In this study, Phylogenetic analysis of alkaline phosphatase activity in *Brevibacterium frigoritolerans* GD44 for understanding of evolutionary function. Others parameters like revealing amino acid composition of the protein within the genome of selected bacteria, GC content for data analysis. Besides those, recognition of optimal codon will provide information about gene prediction, genetic engineering and molecular evolutionary studies and evaluate the Codon Adaptation Index (CAI) to know adaptability of the protein/gene.

**Effects of bifenthrin pesticide on aquatic mollusc *Bellamyabengalensis***

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**Abstract**

Pesticides are used extensively in agricultural development and controlling different disease causing vectors. Pesticides can be toxic to other non-target and beneficial organisms including human beings. The adverse effects of toxicants produces stress conditions either in the form of physiological and biochemical changes, even death of living organisms. *Bellamyabengalensis* an aquatic gastropod is considered as bioindicator species, has been selected as experimental model species. The main focus is to find out the effects of pyrethroid pesticides like Bifenthrin on aquatic organisms like *Bellamyabengalensis* in laboratory condition. LC50 values of bifenthrin have been determined and *Bellamyabengalensis* has been treated with 2ppm concentration for 24 hrs to 96 hrs. ALP, ACP activity has been found to increase maximum 1.86 folds and 1.46 folds respectively than control animals. AChE activity has been decrease maximum 0.87 folds than control animals. The data generated from the present investigation could be utilized to develop specific preventive measures for the affected community.

**Relative toxicity of lead and nickel on life history parameters of epigeic earthworm *Eisenia fetida* (Savigny, 1826)**

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**Abstract**

Several kinds of anthropogenic activity greatly affect the normal ecological health of soil that is correlated with physiological health of terrestrial biome. Earthworms acts as ecological engineers, are major macro-fauna in the soil subsystem. Heavy metal pollution is an ecophysiological threat to paedo-fauna including earthworms that increases in now days. In the present heavy metal toxicity study, the LC<sub>50</sub> of lead (Pb) and nickel (Ni) were determined in both artificial and natural ground soil by acute toxicity test (14 days) in *Eisenia fetida*. Low observed effective concentrations (LOEC) of mixture of both metals (Pb and Ni) were also determined through repetitive experimental acute toxicity test. In the chronic toxicity test (28 days), the experimental setup had been arranged as control (C), T1 (1506.25mgPb), T2 (3012.5mgPb), T3 (193.75mgNi), T4 (387.5mg Ni), T5 (753.125mg Pb and 96.875mg Ni) and T6 (1506.25mg Pb and 193.75mg Ni) per Kg of dry soil. After end of chronic periods, the mean values of biomass, days for clitellum development, number of cocoon production, rate of hatching success and number of juvenile production were different significantly by the analysis of variance (ANOVA) followed by least significant difference (LSD) (P<0.05).

**Estimation of fungal biomass in relation with the quantification of chitin and chitosan**

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**Abstract**

Fungi are one of the diverse groups of microorganisms have cosmopolitan distribution in the biosphere. Many of their good and evil effect on mankind are documented till date, while some are recently explored. In both classical and advance studies detection and estimation of fungal load/biomass are often needed. The culture-based methods for determining fungal contamination are time-taking where unculturable fungi are untraced. Moreover, it is also difficult to estimate fungal biomass directly when they remain associated with growth substrates or anchorage materials. So, there is an urgent need to develop cheap, rapid and robust technique in correlation with fungal biomass. The cell wall of fungi consist of chitin which is a linear aminopolysaccharide made by  $\beta$ -(1,4) linked N-acetylglucosamine. The partially deacetylated derivative of chitin is called chitosan which is also present in few fungi. Due to abundance of chitin and chitosan in fungal cell wall, their quantitative estimation may be correlated with magnitude of fungal biomass. In this context, a simple colorimetric method for detection of chitin/chitosan of fungal mycelial biomass was carried out. Parametric optimization of the chitinous residue extraction from fungal biomass was undertaken. The colorimetric data was subsequently correlated with quantity of fungal biomass.

**Determination of potability and water index value of different drinking water collected from Purba and Paschim Midnapur, West Bengal, India**

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**Abstract**

The water quality of different drinking water source collected from Panskura, Ghatal and Geonkhali in West Bengal was analyzed. Water samples were collected from residential area of Panskura (pond, 400ft, 170 ft 121ft &70 ft depth deep tube well), Ghatal municipality (Shilabati river water and Ghatal water plan after bleaching), Geonkhali water treatment plant (before and after bleaching). All water samples were subjected to bacteriological (coliform and fecal coliform) and physiochemical studies ( $P^H$ , Conductance, Hardness, Alkalinity, DO, BOD, COD and TDS, TSS) to measure the water quality index (WQI), using standard bacteriological and Physiochemical methods. This study was intended to ascertain the quality of water for public consumption, recreation and other purposes. Present result indicate that water quality of all studied area are Good with respect to WQI value and excellent for drinking purpose collected from Geonkhali water treatment plant after bleaching. So, this result informed that proper treatment is required for excellent water quality before water consumption otherwise may also trigger outbreaks of waterborne disease.

**Evaluation of soil heavy metal pollution with associated  
ecological and human health risk**

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**Abstract**

Heavy metals contamination in soil due to rapid growth of agriculture, industrial, transport and urban activities bring huge pollution load and increases environmental as well as human health risk in various parts of the World specially in developing countries. Chotanagpur plateau is one of the developing regions of eastern India. Hence, in this study total 96 samples of topsoil (0-20 cm) and subsoil (20-50 cm) are collected from a selected area of this region. Heavy metals such as Fe, Cr, Mn, Zn, Ni, As, Cu, Pb, Sr and Zr are analyzed and found Iron, Manganese and Zircon have their most abundances in top and subsoil both. All heavy metals exceeded their World normal concentration values in topsoil and except Sr in subsoil. Correlation coefficient (Pearson's) suggested strong positive correlation among heavy metals. Contamination Factor (CF) has identified Copper, Manganese, Zinc, Nickel, Strontium are the major elements of soil pollution. Moderate Ecological risk (RI) is indicated from industrial and semi township areas at their topsoil. Non-carcinogenic health risk of children suggested that they are highly vulnerable by dermal contact of toxic metals. Therefore, scientific and cost-effective management practices should must be introduced. This overall study should further help researchers and policy makers to make valuable decisions.

**Forest resource of southwest bengal-A study on forest productivity and resource management**

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**Abstract**

Forest is a good habitat for bio-resource from our research and extension point of view that help us in many ways. Round the year, forests yield varieties of products and help to local people to generate their income. In this communication some important plants producing above underground parts have been presented. Above ground parts are varieties of flowers, fruits, bark and seeds even resins produced by plants or interactions with insects and microbes Underground types are corms, bulbs, rhizomes and tubers even roots of plants. Here, underground biomass producing species yield biomass from 4 kg/hectare/annum to 900kg/hectare/annum on dry biomass basis. Above ground biomass of fruits yielding species varies from 10.34 kg/hectare/annum to 62.14 kg/hectare/annum in the dry lateritic area of West Bengal. Animal products like red ant are a major NTFP species used widely by the people and they earn money round the year through local weekly markets. Management is based on the interactions made by forest department as well as FPCs on a local area basis but motto is same. Hoped that interested people will come on that field to study knowledge based practice on forest yield in and abroad based on this study. It will help to manage the species and biodiversity too for the next generations.



**Effects of cadmium chloride on freshwater mollusc, *Bellamya bengalensis***

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**Abstract**

Cadmium chloride is persistent, non-biodegradable environmental pollutants that have hazardous impact on living organisms. *Bellamya bengalensis*, an aquatic gastropod are considered as bioindicator species. In this study, attempt has been made to evaluate the biological effects and metabolic responses during cdcl<sub>2</sub> stress in aquatic mollusc, *Bellamya bengalensis* in laboratory conditions by testing some biomarkers like alkaline phosphatase (ALP), acid phosphatase (ACP) and acetyl cholinesterase (AChE). The main focus has to find out the effects of cdcl<sub>2</sub> on *B. bengalensis* and select suitable biomarkers for environmental monitoring. LC<sub>50</sub> value has determined by toxicity testing and animals have been treated with 5 ppm doses for 24-96 hrs consecutively. ALP and ACP activity has been found to increase maximum 2.27 and 1.54 folds during the treatment respectively. AChE activity has decreased upto 0.9 folds in compare to control animal. As *Bellamya* are highly integrated to their ecosystem, some of the sensitive biochemical parameters of this organism could be used as biomarkers for cdcl<sub>2</sub> toxicity.

**Optimized Biodegradation of Carcinogenic Fungicide  
Carbendazim by Endosymbiont of *Glyphidrilus tuberosis* from  
Agro-Ecosystem**

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**Abstract**

Carbendazim (methyl 1H-benzimidazol-2-yl carbamate) is one of the most widely used fungicides in agriculture worldwide, but has been reported to have adverse effects on animal health and ecosystem function. Two highly efficient carbendazim degrading bacterial strains were isolated from the gut content of a paddy field earthworm, *Glyphidrilus tuberosis*. Two *Glyphidrilus tuberosis* gut colonies (GTGC), GTGC-1 and GTGC-2, were isolated aseptically and *in vitro* degradation of carbendazim (100 mg/L) by GTGC-1 and GTGC-2 in minimal salts medium (MSM) incubated at 30°C at 120 rpm in shaker incubator. After seven days of incubation, Gas chromatography–mass spectrometry analysis revealed that 99% and 99.5% carbendazim were degraded and only 0.905 mg-L and 0.565 mg-L left for GTGC-1 and GTGC-2. 7,9-Di-tert-butyl-1-oxaspiro(4,5) deca-6,9-diene-2,8-dione and 2-amino-1-phenylethanol are the two major metabolite detected in GCMS.

**EVS-47521266**

**Urban flooding in KMC and its responsible factors: A GIS based study**

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**Abstract**

In last few decades the intensity and frequency of floods has been increasing in Kolkata Municipal Corporation which effects economy and society to large extent. The Inter-Governmental Panel on Climate Change (IPCC) over viewed the Global trends of different weather events and notes that the frequency of heavy precipitation events has increased over most land areas (IPCC AR4 2007).In last 100 year's rainfall data shows a cyclic pattern of rainfall intensification and high magnitude storm which led to intensive flood in Kolkata Municipal Corporation. Land use change in Kolkata Municipal Corporation and its surrounding results in reduction of water holding capacity as well as drainage congestion to contribute waterlogging.

**GIS-based assessment of meteorological drought and agricultural susceptibility in West Bengal**

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**Abstract**

One of the main stresses that significantly affect agriculture is a meteorological drought. We use a multi-index technique in this study to track the drought. With the help of Meteorological Drought Monitoring software, seven precipitation-based drought indices like Standardized Precipitation Index, Percent of Normal Index, DI (Deciles Index), China Z index, Modified China Z index, Rainfall Anomaly Index, Z- Score Index are assessed using district wise monthly and seasonal precipitation data (1995 -2018, IMD) in West Bengal. For assessing the drought-prone area, we also applied a weighted overlay in Arc-GIS using those seven indices. Crop production, crop yield, crop diversification, crop combination is susceptible to degree of dryness (DD) due to scarcity of rainfall and insufficient irrigation facility. In pre-monsoon and monsoon seasons, DD is moderate to near normal in 82.44% and 77.83% of the study area respectively, which led negative impact on kharif crop. Rabi crops production, on the other hand, (boro paddy, potato, mustard) are favoured to post-monsoonal wetness in 50.1% area of the state. Also, farmers of Drought prone areas (westernmost blocks and southern coastal blocks) traditionally cultivate Mono-crop and in the area of moderately wet to very wet, crop diversification is followed.

**Effects of the thermal power plant on aquatic plant species in  
Kolaghat, West Bengal**

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**Abstract**

Pollution, a threat to this earth, is deteriorating the air, water and soil quality. These changes affect life forms in various ways. The study focuses on the impacts of the pollution caused by the thermal power plant on aquatic plants. In addition to the production of electricity, thermal power plants also generate a huge amount of waste in form of fly ash and effluents which affects the surrounding areas greatly. The fly ash and effluents from Kolaghat thermal power plant show a huge impact on health, productivity and the environment. *Eichhornia crassipes* and *Pistia stratiotes*- two free-floating aquatic plants, which are abundantly growing in the surrounding areas of KTPS are observed and their pollution tolerance is seen. Their anatomical and biochemical properties are analyzed and compared with plants from a non-polluted area. The comparative study shows that there is a reduction in the growth of the cells and chlorophyll content of the plants from the polluted areas that showed pH near to neutral value and higher relative water content which signifies pollution tolerance. The study also suggests a way of handling the pollution caused by it.

## **Impacts of thermal power plant effluent on terrestrial plant species in Kolaghat, West Bengal**

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### **Abstract**

Kolaghat thermal power plant is one of the largest thermal power stations in West Bengal and it emits a large amount of fly ash and heat, approximately per day 7500 to 8000 metric tonnes. According to our investigation, fly ash gets deposited on the soil and shows high pH i.e.; alkalinity and high deposition of copper and iron (53.05 mg/kg) and low amount of sulphur and phosphorus. Two species of herbs- *Blumea lacera* and *Phyla nodiflora* are collected from the polluted site and a control (non-polluted) site. In these two species of polluted and non-polluted sites; anatomical and biochemical analyses were investigated and compared. Our result revealed that stem pith length, cortical cells, epidermis of *B.lacera* and cortex, vascular bundle, vessels etc of *P.nodiflora* of polluted sites are smaller in size than the non-polluted site; like the stem pith length of *B.lacera* and cortex length of *P.nodiflora* of non-polluted site. The chlorophyll content of *B.lacera* of the polluted site is lower than the non-polluted site. From the whole investigation, we conclude that the plants of polluted areas (Kolaghat thermal plant) are present in stress conditions due to their effluent.

**EVS-37222838**

**Antibacterial activity of some medicinal plants ( Neem , Tulsi ,  
Alovera , Curry) & some spices ( Turmeric , Cumin ) against  
pathogenic bacteria**

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**Abstract**

Screening of medicinal plants for bioactive compounds leads to development of less expensive new antimicrobial agents with improved safety and efficacy. The present study was planned to study the antimicrobial activity of different plant extract (i.e. Neem, Aloevera, Tulshi, Cumin, Curry, Turmeric etc.) against selected microorganisms. In present study we compared the antimicrobial efficacy of methanolic( $\text{CH}_3\text{OH}$ ), ethanolic( $\text{C}_2\text{H}_5\text{OH}$ ) and watery( $\text{H}_2\text{O}$ ) extract of neem, tulsi, cumin, curry and other spices against human pathogenic bacteria (*E.coli*, *Streptococcus sp*, *S.typhi*, *Pseudomonas sp.*, *Bacillus sp.* etc.)

Agar well diffusion method are used to determine the Minimum Inhibitory Concentration (MIC). Result showed that leaf extract exhibit strong antimicrobial activity against all the concentration tasted (100, 200 microgram/ml). The extract from the leaves of these plants are used in malaria, bronchitis, gastric disorders, cough and cold etc. Contrary to the synthetic drugs, antimicrobials of plant origin are not associated with many side effects and have an enormous therapeutic potential to heal many infectious diseases. Among all above uses sample (i.e.- neem, tulshi, aloevera, turmeric, cumin, curry); **Neem gives better result against Streptococcus.sp. Our result suggest that ethanolic extracts of above experimented spices exhibit high antimicrobial activity.**

**Decadal shoreline change at East Midnapore coast from Haldi River to boarder in West Bengal and prediction for future shoreline changes**

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**Abstract**

We estimated shoreline change in a part of the West Bengal coast at East Midnapore coast from Orissa boarder to Haldi river. To estimate shoreline, change during last five decades multi-temporal satellite image from six different time period (i.e., 1972, 1980, 1990, 2000, 2010, and 2020) are selected. To assess the shoreline change, Digital Shoreline Analysis tool (DSAS 5.1) is applied. The linear regression rate and end point rate are found to be 7.25m/year of maximum erosion rate, and the maximum accretion at rate of 3.73m/year at different sites along the East Midnapore coast. The coast was affected by several disaster in the recent past and which is accentuated by anthropogenic activities. Here we found Net Shoreline Movement of approximately 348 m of erosion and about 175 m of accretion. This study concludes that, the coastline of East Midnapore experienced severe erosion and needs some management action. The findings of this study may help the coastal planners and managers in preparing coastal zone management plans.



**EVS-51475727**

**Role of plant growth promoting microbes in enhancing plant tolerance to heavy metals**

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**Abstract**

Overuse of chemical pesticides in agriculture and other human activities have a direct or indirect impact on heavy metal contamination as a result of fast industrialisation. The ecology and human health are seriously threatened by heavy metal poisoning of soil. Due to their non-biodegradability and toxicity, heavy metal pollution in contaminated soil has a significant negative impact on plants. Physical and chemical procedures are used in traditional treatment of heavy metal contamination in contaminated soil. But they are expensive, time-consuming, and also cause problems with secondary pollution. As a result of its cost-effectiveness and eco-friendliness, microbe-assisted phytoremediation has a substantial impact today. Heavy metals can be effectively immobilised by plant growth-promoting microorganisms (PGPM). The bacterium known as plant growth-promoting rhizobacteria (PGPR) demonstrates a bioremediation method for stabilising and remediating heavy metal contamination.

## **Soil Biodiversity: Challenges and Possibilities**

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### **Abstract**

Soil is the most complex and bio diverse ecosystem on earth. A typical soil community is comprised of several organisms like nematodes, mites, Collembola, Symphyla, Chilopoda, Pauropoda, enchytraeids and earthworms. This highly diverse community plays a variety of different ecosystem services essential for agricultural sustainability. They regulate the ecological processes through influences on decomposition of dead organic material, nutrient cycling, and formation and maintenance of the soil structure. Many of them are highly sensitive to different edaphic perturbations and some of them are used as a bio indicator species. Now days, the soil biodiversity is facing multiple threats due to various anthropogenic activities. According to Food and Agricultural Organisation (FAO), the loss of biodiversity has already crossed the thresholds and the extinction rate of species to be estimated to be between 100 to 1,000 times higher than what could be considered natural due to rapid climate change and other human activities. Protection of existing natural areas, restoration of the degraded habitats, employment of sustainable agricultural practices, are some methods that fortify and sustain diverse soil communities and the functions and services they provide across all ecosystems.

**Convergence of Semi-Analytical Solution of Homotopy  
Perturbation Method for Nonlinear Differential Equations**

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**Abstract**

Several physical problems in science and engineering sciences are governed by either differential or integral equations, which are mostly nonlinear. It is difficult to solve analytically of such problems. Then these types of nonlinear problems are solved numerically, but there arise many numerical errors. While some are solved by using the semi-analytic method, So-called Homotopy Perturbation Method (HPM), the convergence of the computed series solution is not ensured. If convergent, then the convergent rate is slow. Moreover, HPM neither has any controlling parameters nor any self-sufficient linear operator which accelerates and ensures the convergence of the series solution in the whole region.

Therefore, our objective is to modify the classical HPM. We replace the linear term with the auxiliary linear operator where the coefficients are functions of auxiliary roots of  $L(u)=0$ . Therefore, using the optimization technique of residual error, we can achieve an optimal auxiliary linear operator, which is self-sufficient for ensuring the convergence of our analytical series solution. In fact, the convergence of the HPM series solution can be assured by our technique. Some strongly nonlinear differential equations will be considered to analyze our technique.

**A study of an EOQ model with public-screened discounted items under cloudy fuzzy environment**

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**Abstract**

This article deals with an economic order quantity inventory model of imperfect items under non-random uncertain demand. Here we consider the customers screen the imperfect items during the selling period. After a certain period of time, the imperfect items are sold at a discounted price. We split the model into three cases, assuming that the demand rate increases, decreases, and is constant in the discount period. Firstly, we solve the crisp model, and then the model is converted into a fuzzy environment. Here we consider the dense fuzzy, parabolic fuzzy, degree of fuzziness and cloudy fuzzy for a comparative study. The basic novelty of this paper is that a computer-based algorithm and flow chart have been given for the solution of the proposed model. Finally, sensitivity analysis and graphical illustration have been given to check the validity of the model.

**A Study of an EOQ Model of Growing Items under Parabolic Dense Fuzzy Lock Environment**

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**Abstract**

In this article, the parabolic dense fuzzy set is defined and its basic arithmetic operations are studied with graphical illustration. The lock set concept is incorporated in a parabolic dense fuzzy set. Then it has been applied to the problems of fishery culture via the modelling of an economic order quantity model. Here the fingerlings are fed to reach the ideal size to fulfil the customer's demand. The growth rate of the fingerlings is assumed as a linear function. After the sales of all fish, the pond is cleaned properly for a new cycle. Here, the model is solved in a crisp sense first. Then we have fuzzified the model considering the demand rate as a parabolic dense lock fuzzy number and obtained the result in a fuzzy environment. The main aim of our study is to find the quantity of the ordering items such that the total inventory cost gets a minimum value. Finally, sensitivity analysis and graphical illustrations are added for better justification of our model.

## **Analysis of Fifth Sustainable Development Goal by Covering of Fuzzy Graphs**

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### **Abstract**

In present situation the sustainable developmental goal on “Gender Equality” is a challenging problem in India. In this article, the fuzzy graph theory is used to analyze the overall performance of India for the SGD 5. To solve this problem, new concept of pseudo-vertex-covering set of a fuzzy graph for a well coverage of the entire fuzzy graph is defined. With this new covering concept, an analysis of the performance status of India for SDG 5 is made with individual performance status of all the states/UTs of India. We have shown a nice covering of the whole country by some particular states/UTs which are actively helping to make the pseudo-vertex-covering of the transformed form of India as a fuzzy graph. Lastly, a comparison between the covering score, a new term in fuzzy graph theory for coverage of fuzzy graph by some vertices with underlying some edges; and Index Score for SDG 5 for a better and clean idea of the methodology that how the pseudo-vertex-covering and covering score of the considered fuzzy graphs of India for different indicators; and analyze the performance status of India and help to find the new-defined term self-governing states/UTs in India for a better performance.

**Ionospheric Variability During the Amphan Cyclone-using  
COSMIC satellite Data**

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**Abstract**

Whole Atmosphere is stratified in different layer depending upon density. It is well known that all these layers are inter related and exhibit sensible variability for different geophysical phenomenon occurred in lower atmosphere, like meteorological phenomenon, seismic activity, etc.; similarly for unusual solar variability also. The Ionosphere, is a shell layer of natural plasma medium surrounding our earth, shows sensible variability for different geophysical phenomenon occurred above and below of it, in this study ionospheric variability have been estimated using the most advanced space-based COSMIC-RO data and analysed the cause and effect behind it during a catastrophic cyclonic activity, named Amphan, generated over the Bay of Bengal during 16-21 may 2020. Estimating the Electron Content Ratio (ECR) over a 30 days observational period three important point of conclusion arrived.

1. Denser ionosphere show more irregular variability than other part.
2. Atmospheric Gravity Waves (AGWs) is the key coupling agent between the source of disturbance at lower atmosphere and the ionosphere.
3. Sampling size and quality control criteria may be an issue to the result, in future details and deep study is necessary to minimise these issues.

## **Topological Indices for Fuzzy Graphs with Chemical Application**

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### **Abstract**

Graph theory deals with relationships among objects under consideration. To handle problems with uncertainty, it is always better to use a fuzzy model, which enables one to derive satisfactory solutions incorporating the fuzziness of the system. Topological indices have an essential role in molecular chemistry, network theory, spectral graph theory and several fields of mathematics and chemistry. Most of the topological indices are defined in a crisp graph. In this article, some topological indices are introduced and studied for fuzzy graphs. Here, First Zagreb index, second Zagreb index, F-index and hyper-Wiener index for fuzzy graphs is investigated. Some reasonable bounds of those topological indices are provided for several fuzzy graphs: path, cycle, star, complete fuzzy graph, partial fuzzy graph, etc. Also, bounds of those indices are studied during some fuzzy graph operations such as: Cartesian product, composition, join and union of two fuzzy graphs. In the end of the article, a chemical applicability of these indices is presented.



**A generalized cyclic contraction result on probabilistic metric spaces**

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**Abstract**

In this paper, we introduce a new cyclic contraction and prove pertinent fixed-point theorem for such type contraction in probabilistic metric spaces (briefly PM spaces). In these spaces distribution function plays the role of metric. Our theorem assures the existence and uniqueness of fixed point for certain self-mapping of such spaces. Our result generalizes some existence cyclic fixed-point results. In our main result we use the continuous t-norm. In our theorem t-norm has an important role. One example is given to validate our result.

**MAT-63539956**

**Role of component Allee effect in predator-prey system**

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**Abstract**

Interactions in predator-prey system with Allee effect are intricate in nature. Allee effect plays vital role in population dynamics where it is challenging fact that per capita population growth rate is positively dependent on population density of a species. In this paper, we have studied the famous Hastings and Powell (HP) model incorporating component Allee effect on top predator's reproduction. The modified model is analysed in terms of both analytical and numerical point of view. The Hopf point bifurcations are also determined with respect to vital parameters. The direction of Hopf bifurcation is studied theoretically. The model system shows that the system exhibits chaotic, periodic and stable dynamics in variation of vital parameters. The chaos can be controlled for proper application of large values of the vital parameters. The results of this study are applicable in the field of forestry and wild ecology.

**MAT-16936739**

**Is the intermediate predator a key regulator of a tri-trophic food chain model? : An illustration through a new functional response**

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**Abstract**

The prey preference mechanism is a common aspect of the interactive dynamics, but this is still a debatable issue in the modern theoretical and experimental ecology for numerous species across the globe. In this work, we have studied a three-species predator-prey model with prey switching where top predators and intermediate predators have competed with each other for the same prey. Earlier hypothetical studies predict the feeding behavior of any species that feeds on more than one trophic level in any food chain consisting of three and more trophic levels is either stabilizing or destabilizing depending on the condition of the system. Moreover, the effect of this type of selective mechanism is yet not properly understood. In such a case, it would be worthwhile to construct a new form of functional response depending upon the densities of a pair of prey and intermediate predator. In addition, we study the effect of an intermediate predator through the consumption rate of the top predator, which ultimately derives the new functional response and finds that the predation pressure on the intermediate predator may be decreased as prey populations are abundant. During their food selection, intraspecific competition also plays a major role for the stability of the system. The theoretical illustrations have been provided by numerical simulations.

**A production-inventory model on a series-parallel system with mixed strategy considering warranty period and credit period**

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**Abstract**

This study deals with a production-inventory model considering reliability redundancy allocation problem in the production cell with series-parallel configuration in which production cost is directly dependent on system reliability. To produce a product, raw-materials are purchased in some cycles of equal length and stored in a warehouse. In this system, a retailer gets the opportunity of warranty period which yields negative impact on credit period offered by the manufacturer. Also, here the retailer's demand is exponentially dependent on system reliability, logistically on credit period, but in case of selling price, initially in quadratic nature and exponentially after certain values of selling price. Main goal of this article is to determine the optimal number of cycles and components to maximize manufacturer's profit and system reliability with some constraints. In this current study, a mixed strategy has been used in the series-parallel system and compared with the model using only active strategy. Some numerical examples have been executed to give the realistic environment accomplishing different cases. NSGA-II (elitist non-dominated sorting genetic algorithm) solution methodology has been utilized to solve the problems. Finally, some sensitivity analyses and managerial insights have been drawn.

## **Edge-vertex domination on interval graphs**

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### **Abstract**

In an undirected graph  $G = (V, E)$ , an edge  $e \in E(G)$  edge-vertex dominates a node point  $w \in V(G)$  if  $w$  is incident to  $e$  or if  $w$  is incident to an adjacent edge of  $e$ . A set  $D_{EV} \subseteq E$  is called an edge-vertex dominating set of  $G$  if atleast one edge of  $D_{EV}$  edge-vertex dominates every node point of  $G$ . The minimum cardinality among all edge-vertex dominating sets is the edge-vertex domination number, symbolled by  $\tilde{\alpha}_{EV}(G)$ . Here, we propose an algorithm that runs in  $O(n)$ -time for determining a  $D_{EV}$  with the fewest cardinality of interval graph having  $n$  nodes. We also study some properties relating to edge-vertex dominating set of interval graphs.

## **Two-way COVID-19 vaccination station assignment and delivery optimization**

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### **Abstract**

During the COVID-19 epidemic, the vaccination process plays an important role to save humanity. The process of distributing vaccines between vaccination stations in a precise manner to maximize the number of vaccination using rationable vaccination stations with minimum cost. All vaccination stations are open on an alternate day, how to allocate the demand of vaccines to the open stations, how many medical personnel to arrange at the open stations, and the route of refrigerated vehicles to deliver vaccines to the open stations are issues that need to be addressed in this process. This study proposes a two-way vaccination demand allocation and delivery problem to describe the above problems and a modified Variable Neighborhood Search (mVNS) is used to solve our proposed problem. A case study is done based on the District Level Distribution Center (DLDC) in Purba Medinipur District, West Bengal, India to test the feasibility of the proposed model. Opening more vaccination stations could indeed speed up the vaccination process but increase the total vaccination cost. Opening a reasonable number of stations and rationally allocating the people to get the vaccine to these stations could reduce the whole system's costs and the chance of spreading up disease too.

**Different control strategies and synchronization of newly proposed chaotic inventory model**

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**Abstract**

This Letter focuses to study the problem of controlling chaos for newly proposed chaotic inventory model. Linear feedback control (dislocated feedback control and enhancing feedback control) is used to suppress chaos to unstable equilibria of the newly proposed inventory model and to achieve chaos synchronization of two identical newly proposed chaotic inventory model. Numerical simulation results are presented to demonstrate the effectiveness of the proposed chaos control and synchronization schemes.

**Work performance dependent screening process under preservation technology in an imperfect production system**

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**Abstract**

In this article, an economic production quantity model with imperfect production has been considered. Initially due to existence of all sources in fresh, the system remains in good condition i.e., in-control state. But, after certain time of production this system must produce some defective items with the perfect ones, i.e., the system goes on out-of-control state. Here, the shifting time from in-control state to out-of control state has been considered as a random variable. Besides that, a new type of screening process has been proposed which is based on the work performance of a worker that also depends on time. Also, we have considered a preservation investment cost in the manufacturing system to control the defective rate. To better reflect the market demand, a more generalized stochastic demand function has been proposed. Finally, numerical examples, sensitivity analysis, managerial insights, and conclusion are made for justification of my proposed model.



## **Identification of Abnormal Behaviors on Videos using Auto-encoded C3D Feature**

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### **Abstract**

A significant issue for video monitoring systems is the consecutive flow of endless data that may be investigated. However, a comprehension test makes no sense when using facts. Convolutional layers are promised by contemporary applications of convolutional neural networks for classifying and evaluating various objects. To be trained, neural networks need several classes grouped according to features. Here, we create an auto-encoded C3D feature for detecting anomalous occurrences in recordings of situations, including natural mobility. A C3D feature illustration and an establishing temporal expansion of the spatial features are the two main modules of our introduction. The proposed method's precision is confirmed by empirical data from evaluations on the UMN Anomaly Dataset and the UCSD Anomaly Dataset.

**A study on regular bipolar intuitionistic fuzzy soft graphs with application**

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**Abstract**

In the combining concept of bipolar intuitionistic fuzzy set and fuzzy graph structure, the concept of soft sets is imposed and which is a new graph structure called a bipolar intuitionistic fuzzy soft graph. In this article, the concept of bipolar intuitionistic fuzzy soft graph, bipolar intuitionistic fuzzy soft subgraph and strong bipolar intuitionistic fuzzy soft graph are introduced. We give the concept of regularity on this graph. The concepts of regular, totally regular, perfectly regular and edge-regular, totally edge-regular, perfectly edge-regular bipolar intuitionistic fuzzy graphs are proposed in soft environment and discussed with suitable examples and shown the proof of some theorems based on their aspects. Also, some related properties are investigated. The concept of perfectly irregular and perfectly edge-irregular bipolar intuitionistic fuzzy soft graphs is introduced and explored a few features. At last, we give a real-life application of this graph on a social group as a decision-making tool and find out the most influenced person in a social group. In the application part of this paper, by this combined concept, anyone can analyse the characteristics together with positive and negative membership and non-membership facts in a certain way. This analysis process gives more efficient fuzziness results than other fuzzy soft graphs.

## **Surjective $L(2,1)$ -labelling of paths and interval graphs**

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### **Abstract**

The graph has a wide range of applications in engineering, physical, computer, mathematical, social, and biological sciences. One of the key topics in graph theory is the labelling of graphs.  $L(2,1)$ -labelling problem has been widely studied in the last three decades due to its wide applications, especially in frequency assignment in mobile communication systems, X-ray crystallography, radar, coding theory, astronomy, circuit design, etc. Nowadays, surjective  $L(2,1)$ -labelling is a well-studied problem. Motivated from the  $L(2,1)$ -labelling problem and the importance of surjective  $L(2,1)$ -labelling problem, we consider surjective  $L(2,1)$ -labelling problem for paths and interval graphs. A surjective  $L(2,1)$ -labelling of a graph  $G = (V, E)$  is a function  $f$  from the vertex set  $V(G)$  to the set  $\{1, 2, \dots, n\}$  such that  $|f(x) - f(y)| \geq 2$  if  $d(x, y) = 1$  and  $|f(x) - f(y)| \geq 1$  if  $d(x, y) = 2$ , and every label is used exactly once and must belong to  $\{1, 2, \dots, n\}$ , where  $d(x, y)$  represents the distance between the vertices  $x$  and  $y$  and  $n$  is the number of vertices of the graph  $G$ .

In the present article, it is proved that any path of length  $n$  can be surjectively  $L(2, 1)$ -labelled if  $n \geq 4$  and also proved that any interval graph  $G$  with  $n$  vertices and degree  $\Delta \geq 2$  could be surjectively  $L(2,1)$ -labelled if  $n \geq 3\Delta - 1$ . Also, we designed two efficient algorithms to surjective  $L(2,1)$ -labelling of paths and interval graphs.

**An integrated inventory model for non-instantaneous deteriorating items with advertising and price-dependent stochastic demand**

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**Abstract**

In today's business world, advertising is one of the most important policies to attract customers. This policy increases the retailer's sales and makes the retailer's business position strong. Here, we consider an integrated inventory model for non-instantaneous deteriorating items with a single supplier and single retailer, where a supplier sells his/her products in the market through a retailer who faces a stochastic demand depending on both retail price and advertisement. To increase the retailer's demand, the supplier sells his/her products to the retailer with a credit period. Since the long credit period increases the demand rate but at the same time, it increases the supplier's opportunity loss. In this paper, we have discussed the full and partial two credit periods and we will find out which is more profitable for the supplier, the retailer as well as the whole system. After purchasing, the retailer sells his/her products to his customers with a mark-up. This mark-up is based on the supplier's wholesale price and also on advertising cost. The retailer has to face shortages due to uncertain demand of his/her customers, which is taken as partially backlogged. The main objectives of this paper are: (i) For uncertain demand, we have to calculate the retailer's optimum ordering quantity. (ii) How credit period effective on the retailer's ordering quantity? We know that a credit period is beneficial for the retailer, can the retailer gradually increase ordering quantity with an increasing credit period? (iii) What will be the effect of advertisement on the profit of the whole system? We have also analysed how the supplier and retailer can increase their individual profit structure.

## **Some operations on interval-valued picture fuzzy graphs**

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### **Abstract**

The concepts of graph theory are applied in many areas of computer science including image segmentation, clustering, data mining, image capturing, and networking. Fuzzy graph theory is successfully used in many problems to handle the uncertainty that occurs in graph theory. Interval-valued picture fuzzy graph is a generalization of the fuzzy graph, intuitionistic fuzzy graph and interval-valued intuitionistic fuzzy graph. In this article, we apply the concept of an interval-valued picture fuzzy set to graph theory and obtain a new graph, called an interval-valued picture fuzzy graph. Different types of operations like the Cartesian product, composition, join, union, direct product, normal product, and tensor product of interval-valued picture fuzzy graphs have been studied in this article. Besides this, we investigate some properties of the operations with proof and examples.

**On solving linear programming problem in uncertain atmosphere: A novel approach**

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**Abstract**

When some relevant parameters are additionally acted upon the system of a linear programming problem (Lp-problem), its optimal objective value may be fluctuated. In the parlance of a number of such parameters, the structure of an Lp-problem is developed to have a fair outcome. Each parameter correspond one objective function and thus the problem is turned into multi-objective. The co-efficient of objective function is set upon the expert's past experiences and its degree of functionality so that a particular problem can also support the several atmospheres. To deal with uncertainty, the experimental data is designed by three kinds of single valued triangular neutrosophic number (Svtrn-number). The huge number of data in this study is manipulated by use of Graded mean integration concept. A simple and user friendly algorithm is developed to solve the Lp-problem. The proposed model is illustrated by applying on a fishery planning and its efficiency is claimed by comparing with existing frames.

**Four-dimensional combinatorial optimization problem under road restoration**

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**Abstract**

Natural disasters create a transportation network to be damaged or blocked. The road network may be disconnected, impeding accessibility between disaster-stricken areas and critical locations such as health centers, relief depots, and transportation hubs. In hilly regions, snowfall, landslides, fog, etc. such kinds of disruptions are always common phenomena that affect the traveling plans of the common people as well as of tourists persons. Since tourism is one of the most important economical pillars it needs to realize a sustainable optimal traveling plan. Considering all of these, till now this problem is not been much investigated by researchers in the context of the northeast (hill region), of India. In the present article, a novelty considered using multi-path and multi-vehicle which is termed as a four-dimensional in traveling, and realistic blocked/unblocked restriction constraints are allowed to formulate a novel four-dimensional combinatorial optimization problem. The proposed model can be solved using some standard metaheuristics like Genetic algorithm (GA), Ant colony optimization (ACO), Particle swarm optimization (PSO), and their hybridizations. The efficiency of our developed algorithms can be shown in various aspects.

**Mitigating consumer returns through omnichannel retail operations: An EOQ model under stochastic demand**

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**Abstract**

This paper develops an economic order quantity inventory system for an omnichannel retailer who operates a bricks-and-mortar (B&M) store and an online channel. One major challenge the retailer faces in the online channel is handling product returns. To address this, retailers are now adopting omnichannel operations in which customers are offered flexible return options. Considering such an omnichannel configuration, we have studied the buy-online-return-in-store option by which customers can return a damaged product purchased online to the B&M store. Here, the retailer's optimum ordering strategies are obtained considering a stochastic demand in the market. From our analysis, we find that when the return rate is high, it is ideal to operate with the omnichannel setup. Comparing different pricing strategies in online and offline platforms, we have obtained some crucial outcomes. When the same price option is chosen for both shopping channels, online retailing with a low return rate and omnichannel retailing with a high return rate perform better in terms of profit-making. On the other side, under a higher offline selling price strategy, omnichannel remains the most preferable option to the retailer. Furthermore, several important insights are provided based on the role of the B&M store and the uncertainty in the market.



**A parametric de-neutrosophication based MCDM approach for employee selection in an IOT-based enterprise**

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**Abstract**

The traditional supply chain management system is gradually undermined due to the massive growth of digitalization in our way of life in the past few years specially from the COVID situation. IOT (internet of things) based supply chain management system could ensure the digitalization where physical objects are monitoring by internet, sensor and other technologies with or without human control. Consequently, to deal with this digitalization process, company employees need to be much more knowledgeable about this digital technologies and their connections. This necessity demands a proper employee selection process to select a suitable employee for an IOT-based supply chain management system. In this paper, we have proposed a multi criteria decision making approach under neutrosophic environment which assists an employee selection of an IOT-based company by addressing few relevant attributes influenced by the associated decision experts for accurate judgements. In this regard, firstly we have established a Parametric de-neutrosophication technique to transfer a neutrosophic evaluation into some real number. Then, we have proposed Estimated Mean Operator (EMO) to integrate the opinions of the decision experts. Finally, we have constructed a ranking order of the alternatives with the help of Standard level point of a problem. A case study related to a private company (M/S XYZ pvt ltd company) is illustrated to justify the validity and applicability of our proposed approach.

## **Betweenness centrality of corona and unicyclic graphs**

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### **Abstract**

The idea of centrality measurements is quite appropriate for determining the important vertices or edges in a network. A vertex in a network may be an important vertex depending on its angle of assumption. There are many centrality measurements to find the characteristics of a vertex in a network. Betweenness centrality is an important variant of centrality measurement for analyzing complex networks based on shortest paths. The betweenness centrality of a vertex is the sum of the fraction whose denominator is the number of shortest paths between any two vertices  $u$  and  $v$ , and the numerator is the number of the shortest paths passing through the vertex  $w$  between them. In this paper, we determine the betweenness centrality and relative betweenness centrality of different types of corona and unicyclic graphs.

**Inventory Model for a Deteriorating Item with Cloudy Fuzzy  
Lead Time and fully backlogged shortage**

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**Abstract**

This paper deals with an inventory model for a deteriorating item with constant demand and cloudy fuzzy lead time. Here, shortages are allowed and fully backlogged. Due to delayed supply/production, transportation problem, sudden increasing demand, artificial crisis of item, shortages occurs that resulted in uncertainty of lead time. In general, fuzziness of any parameter remains fixed over time, but in practice, fuzziness of parameter begins to reduce as time progresses because of collected experience and knowledge that motivates to take cloudy fuzzy number. The closed form solution to minimize the average cost is obtained. A Generalized Reduced Gradient (GRG) technique is used to obtain the optimal decision in fuzzy and cloudy fuzzy environment using Yager's index method and De and Beg's ranking index method and compare the results. The numerical examples are presented to illustrate the model and sensitivity analysis have been carried out for justification of the model.

**A study on fisheries production using fuzzy inference system**

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**Abstract**

Seas, marine ecosystems and coastal regions are crucial components of our environment. To boost fisheries and aquaculture productivity, numerous scientific strategies have been used. A fuzzy-logic-based model is created in the current effort to produce fisheries in India, which ranks fourth in the world for fisheries production. Five input variables, such as fish seed, export, post-harvesting, released fund and temperature are considered as inputs, and the production of fisheries is taken as the output variable. A Mamdani-type fuzzy inference system with trapezoidal membership functions is prepared with 243 rules in the IF-THEN format. This mathematical model investigates the impacts of input parameters on the production of Indian fisheries. From the system, we observed that fish seed, export, released fund, and post-harvesting facilities positively impact fisheries production. However, a very high temperature is not suitable for high production, even if all other parameters lie at their desired level. Lastly, we have fitted the model with real-world data.

## **Multi-objective optimization Energy Efficient Routing Protocol for Mobile Ad-hoc Network**

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### **Abstract**

An energy optimization routing protocol mechanism with a fuzzy inference basis that is state-based control epidemics. Based on their lifespan and varying mobility speeds, it is dependent on energy optimization yield under various scenarios. Fuzzy-based multi -objective criteria in energy-efficient routing protocol for the mobile ad-hoc network to select the different constraints like link stability, bandwidth, and battery life. The main goal of this paper focused on obtaining the optimal solution to choose the best route and limited battery life and different movement of mobile nodes for large-scale mobile ad-hoc networks. It is demonstrated that the possible solution relates to the domain of selecting the variables by outlining the connection between the energy function's variables. Researchers optimize a path's link lifespan, resulting in the choice of the shortest path being particularly efficient in recent secinorio prevention and treatment.

**Antidiabetic activity of volavetki (*Panna microdon*, Bleeker, 1849)  
Sea Fish oil v/s bata (*Labeo bata*, Hamilton, 1822) fresh water fish  
oil on experimentally induced Type 2 Diabetic Mellitus in Rats**

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**Abstract**

**Background:** Type 2 Diabetes mellitus (T2DM) is a chronic metabolic disorder marked by hyperglycemia and abnormalities in glucose, protein, and lipid metabolism, resulting in impaired insulin production, action, or both. According to the 10th edition of the International Diabetes Federation, the prevalence of diabetes is 463 million people (9.3%) in 2019, rising to 578 million (10.2%) by 2030 and 700 million (10.9%) by 2045.

**Objective:** The main objective of this present study was the efficacy of sea fish oil or fresh water fish oil to lower hyperglycemia with the supplementation of volavetki sea fish oil (VSFO) or bata fresh water fish oil (BFWFO) in diet of T2DM in rat model. **Methods:** At first, we prepared the VSFO from volavetki (*Panna microdon*, Bleeker, 1849) sea fish and BFWFO from bata (*Labeo bata*, Hamilton, 1822) fresh water fish and fed to high lipid diet (HLD) and streptozotocin (STZ, 40 mg/ b.w) induced T2DM rats for 28 days. There were four groups of each group (n=5) rats were subjected to induce T2DM except control group. After 28 days, we assessed fasting plasma parameters such as glucose (FPG), glycosylated haemoglobin (HbA1c), glucagon like peptide-1 (GLP-1), dipeptidyl-peptidase 4 (DPP-4), insulin, C-peptide, and free fatty acid receptor 1 (FFAR1). **Results:** HLD and STZ induced T2DM was confirmed by C-peptide and insulin concentration in plasma of T2DM group. Hypoglycemic activity of VSFO was proved by significantly lowered FPG, HbA1c, GLP-1, DPP-4, insulin, C-peptide, and FFAR1 in VSFO supplementation rats than BFWFO supplementation rats.

**Conclusion:** It has been revealed that VSFO supplementation was confirmed as anti-hyperglycemic supplementation.

## Can Artificial Intelligence (AI) Predict COVID-19 using Chest X-Ray Imaging Signatures?

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### Abstract

COVID 19 affects the lungs where anatomical alterations are observed by radiologists from the chest X-ray (CXR) images. Such imaging technique is very simple and less expensive. Hence, the clinicians generally recommend it for screening or diagnosis. However, manual investigation of visual characteristics of CXR images is difficult due to noise and ambiguities present in the images. Such observations by the medical experts is not only subjective and error-prone but also time-consuming. Simultaneously, the number of suspected Covid-19 patients is ever-expanding during pandemic. Artificial intelligence (AI) plays a crucial role as assistive technology to provide improved rapid screening or diagnostic support to clinicians. This study focuses on the introduction of AI model called '*fine-tuned deep transfer learning model*' which automatically identifies COVID-19 image signatures. The research dataset of COVID CXR images from Kaggle Image Database was considered and the model trained on it by experimentations. Sequential Model was trained and then transfer learning model was applied to achieve non-satisfactory result of 76.25% accuracy. Various transfer learning models viz., Res Net-50, Efficient Net B7, Inception Net v2 and Inception Res Net V2 have been considered. Out of these, Inception Res Net V2 achieved 94.74% prediction accuracy which was further fine-tuned to achieve the final prediction accuracy of 99.45%.

**Prevalence of  $\beta$ -lactamases among *Escherichia coli* and *Klebsiella* spp. isolates from poultry and cattle: An observational study from Midnapore, West Bengal**

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**Abstract**

The occurrence of antibiotic resistance among poultry and cattle is rising due to indiscriminate, over use of antibiotics. The observational study aimed to detect  $\beta$ -lactamase harbouring GNB from cattle and poultry samples in West Medinipur, West Bengal from Feb-Sep, 2022. 51 samples were processed in MacConkey and EMB Agar. After biochemical testing, AST was performed by KBDD targeting  $\beta$ -lactam antibiotics. Phenotypically non-susceptible isolates (n=51;100%) were subjected to DNA extraction, followed by molecular detection of AmpC (CMY-1&2, ACC, DHA, MIR), ESBL (TEM, SHV, OXA-1, and CTX-M-1,2,9), and carbapenemase (NDM and OXA-48-type) genes by PCR. Among 47 *E. coli* and 4 *Klebsiella* spp. TEM was predominant (n=25;73.52%), followed by CTXM (n=7;20.58%), SHV (n=5;14.70%), CMY-1&CMY-2 (both n=2;5.88%). All were susceptible to carbapenem. No AMR genes were found in 16 samples, Active molecular surveillance of AMR may unfold the potential reservoir(s) to contain the spread of antibiotic-resistant bacteria.



**Contraceptive efficacy assessment of different fractions of  
*Tinosporacordifolia* (Willd.) Stem: An approach through testicular  
gametogenesis and androgenesis**

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**Abstract**

Population explosion is a global issue has negative impact on the overall progress in developing world. World Health Organization launched safe and efficient alternatives i.e., herbal contraceptives over synthetic drugs for population control. *Tinospora cordifolia*, known as Gulancha, a reputed medication in Ayurveda and reported for antifertility effects of this plant stem in male albino rats. The aim of this study is to identify the most effective solvent fraction of the hydro-methanol (3:2) extract of *T. cordifolia* stem. Studies were performed after 28 days oral administration of n-hexane, chloroform, ethyl-acetate and n-butanol fractions at the dose of 5 mg/ 100 gm of body weight/day to the male rats. Significant diminution ( $p < 0.05$ ) in reproductive organo-somatic indices, spermogram, serum testosterone level, seminiferous tubular diameter and germ cell populations at stage VII of spermatogenic cycle, genomic expression of antioxidant and androgenic key enzymes activities were noted in treated groups compared to the control group. Testicular TBARS and cholesterol levels were significantly elevated ( $p < 0.05$ ) and non-significant change ( $p > 0.05$ ) in toxicity markers were observed in all the treated groups compared to the control group. So, it can be concluded that *T. cordifolia* stem induces male contraceptive efficacy, may be via modulating spermatogenesis and androgenesis process.

**Potent extract screening of leaves of *Ceasalpinia Pulcherrima* (L.)  
SwFor Anti-Testicular Activity: A preclinical study on male  
Albino Rat**

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**Abstract**

Contraception is trendy accepted route for the control of population explosion in the world. The experiment has been designed to find out the most effective extract out of aqueous, hydro-methanol, hydro-ethanol extracts of leaves of *Ceasalpinia pulcherrima* in male rat regarding its anti-gonadal activities in connection with herbal contraceptive development. Aqueous, hydro-methanol(60:40), hydro-ethanol(60:40) extracts of leaves of *Ceasalpinia pulcherrima* were orally administered at the dose 20mg/100 g body weight to albino male rat for 28 days. The results showed significant reduction ( $p < 0.05$ ) in spermiological parameters, androgenic key enzymes activity, serum testosterone level, seminal vesicular fructose level, antioxidant enzymes activity in above mentioned extract treated group in respect to the vehicle-treated control group (VTCG). TBARS level in testis and epididymis significantly elevated ( $p < 0.05$ ) and non-significant changes in toxicological parameters such as GOT and GPT in reproductive organs, liver and kidney in above mentioned extracts treated group in respect to VTCG. Out of three extracts tested, HEE extract more potent in antispermatogenic activities with out any toxicity induction. This may be due to presence of effective bioactive compound, which results maximum anti-spermatogenic activities towards male contraception than the other solvent extract.

## **Raman spectroscopic imaging-A novel technique in disease diagnosis**

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### **Abstract**

Using Raman spectroscopic imaging technique one can examine the spatial distribution of various molecular constituents in a heterogeneous sample at a microscopic scale. Raman technique provide bond-specific vibrational frequencies to characterize molecular species without external labelling. In addition, this technique is rapid, non-invasive and provide multiple advantage. In this study, we have performed Raman imaging of Hippocampal neuron and identified different peaks related to different cellular components. Hippocampal neuron network culture from Wistar rats was grown on MgF<sub>2</sub> coverslips for 7 days. Before Raman experiments, the culture cover slips were washed with HEPES buffer solution. The cells were incubated in the same buffer with 5% CO<sub>2</sub> and 95% air humidified, at 37°C. Raman peaks related to protein as well as nucleic acids (785cm<sup>-1</sup>, 1003cm<sup>-1</sup>, 1320cm<sup>-1</sup>, 1340cm<sup>-1</sup>, 1375cm<sup>-1</sup>, 1420cm<sup>-1</sup>, 1486cm<sup>-1</sup>, 1576cm<sup>-1</sup>) was identified and used for imaging as shown in the Figure 1. Figures 1A, 1E and 1G show different neurons in the culture plate. Figures 1AB, 1C and 1D show Raman images with different Raman peaks related to lipid, protein and nucleic acid respectively.

**Pre-Clinical Study About Hypo-Testicular Activity Of Seed Of  
*Areca catechu* (Linn) In Fertile Albino Rat: Effective Extract  
Selection Study**

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**Abstract**

The present study was conducted to evaluate the hypo -testicular effect of *Areca catechu* (Linn). Aqueous, hydro ethanol and hydro methanol extracts were administered orally at 50 mg/ 100 gm body weight. For this experimental study, various parameters like the weight of the reproductive organs. Serum testosterone level sperm motility, sperm counts, testicular androgenic key enzymes like 5 $\alpha$ , 3 $\beta$ -HSD, and 17 $\beta$ -HSD activities and toxicity markers were studied. Treatment with different extracts resulted a significant reduction ( $p < 0.05$ ) of the weight of relative sex organs and significant reduction ( $p < 0.05$ ) of the androgenic key enzymes activities in respect to the control. After the extract treatment oxidative stress in testicular tissue was increased significantly. Activities of the acid phosphatase and alkaline phosphatase in liver tissue were not significantly altered compared with the control. It may be concluded that hydro ethanol extract of the seed of *Areca catechu* has the most promising effect to develop herbal contraceptives without producing any toxicity.

***Alternative Prophylactic Strategy for COVID-19 Stress Management***

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**Abstract**

Scanty information is on the carpet concerning the yogic and quercetin influence during the COVID-19 stressful pandemic situation. Lockdown caused stressful impacts on psychophysiological health by increasing the risk of anxiety, obesity, cardiometabolic disease. Yoga and Quercetin might be used to counteract these psychophysiological effects by lowering key stress variables. A three-month yogic practice (n=74) for 6 days/week and one-month of quercetin supplementation (n=100) at a dose of 200 mg/day in stressed female college students was investigated in a randomized, double-blinded, controlled experiment. A significant decrease ( $p < 0.05$ ) in heart rate, systolic blood pressure (SBP), cortisol, tumour necrosis factor, and triglycerides (TG) were measured. High frequency (HF), total power, time domain characteristics of the heart rate variability (HRV), aerobic fitness ( $VO_2$  max), high-density lipoprotein (HDL), and dopamine raised considerably ( $p < 0.05$ ) in the yoga group as compared to the control group. Compared with placebo, quercetin supplementation improved HDL, HRV with significant decrease in cortisol, catecholamine. Antioxidative index were more pronounced in both post-intervention studies. According to these results, yoga and quercetin intervention supervenes stressful effects by rehabilitating the activity of antioxidant enzymes, autonomic function, immunological metabolism. We explored a non-pharmacological but decent supra-nutritional effect of yoga and quercetin for stress management.

**Evaluation of antidiabetic and antioxidative efficacy of root tuber of *Ipomoea mauritiana* in streptozotocin induced diabetic male Albino Rat**

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**Abstract**

The prevalence of diabetes mellitus is now on alarming phase. The experiment was conducted to identify the effective extract of root tuber of *Ipomoea mauritiana* for antidiabetic and antioxidative efficacies. Streptozotocin (STZ) induced diabetic rats were treated with extract of aqueous or hydro-methanol (60:40) or methanol or ethanol of root tuber of *Ipomoea mauritiana* at the dose of 50 mg/ 100 g body weight for 28 days. To assess the antidiabetic potentiality, activity of metabolic antioxidative enzymes, toxicity, and histological study of diameter of Pancreatic islet were adopted. Results showed that after administration of different extracts to diabetic animals, a significant ( $P < 0.05$ ) recovery was noted towards the control. Hydro-methanol (60:40) extract treated group showed maximum recovery in most of the sensors such as hexokinase and glucose-6-phosphatase, SOD, Catalase, TBARS and hepatic toxicity biomarkers (GOT and GPT) among other extract treated diabetic groups towards the vehicle treated control group. Improvement was also noted in the expression of proapoptotic gene Bax, antiapoptotic gene Bcl-2 and Hexokinase-I Pancreatic beta cell diameter in hydro-methanolic extract treated group compare to diabetes and other extract treated groups. It may be concluded that the hydro-methanol extract has potential antidiabetic and antioxidative effects.

## Therapeutic Efficacy of Green Apple on Obesity

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### Abstract

Changes of global lifestyle among civilized population leads to increase in obesity and associated diseases. Apple along with other fruits have greater contribution against numerous metabolic disorders as these are enriched in several therapeutic bio-active compounds. The present study elucidated the therapeutic role of aqueous extract of green apple (AGA) on obesity. We found a noticeable antioxidant activity of green apple as evidenced from *invitro* assay. Female Wistar rats were divided into three groups according to their diet: control group (consumed normal-diet), obese group (consumed high-fat-diet) and supplement group (consumed high-fat-diet + AGA). It was explored that AGA has significant beneficial effect in the maintenance of body weight, glucose level, lipid profile, liver function and antioxidant status in the rats challenged with high fat diet. Different obesity regulatory hormones (leptin, adiponectin, ghrelin), pro-inflammatory cytokines (tumor necrosis factor-alpha, interleukin-6) have been shown better action of AGA. However, this finding suggests a critical therapeutic role of green apple in the way of regulating obesity.

## Urinary proteomics in diabetic kidney disease

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### Abstract

**Background:** Diabetic kidney disease (DKD) is characterized by increased urinary albumin excretion (proteinuria) and loss of renal function. DKD has become the most serious cause of end stage renal disease (ESRD), symptoms include no urine output (anuria) and only treatment required dialysis or kidney transplantation. Current advances in urinary proteomics enable screening of appearing proteins in urine in advancing diabetes. **Objective:** The main objective of this present study was urinary proteome analysis of DKD patients. **Methods:** We examined urine samples from a cross-sectional of type 2 diabetic patients (T2DP,  $n = 9$ ) to identify urinary albumin to confirm DKD and urine samples were processed SDS-PAGE gel electrophoresis to *Mass Spectrometric Analysis of Peptide Mixture* and analyzed with Proteome Discoverer (v2.2) against the Uniprot Human proteome database. T2DPs were selected as per duration of T2D. Group 1 ( $n=3$ ) T2DPs were suffering 10 years and above with diabetes, group 2 ( $n=3$ ) were suffering 20 years and above, and group 3 ( $n=3$ ) were suffering 30 years and above with diabetes. **Results:** Albumin (*Accession-P02768*, 609 amino acids, 69.3 mw, and 23 peptides) and uromodulin (*Accession-P07911*, 640 amino acids, 69.7 mw, and 6 peptides) found in **Group 1 T2DPs**. Albumin, uromodulin, dermicidin (*Accession-P81605*, 110 amino acids, 11.3 mw, and 4 peptides) and Peptidyl-prolyl cis-trans isomerase (*Accession-P62942*, 108 amino acids, 11.9 mw, and 1 peptide) found in **Group 2 T2DPs**. Albumin, uromodulin, cystatin-A (*Accession-P01040*, 98 amino acids, 11 mw, and 2 peptides), Prothymosin alpha (*Accession-P06454*, 111 amino acids, 12.2 mw, and 1 peptide), insulin (*Accession-P01308*, 110 amino acids, 12 mw, and 1 peptide), and heat shock protein (*Accession-P61604*, 102 amino acids, 10.9 mw, and 1 peptide) found in **Group 3 T2DPs**. **Conclusions:** Our study revealed the potential for urinary proteomics as a noninvasive method for identifying high-risk DKD patients for progression monitoring.



***In-vitro* Antibacterial Activities of Green Synthesized Silver Nanoparticles from *Hygrophila auriculata***

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**Abstract**

Green synthesis of nanoparticles is the most important and beneficial method as it is very simple and eco-friendly compared to chemical methods. The present study is carried out for the green synthesis of silver nanoparticles using *Hygrophila auriculata* and evaluation of its antibacterial activities *in vitro*. The synthesized silver nanoparticles were confirmed by colour change from colourless to dark brown colour and were characterized by various techniques viz. UV-Visible (UV-Vis) spectrophotometry, scanning electron microscope (SEM), Dynamic Light Scattering (DLS), Zeta potential and Fourier Transform Infrared Spectroscopy (FTIR). Furthermore the antibacterial effect of synthesized nanoparticles using *Hygrophila auriculata* was evaluated against two pathogenic bacteria [*Escherichia coli* and *Staphylococcus aureus*]. Different concentrations of the synthesized nanoparticles were used, viz. 50 ml/ml, 100 ml/ml, 150 ml/ml, 200 ml/ml and 250 ml/ml. The disk diffusion method showed significant antibacterial activity of the synthesized nanoparticles.

## Development of phytotherapy based treatment for combat COVID-19

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### Abstract

The disease COVID-19 caused by SARS-CoV-2 is highly infectious and human threatening due to its rapid spreading and adaptation to varied climatic conditions through rapid mutations. Lacking of proper therapeutic drugs, insufficient diagnostic tool, and awareness the severity of disease increases. Therefore the preventive measure is an important strategies to control the spreading of disease. Beside allopathic and homeopathy treatments basically tribal people those belonging to rural areas also depends upon some selected plants for COVID-19 treatment. At this time, Indian traditional medicinal plants received a noticeable attention to treat COVID-19 patients in Indian subcontinent. Our prominent focus is highlighting Indian traditional plants have novel therapeutic application against corona virus. A series of medicinal plant have been summarized with the source of bioactive phytochemicals that act on COVID-19, following in-silico analysis we have analyzed their mechanism of action against COVID-19. Their probable mechanism and therapeutic approaches behind the activity of phytochemicals the probable mechanism and therapeutic approaches stimulates immune response as well as inhibition of viral multiplication discussed rationally. Mixtures of these secondary metabolites/ phytochemicals are the only choice to prevent this disease in countries where vaccination is going to take a long time due to over crowded population density.

## **Serum Lipid Profiling of Oral Potentially Malignant Disorders: A Retrospective Study**

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### **Abstract**

Alterations in lipid profile have been associated with malignancy because of their crucial role in the upkeep of the integrity of the cell membrane. The present study evaluated the variations in serum lipid profile if any, in untreated patients of OPMDs (Oral Potentially Malignant Disorders) as compared to healthy controls. The lipid profile of 35 clinically and histopathologically confirmed patients recruited in each group of Oral Lichen Planus [OLP; Group-II], Oral leukoplakia [OLK; Group-III] and Oral erythroplakia [OLE, Group-IV] were evaluated and compared with 35 healthy controls [Group I]. Serum lipids analyzed included Total cholesterol [TC], Triglycerides (TGL), High density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL) and very low density lipoprotein cholesterol (VLDL). Serum levels of TC were significantly increased in Group II-OLP and Group IV-OLE as compared to controls [Group-I]. All the four groups had comparable serum TG values. Amongst the three test groups, Group-III-OLK showed the least serum level of HDL as compared to the controls. Serum LDL level was significantly higher in Group-IV-OLE as compared to controls. Interestingly, the serum LDL level was significantly lower as compared to controls in Group-II-OLP.

**A cross-sectional observational study on prandial dependence of  
pharmacodynamics of sulfonylurea among elderly diabetics**

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**Abstract**

Diabetes Mellitus, with its subsequent complications and increased morbidity, is one of the major global public health crises with a very high prevalence. Sulfonylurea, the oldest oral antidiabetic with serious hypoglycaemic effect, is often used as a second line treatment for the disease.

Often patients, forgetfully or ignorantly, defer from the dosage schedule and take drugs just before or after their meal rather than 20 minutes prior. This affects the therapeutic efficacy of the drug.

This study was done in 44 62–80-year-old diabetic patients on oral medications, where their FBG, PPBG, medication history and time of dosing were noted and tallied. People taking sulfonylurea 20 minutes prior showed timely control of glucose surge with near to normal PPBG levels, compared to the ones taking just prior to or after the meal. Though some did take the medication 20 minutes prior, majority took it after their meal and had pretty high PPBG, significant of postprandial glycaemic tide.

This signifies the importance of abiding by the dosage schedule and calls for caregivers to look after it, because glycaemic surge, rather than steady-state hyperglycaemia, causes several macrovascular complications to arise. The caregivers need to also make sure that meals are not skipped following intake of sulfonylurea to prevent hypoglycaemia.

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## **Evaluation of bioactive potentiality of carotenoids of crustacean shell origin**

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### **Abstract**

Ingestion of nutrient-rich seafood augmented several times among the consumers from the end of 20th century. However, just 50% of total weight of seafood is suitable for human consumption and the rest is usually either discarded or considered as protein supplements for fish. Although, crustacean exoskeletons are enriched with various bioactive compounds viz. chitin/chitosan, carotenoids, bioactive peptides, etc. Carotenoids-a well-known natural pigment, comprised of heterogeneous group of chemicals, dispersed among widerange of living entities. Due to diverse range of bioactive potentialities, the application field of carotenoids is ever increasing. Global research fraternity mainly emphasized on the extraction of carotenoids from shrimp and vegetables sources. Considering this perspective, carotenoids was extracted from shrimp and crab shell of local coastal area by physiochemical mode (ultrasonication followed by organic solvent extraction) and later quantified spectrophotometrically. The bioactive potentiality of the extract was then evaluated by conducting several *in-vitro* experiments viz. antibacterial activity, antioxidant and anti-hemolytic activity. Moreover, the bioactivities of crab shell carotenoids were also comparatively analyzed with bioactive potentiality of shrimp shell carotenoids.

**Evaluation of biologically extracted chitosan on cold-restraint stress induced gastric ulceration**

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**Abstract**

Chitosan is a cationic carbohydrate that has multifaceted documented bioactivities. It is often extracted from crustacean shell by extensive chemical treatment. In the present study chitosan was purified from native crustacean shell by biological means through deproteinization, demineralization and deacetylation. The extracted chitosan was administrated orally and their efficacy to combat cold-restraint stress (CRS) induced gastric ulcer was addressed. A dose depended anti-ulceration activity was noticed. Administration of biologically extracted chitosan (BEC) significantly decreased the MDA and GSH level whereas, different anti-oxidant enzymes such as SOD, CAT, GPx significantly increased. The histopathological study revealed that ulcer index was reduced. The normal pattern of gastric mucosal layer, rearrangement of epithelial lining, glandular tissue, and connective tissue was recovered in BEC group than CRS group. These results indicate that BEC has reasonable potential to exhibit gastric cytoprotective effect.

## **Lycopene and its Dermatological effects**

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### **Abstract**

The red colored lipophilic ‘lycopene’ (belongs to the group of ‘Carotenoids’) is an active antioxidant and free radicle scavenger. This helps to prevent photo-induced aging of skin. Tomato, which is the major source of lycopene is very helpful to fight against the risk of skin aging and wrinkles. Besides tomato, we have watermelon, pink guava, papaya, etc. as the good sources of lycopene.

Lycopene has the ability to quench the primary cause of skin aging, i.e., singlet oxygen produced during exposure to UV (ultraviolet) light. Other than skin aging, lycopene also prevents skin discoloration, texture changes, fine lines and wrinkles. This excellent antioxidant can even reduce the risk of UV induced skin cancer.

Carotenoids are not synthesized in human body, hence must be ingested via food or any supplementation. Tomato is a functional food where lycopene gives beneficial nutraceutical effects for the dermatological matters.

Beneficial to any skin type, lycopene works well for sensitive and aging skin. Lycopene is astringent and reduces the appearance of large pores. Also, lycopene reduces redness and irritation of skin. As the tomato ripens, lycopene content gets higher.

In this article, role of lycopene in dermatological matters is reviewed.

**Phytochemical analysis of *Strychnos potatorum* seed and Double Blind Placebo Controlled Human Pathogenetic Trial (HPT) of *Strychnos potatorum* 6 - a new drug source in Homoeopathy**

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**Abstract**

*Strychnos potatorum* L.f(SP), a medicinal plant, belongs to the genus *Strychnos*. SP is used as drug source by all systems of AYUSH except Homoeopathy. So the objective is to search the scope of inclusion of this plant as new medicinal source in homoeopathic system of medicine and to search its pathogenesis by HPT. Firstly SP seeds were collected, authenticated, followed by ethanolic extraction for chemical analysis and preparation of mother tincture (MT). Then the MT was potentised to 6CH potency for Double blind placebo controlled RCT, performed on healthy human being of both sexes aged from 18 to 60 years with sample size of 30, (Verum: Placebo 1:1) at CHMCH, Kolkata. Chemical analysis showed that significant amount of alkaloid is present in the ethanolic extract. HPT showed that 5 provers in Placebo group remains unaffected, while, 2 provers, (one each from venom and placebo groups) were terminated owing to intercurrent illness. 2 provers produced constipation, 2 provers had difficulty in inspiration and 6 provers developed red rashes in different parts of body. Thus HPT proved its pathogenetic effect as per homoeopathic definition.



**Atmospheric gravity wave as a detection knob for forecasting tropical cyclones: A study on Amphan**

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**Abstract**

Due to tropical jet movement, Hadley Cells formation, Earth's gravity, and buoyancy of air, the atmospheric gravity wave (AGW) is formed. There are several such controlling parameters related to the changes in intensities of the AGW. The dynamic nature of Earth's atmosphere results in drastic variations of AGW. Before and after each atmospheric catastrophic situation, significant anomalies are observed in AGW. In this introductory study, we have used the geophysical data collected from the instrument, Surrounding of the Atmosphere using Broadband Emission Radiometry (SABER), of the TIMED satellite around the landfall of Super Cyclonic Amphan at the coast of the Bay of Bengal on May 20, 2020. We have shown the remarkable variation in potential energy of AGWs derived from the altitude variation of temperature profile for five consecutive days before and after the day of occurrence of Amphan. The graphical analysis of our study indicates that a significant change has been observed in AGW before some days, as well as the day of the cyclone also. So AGW can be projected as a detection knob to forecast the formation of tropical cyclones.

**An automated disinfectant device (steriall) as a control knob for non-proliferation of harmful microbes**

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**Abstract**

Since December 2019, the world has had to face an unprecedented public health emergency due to COVID-19. Environmental microbial infection is increasing alarmingly. Steriall is a portable sterilizer box containing UV-C lamps which penetrates the thin wall of a small microscopic organism and destroys its nucleic acid. UV-C sterilization is an established and sophisticated method for dry cleaning pathogens, viruses, and bacteria including SARS-CoV-1 etc. Direct exposure to UV-C rays can harm human health; hence, it has 100% UV leak proof cabinet an auto switch on while opening the sliding door. This box shaped sanitization chamber kills 99.99% microorganisms from surface of all inanimate objects exposed to it, like watches, wallets, shoes, mobile phones, keys, cash, tickets, hospital items, medicines, masks. The device may have a vast range of application where physical transaction of currency is widely used. Steriall is a lightweight, cost-effective, and chemical-free solution to decontaminate surfaces of small items at any public environment like hospitals, residential care, railways, metro stations, banks, classrooms, offices, where a continuous flow of staff, patients and visitors can harbour unseen bacteria and viruses. Steriall is a simple device in view of manufacturing, affordability, and also application in case of any establishment.

## Offline measurements for characterization of gamma-ray detectors

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### Abstract

Radiation detectors are of widespread use in research and in myriad applications such as medical diagnostics, nuclear security and those of industrial use. As far as gamma-rays are concerned, detectors based on solid state media are of preference owing to the better interaction probability in compact dimensions that they entail. These detector media can either be scintillators or semiconductors. The scintillators used in gamma-ray detection are typically of inorganic type, such as BaF<sub>2</sub>, BGO, NaI(Tl), LaBr<sub>3</sub>(Ce) etc. The semiconductor material used in gamma-ray detection, particularly for spectroscopy, is High Purity Germanium (HPGe). The two genres of detectors are characterized by distinct operational principles and properties that are of pertinence while choosing one of them for a given application. The present work reports the measurements of different properties (energy efficiency, energy resolution, output pulse characteristics) of two gamma-ray detectors, one single crystal HPGe and one LaBr<sub>3</sub>(Ce), as a function of their operational parameters (applied bias voltage) and energy of incident radiation. Some of the results have been least-square fitted with analytical functions wherefrom detector characteristics could be ascertained beyond the acquired data. Such exercise is expected to help identifying optimum working conditions of the detectors and facilitate their usage in the aforementioned domains. (Support and guidance of the faculty members at UGC-DAE CSR, Kolkata Centre and PanskuraBanamali College are gratefully acknowledged.)

**Effect of boron doped on structural and optical properties of diamond like carbon thin films deposited by cyclic voltammetry technique**

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**Abstract**

Carbon is the fourth most abundant element in the universe. A large variety of nanomaterial can be formed from elemental carbon. Diamond like carbon (DLC) is the mixture of high fractions of  $sp^2$  ( $\pi$ ) and  $sp^3$  ( $\sigma$ ) bonds of hybridization. DLC thin films have been a focus of considerable research efforts due to their remarkable and outstanding properties, such as high hardness, chemical inertness, low friction, optical properties, thermal conductivity, chemical inertness and dielectric properties, etc. In this study we deposited boron doped diamond like carbon (B:DLC) thin films on Indium tin oxide (ITO) coated Polyethylene terephthalate (PET) substrate, synthesized by cyclic voltammetry (CV) which is cost effective, environmental friendly and less time- consuming as relative to above discussed technique. The deposited samples were characterized by using EDX, AFM, FT-IR and UV-VIS Spectrophotometer to investigate the doping growth, structural crystallinity, surface morphology, chemical bonding information and optical properties. SEM has been used to measure the thickness of all deposited films. We have reported the change in transparency as well as optical band gap and Urbach parameter i.e., defect density for DLC films caused by B doping. The capacitive and dielectric constants were measured from the impedance analyser.

## **Synthesis and characterization of Nickel doped Zinc Oxide Thin Films**

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### **Abstract**

RF/DC reactive co-sputtering technique has been used to fabricate pure zinc oxide (ZnO) and nickel doped ZnO thin films on glass substrate at room temperature 30° C. The actual target of this experimental work was to investigate the effect of nickel incorporation on structural and optical properties of nickel doped ZnO thin films. The deposited samples were characterized by using Energy-Dispersive Analysis X-ray, X-Ray Diffractometer (XRD), Atomic Force Microscope, Fourier Transform Infrared Spectroscopy (FT-IR), Scanning electron microscope and UV-VIS Spectrophotometer to investigate the doping growth, structural crystallinity, surface morphology, chemical bonding information, film thickness and optical properties. The XRD of all deposited films reveals that the highly intensive peak has been found near glancing angle at 34.48° corresponds to miller indices (002), which confirmed the wurtzite hexagonal crystallite structure of ZnO that matched with JCPDS card no 36-1451. Crystallite size of deposited thin films is increased from 8 nm to 15 nm with the increasing of atomic % of nickel from 0 to 7.5 respectively in ZnO. Optical band gap energy decreases from 3.15 eV to 2.21 eV whereas the urbach energy increases from 118 meV to 243 meV with increasing of atomic % of nickel from 0 to 7.5 respectively.

**Nonreciprocal transmission in a rotating semiconductor  
microcavity**

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**Abstract**

The nonreciprocal transmission of optical field in a rotating semiconductor microcavity with second order nonlinearity is analyzed. The nonlinear materials are basically III-V semiconductors such as AlGaIn, AlGaAs, GaN, AlN and BN etc. The probe response is illustrated when the cavity is driven from its left and right sides. The transmission profile exhibits nonreciprocal behavior. The absorption spectra show double transparency window symmetrically placed around zero probe detuning when the cavity is driven from its right. The dispersion profiles show both the anomalous and normal behavior and this confirms the group velocity is both negative and positive. The non-reciprocity is also described by delay time-bandwidth product according to Lorentz reciprocity theorem. The figure-of-merit strongly depends on the hopping strength between the field modes and cavity quality factor. Our study may offer applications in motion sensing and ultrafast signal processing.

**A numerical study of slip condition on unsteady flow over an infinite vertical plate with ramped temperature and concentration in the presence of thermal radiation and buoyancy**

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**Abstract**

In this article, we have studied the effects of slip condition on unsteady laminar flow along an infinite vertical plate with ramped and constant temperatures and concentration in the presence of thermal radiation and buoyancy. An analysis is made by using the numerical study of the Navier–Stokes equation, energy and species equations with the help of the finite element technique and also the thermal radiation have to be considered. The fluid velocity profiles, fluid temperature profiles, and species concentration are presented graphically for both ramped and constant plate temperature and concentration conditions. The numerical values of skin friction, Nusselt number, and Sherwood number are shown on tabular form. The non-dimensional slip condition effects on radiation and buoyancy near the plate produce a strong flow. The skin-friction on the plate increases with an increase in both time and radiation. The slip length on the skin-friction has negative impact and finally, the difference between the skin-friction curves of ramped and constant temperature decreases with an increase in slip parameter.

**Ball-Mill synthesized TiO<sub>2</sub>-CeO<sub>2</sub> nano composites: an efficient Photocatalyst for degradation of Rhodamine B under visible light**

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**Abstract**

This study investigates the structure, optical and photocatalytic performance of 20% CeO<sub>2</sub> and 80% TiO<sub>2</sub> of TiO<sub>2</sub>-CeO<sub>2</sub> nano composites were synthesized by one step ball-mill method under different milling time. The photocatalytic performance of the nano composites were investigated with a model pollutant Rhodamine B (RhB) dye molecules under visible light. The performance of the photocatalytic activities played important role by the adsorption of the dye molecule on the photocatalytic surface in their selective photo degradation under visible light. XRD, Ultra Violet-Visible (UV-vis) reflectance spectroscopy are used to analyse the structure, optical and photocatalytic activities of the as prepared nano composites. The result show that the photocatalytic dye degradation performance of nano composites catalyst synthesized through 15hour milling is greater than pure TiO<sub>2</sub> or pure CeO<sub>2</sub> as well as 5hour milling of TiO<sub>2</sub>-CeO<sub>2</sub> nano composites.



**Semiconductor quantum dot-Protein interaction: spectroscopic, microscopic investigation and photoconductivity study**

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**Abstract**

The nano-diagnostics as well as nanomedicine and their biophysics are considered to put forward expectation with some of the most difficult challenges in human health. In this presentation, I focused on the interaction study of the fabricated CdS and PbS quantum dots (QDs) with model serum albumin protein. The absorption of the PbS QDs and CdS QDs has been observed in the NIR and VIS region with band gap  $H \approx 0.9$  eV and 2.75eV, respectively. The average size of the PbS QDs and CdS QDs from the HRTEM study was found to be 5nm and 3 nm, respectively with well crystalline nature. Crystal structural phase and lattice parameters of both QDs were analyzed from the XRD study. The ground state complex formation between albumin and CdS QDs/ PbS QDs have been observed and discussed from UV-VIS spectroscopy. The bioconjugate and corona formation of CdS QDs/PbS QDs-albumin have been observed from the HRTEM images and DLS study. The quenching of albumin and energy transfer between QDs and albumin have been observed from the PL and TCSPC spectrum. The change in photo-current/ photoconductivity within the pure QDs and QDs-BSA conjugate were observed under photo-conducting process.

## **Prediction of glass transition temperature from machine learning models**

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### **Abstract**

Glassy materials are a category of non-crystalline material which has many applications in our life. Unlike crystals, glassy materials can be synthesized in wide compositional range. The vast compositional envelop accessible to glassy materials opens great opportunities for the discovery of novel glasses with improved properties and functionalities. Recently, the application of artificial intelligence and machine learning have revolutionized different aspects of human lives. The core concept of the machine learning is that it can learn from example by analysing the given datasets and identify the hidden patterns contained in that data. Therefore, it is possible to predict some material properties by providing some input data collected from literature. Glassy materials exhibit glass transition temperature ( $T_g$ ) which is an important property related to thermal and chemical stability. The literature review shows that the  $T_g$  depends on composition in complex non-linear way in case of borate and boro-phosphate glasses which is typically known as boron anomaly. Long ago some modelling was performed from the concept of physics to investigate  $T_g$  - composition relationship. In the present study, the modelling has been performed by employing some non-linear machine learning algorithms and satisfactory performance was observed in predicting the  $T_g$  values from unknown composition.

**PHY-25059006**

## **Innovative Physics Experiments with Python**

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### **Abstract**

Laboratory experiments have played a pivotal role in the teaching curriculum for basic and applied science. It is desired that these experiments be designed so as to be modular and transparent in nature. Data recording and visualization are the major components in any experimental measurement. Modular computer-based experiments based on commonly encountered open-source hardware and software resources, allows the students the flexibility to acquire and analyse the data and comprehend the underlying phenomena. In the presented experiment, we have used the commonly encountered sound card readily available in modern day computers, as the waveform generator, as well as the data recording system. With the help of an open-source audio recorder *viz.* Audacity, the acquired data has been stored, which then have been accessed using open-source toolkits such as Octave and Python. As a part of this project the characteristics of the conventional Integrator and Differentiator circuits were investigated.

The authors acknowledge the support and encouragement extended by Dr Abhijit Kar Gupta, Dr Mrityunjoy Das and other faculty members of the Department of Physics PanskuraBanamali College. The authors are grateful to the guidance and tutelage of Dr Sandeep S Ghugre, UGC-DAE CSR, Kolkata Centre.

**Entanglement properties of a three-mode Bose-Einstein condensates system considering inter-modal as well as intra-modal interactions**

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**Abstract**

A three-mode Bose-Einstein condensates (BECs) system is prepared through the Bose Stimulated Raman adiabatic passage (STIRAP). Three modes are one stable atomic BEC, one stable molecular BEC, and one excited molecular BEC. The inter-modal interactions are present between the atomic and the excited molecular modes and also between the excited and stable molecular modes. Intra-modal interactions are also present in all three modes. Hamiltonian of the system is solved analytically to derive the time evaluation of the field operators associated with all three modes. Employing these solutions, the entanglement properties of the system studied.

## **Optical bistability in coupled micro-cavities**

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### **Abstract**

We theoretically analyze the optical bistability in parity-time-symmetric coupled micro-cavities. The two cavities are coupled via tunable photon tunneling. One cavity is active with an optical gain and the other is passive and contains Kerr optical medium with third-order non-linear susceptibility. Solving Heisenberg-Langevin equations of motion, the mean cavity photon number is obtained. With a high degree of control and tunability via photon tunneling strength, the Kerr nonlinearity over bistable behavior is discussed. The bistable nature can also be explained as the hysteresis nature of the mean cavity photon number. The bistability shows a prominent effect at exceptional points. The present system exhibits switching characteristics, with a tunable zero-intensity window. The variation of mean cavity photon number is symmetric around zero cavity detuning for weak nonlinearity but is asymmetric for considerable nonlinear strength. The results obtained in this investigation have the potential to be used for designing efficiently all-optical switches and optical memory elements.

**Melanin and Vitamin D Can Inactivate Furin Protease for Preventing COVID-19 Infection**

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**Abstract**

Several number of micronutrients as well as macro nutrients are require for human growth and development. Some Vitamins are also synthesized by gut microbiota and few are taken in from outside as food. On the other hand the biological compounds like melanin is synthesized in human skin, eye and hair. Although polygenic melanin can impart pigmentation of skin; they also combat viral infection in our body. In this context we present the activity of melanin which can strongly interact with furin protease, which inhibits the growth of virus including COVID - 19. The Vitamin D can help melanin synthesis and in able to reduce cellular cytokine level, which modulate adaptive immune response. Through molecular docking, we observed that L-DOPA (precursor of melanin), L-Dopaquinone eumelanine and melanin strongly interact with the active site of furin protein thus preventing the viral entry. Melanin basically interacts with - HIS194, ASP258, ALA292, SER253, TRP254, GLY255, SER293, GLY294, ASN295, THR367 residues of furin protein.

**PHYSIO-14799336**

**Phyto-Therapeutic Potential of n-Butanol Fraction of *Aloe vera* (L.) In The Treatment of Diabetes and Diabetes-Induced Testicular Impairment: A Molecular Multi-Target Approach**

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**Abstract**

Diabetes is a silent epidemic, and endocrine syndrome, affects different physiological systems including reproductive one also. No specific medicine is available in the market that can treat diabetes and diabetes-linked testicular impairment. The investigation focused on the curing efficacy of different fractions of *Aloe vera* (L.) on testicular impairment linked to diabetes in streptozotocin-induced diabetic animal model. Solvent fractions of hexane, chloroform, ethyl acetate, and n-butanol of *Aloe vera* (L.) were prepared and treatment was continued for 28 days. Glycemic sensors, oxidative stress markers, spermiological sensors, androgenic key enzyme activities, serum lipid profile, and general toxicity level were measured. mRNA expression of caspase-3, caspase-9, 5, 3 HSD, and 17 HSD in testicular tissue were also studied and a comparison was made with the vehicle-treated control and vehicle-treated diabetes group. Histo-architectural studies of testis and pancreas were also done. Significant ( $p \leq 0.05$ ) improvement in FBG level along with the mentioned parameters was noted in different *Aloe vera* (L.) fraction-treated groups but recovery in major of the parameters was noted in the n-butanol fraction-treated group. Our findings suggest that the n-butanol fraction of *Aloe vera* (L.) can be used as a multi-target drug in the treatment of diabetes and related testicular hypo-function.

## **A study on multi-drug resistant bacterial isolates in Urinary Tract Infections**

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### **Abstract**

Kidneys, bladder, ureters and urethra are collectively known as urinary system. Several uropathogenic bacteria, including *Escherichia coli* (primary), *Klebsiella pneumoniae* (secondary), *Pseudomonas aeruginosa*, *Staphylococcus aureus*, etc., cause urinary tract infections (UTIs), a major public health issue that affects women more than men. These infections get further lethal due to biofilm development by the bacterial pathogens in the environment as well as in host, which multiply their capacity for resistance acquisition for a good number of antibiotics, and pathogenic potential as well. As a result, majority of them have been classified as multi-drug resistant (MDR), along with a strong capacity to build biofilms and quorum sensing signalling action. Therefore, alternative therapeutic methods than the conventional are of increasing demand to combat UTIs. Urine samples were taken from Midnapore (West Bengal, India) town's UTI-affected human subjects. Then bacterial agents were isolated using Klebsiella-specific agar for *Klebsiella* sp., MacConkey agar for *Escherichia coli*, and *Pseudomonas aeruginosa*. Twelve isolates of *Escherichia coli*, eight of *Klebsiella pneumoniae*, and seven of *Pseudomonas aeruginosa* were among them. All isolated bacteria were biochemically characterised and shown to be catalase positive, while *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* were positive for urease enzyme but *Escherichia coli* isolates were urease negative. The susceptibility of all the bacterial isolates for several antibiotics were investigated to understand their drug-resistance profile by performing antibiogram analyses. Research is also being on the way to determine their capacity to form biofilms, quorum sensing signalling, virulence traits and characteristics polymorphism patterns responsible for their lethality.



**LAB associated organism ameliorates oxidative damage and gastrointestinal infections of large intestine under simulated Hypobaric Hypoxic condition**

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**Abstract**

Recent clinical trials have demonstrated tremendous potential for the use of probiotics to reduce gastrointestinal (GI) infections in critical care. The possibility for probiotic medication to alleviate oxidative liver damage under hypobaric hypoxia has not been investigated properly, despite the benefits of probiotic use in intestinal disorders. In order to evaluate, if *Pediococcus pentosaceus*(BACL7), *Bacillus subtilis* (KCL9) treatment in hypoxic rats will protect against oxidative liver damage and GI infection, this study used 20–22-week-old albino rats which were exposed to 65 kPa (air pressure at 3600 m altitude) to establish hypobaric hypoxia model and examine mRNA and protein levels of IL-1 $\alpha$ , NLRP3, IL-6, TNF- $\alpha$  NF-K $\beta$ , VEGF, MCP1 and HIF-1 $\alpha$  in the liver via real-time PCR, Elisa and Western blot. This study showed that BACL7 and KCL9 treatment significantly ameliorated oxidative liver damage and GI infection following experimental hypobaric hypoxic model. Liver mRNA and protein levels of NLRP3, IL-6, IL-1 $\alpha$ , TNF- $\alpha$ , VEGF, MCP1, NF-k $\beta$  and HIF-1 $\alpha$  were significantly reduced in rats receiving BACL7 and KCL9. Thus, our study demonstrated that BACL7 and KCL9 treatment can reduce oxidative liver injury, GI problem following experimental hypoxic model. Probiotic therapy may be a promising intervention to ameliorate of following systemic GI infection and oxidative liver damage.

## Computational Analysis and Structure Prediction of Propionate CoA Transferase in Gut Microbiota

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### Abstract

Propionate, a Short Chain Fatty Acid has a great deal of immune- and neuro-modulatory functions through usage of GPR41, GPR43 and FFAR3 after their productions via Succinate, Acrylate and/or Propanediol pathway. Propionate CoA transferase is the ultimate key enzyme for the synthesis of propionate via succinate pathway found in many bacteria of gut microbiota, such as, *Lactobacillus intestinalis* DSM6629. Computational studies reveal that it is hydrophobic, negatively charged, 523 amino acid long protein possessing a conserved amino acid combination with two over-repressible codons ACC (1.83) and GCC (1.66). *In silico* analysis of the enzyme among 133 different bacterial strains against reference bacteria determines the enzyme to have low aromaticity (0.151), codons being slightly anonymous (average Nc=43.90±5.14), and the enzyme to be quite stable under mutation-induced variation. Correspondence analyses of genes of *Methylovarstilisdiscipulorum*, *Rhodocyclaceae bacterium*, *Clostridium amylolyticum* and *Epulopiscium sp.* demonstrated the highest codon usage potential than others. During the translation of this enzyme, tRNAs were found to prefer GGC, GUC, AAU and UGU over other codons. The CDS analysis showed that the enzymes have a conserved domain of the sugar-phosphate isomerase gene with beta-pleated sheets mostly along with the alpha-helical structure in between beta sheets.

**A Review on Antifungal and Antibiofilm activity of Ginger Derived Bioactive Agents 6-Shogaol, 8-Gingerol, 10-Gingerol Against Multidrug Resistance Pathogenic Fungus *Candida auris* and *Candida albicans***

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**Abstract**

*Candida auris* and *Candida albicans* both are opportunistic pathogens that are primarily cause of hospital acquired fungal infections with therapeutic failure. Both species are multiple drug resistant fungi and is being rapidly identified as a universally emerging pathogenic agent. *Candida auris* and *Candida albicans* species can also develop biofilm. Biofilms are complex structured community of micro-organism's enclosed by polysaccharides (known to be exopolysaccharide). Biofilms are resistant to disinfection and even to antibiotics. Ginger has been used in traditional medicine since long before. Ginger contains major bioactive compound like 8-Gingerol, 6-Shogaols and 10-Gingerols in its which has a bioactive property and shows predominantly antibiofilm and antifungal activities'. It was found that 8-Gingerol, 6-Shogaols and 10-Gingerols effectively reduces the biofilm formation and inhibits the virulence activity. The rate of inhibition and antibiofilm activity were further confirmed through time-kill assay and XTT reduction assay. The effect of 6-Shogaols on *Candida auris* and *Candida albicans* biofilms was visualized by confocal laser scanning microscopy. The data indicates that the bioactive agent 8-Gingerol, 6-Shogaols and 10-Gingerols could be considered as a promising alternative to antibiotic strategies targeted to reduce the production of biofilm by *Candida auris* and *Candida albicans* like species of virulent fungi.

**Antigonadal effect of *Thevetia peruviana* on male albino rat**

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**Abstract**

The present study was conducted to investigate the anti-spermatogenic efficacy of hydro-methanolic (2:3) extract of *Thevetia peruviana* leaves (TPHmLE). Healthy mature albino rats were treated with TPHmLE at the dose of 40 mg/0.25 ml DW/100 g of body weight for 28 days that results significant reduction of ( $P < 0.05$ ) the epididymal sperm count, motility, viability, seminal fructose levels. Serum testosterone as well as androgenic key enzyme 17 $\alpha$ , hydroxyl steroid-dehydrogenase and 3 $\beta$ , hydroxysteroid dehydrogenase activities in testis also decreased in TPHmLE treated group. Proapoptotic marker p53 gene expression was significantly higher but superoxide dismutase and catalase expression was significantly decreased in TPHmLE treated group in compare to control. Seminiferous tubular diameter, number of stage VII spermatozoa were significantly decreased in TPHmLE treated group in respect to control. There was a significant number of damaged germ cell observed by Feulgen's staining in TPHmLE treated group in respect to control. These results suggested that the *Thevetia peruviana* (TPHmLE) possess antigonadal activity by the generation of free radicals that trigger testicular germ cell apoptosis and decreased spermatogenesis.

## Molecular Variation of *mecA* Gene in Clinical Isolates of Methicillin-Resistant *Staphylococcus aureus*(MRSA) and Other Bacterial Agents

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### Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a major public health problem all around the globe that has developed resistance to beta-lactam antibiotics, such as, penicillin, cephalosporins. Antibiotic-resistance characteristics of MRSA is understood predominantly by the existence of *mecA* gene that is expressed on the bacterial cell wall as encoding for Penicillin-Binding Protein 2a (PBP2a), and that is important marker for drug-resistance and subsequent virulence of the lethal human pathogen. In this study, the molecular evolution of 124 PBP2a proteins among various strains of *Staphylococcus aureus* were analyzed. Compositional analysis shows that nucleotide sequence is AT-rich with C ending codon. Correspondence analysis of codons depicts that AUC, AGA, GGU, UCC, and a few others are over-repressible codons. ENc studies also reveal that AU-ending codons are preferred over GC-ending codons, mutational pressure is one of the main factors to shape codon usage biasness. The results obtained from *in-silico* study will enhance our understanding of major factor and pattern of codon usage in *mecA* gene to give rise to effective antibiotic-resistance to the bacterial agent. Additionally, these results will help further investigation of PBP2A protein and development of new antimicrobial agent, which may require synthetic gene design based on codon usage pattern.

**Ameliorative efficacy of green synthesised gold nanoparticles against inflammatory cytokines, reactive oxygen species and apoptosis in experimental rat model**

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**Abstract**

Gold nanoparticles possess promising ameliorative effects due to their distinctive properties such as high surface reactivity, biocompatibility, flexibility in functionalization and a broad range of delivery targets. This study was designed to investigate the protective effect of green synthesized gold nanoparticles (AuNPs) using aqueous bark extract of *Terminalia arjuna* on acetaminophen-induced immunotoxicity in the experimental rat model. After 14 days all animals were sacrificed for the assessment of inflammatory cytokines, Reactive oxygen species and apoptosis study by flow cytometry. Immunological analysis revealed that there was a significant decrease in the IL-10 level with acetaminophen treatment but a marked increase in the KIM-1, Cystatin C, TNF- $\alpha$  and IL-18 levels. After co-administration with AuNPs along with acetaminophen showed effective significant recovery in the expression of inflammatory biomarkers. Flow cytometric technique indicated that AuNPs have potential defensive and protecting activity against reactive metabolite mediated by ROS generation and apoptosis, due to acetaminophen overdose that causes hepato-renal toxicity. Hence, the results highlighted the protective therapeutic effects of AuNPs against acetaminophen-induced hepato-renal toxicity.

**Study on dimethoate hydrolase, a bioremediating amido hydrolase from *Sphingomon aswittichii* strain DC-6: An approach through bioinformatics**

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**Abstract**

Dimethoate is a widely used organophosphorus insecticide often detected in the environment for its frequent use in agricultural practices. Dimethoate hydrolase, a bioremediating amidohydrolase enzyme from *Sphingomon aswittichii* strain DC-6 is responsible for transforming dimethoate to dimethoate carboxylic acid and methylamine. Here we have systematically investigated the molecular evolution, protein structure, compositional analysis, correspondence analysis and codon usage bias of the protein from the *Sphingomon aswittichii* strain DC-6 in fifty-six (56) selected microorganisms. The protein and species-specific phylogenetic trees using amino acid sequences of dimethoate hydrolase and homologous proteins showed clear clustering formation of the selected species according to their respective genera such as *Sphingomonas*, *Novosphingobium*, *Pseudomonas*, *Klebsiella*, *Burkholderia* and *Paraburkholderia*. In multiple sequence alignment (MSA), numerous conserved, semi-conserved and non-conserved sites were identified that indicate acquired mutation during evolution. The nucleotide composition of the encoded protein showed that average GC%, GC1%, GC2% and GC3% were higher and that has also been properly reflected in relative synonymous codon usage (RSCU) values of the codons with few exceptions. The correspondence analysis (COA) based on RSCU values demonstrated that the selected proteins prefer G/C ending codons over A/U ending codons *i.e.*, G/C ending codons are comparatively more preferable. Detailed analyses revealed that mutational pressure contributes to shaping the codon usage pattern from the selected proteins as evidenced from the COAs. These comprehensive computational studies can be beneficial for further studies and conceptual advancement in molecular phylogenetics, genomics and proteomics that may be contributory for better understanding of the evolutionary dynamics of dimethoate hydrolase, one of the key enzymes for Dimethoate-the organophosphate pesticide biodegradation, being prospective in developing a pollutant-free healthy environment.

**Protective Efficacy of Hydro-Methanolic Extract of  
*Paederiafoetida* Leaves on Cyproterone acetate (CPA) Induced  
Testicular Hypofunction in Rat**

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**Abstract**

The goal of this study is to explore the corrective effect of hydro-methanolic (3:2) extract of *Paederiafoetida* leaves on cyproterone acetate (CPA) induced testicular hypofunction in rat. Cyproterone acetate induced testicular hypofunction was evaluated by Sperm count, motility, viability and hypoosmotic swelling (HOS), androgenic key enzymes, oxidative bio-sensors, toxicity profile and gene expressions. A significant correction was observed in the sperm count, motility, viability and HOS test after the oral administration of *P.foetida* leaves extract at the dose of 20mg/100g body weight for 28 days. Serum testosterone, FSH and LH levels were significantly increased in extract treated group compared to the CPA treated group. Androgenic key enzymes <sup>17</sup>β-HSD and <sup>3</sup>β-HSD and testicular catalase, peroxidase, superoxide dismutase activities and protein expression patterns were decreased and in other hand conjugated dienes and malondialdehyde levels were elevated in CPA treated group due to oxidative stress generation. All these parameters were significantly recovered in extract treated group. Pro-apoptotic gene p53 of testicular tissue was measured by PCR technique which was also significantly reduced in extract treated group. This investigation demonstrated the potentiality of hydro-methanolic extract of *P.foetida* leaves for recovery the CPA induced testicular hypofunctions.



**Hypo-Testicular Activity Assessment of Different Seed Extract of  
*Luffa Acutangula(L.) Roxb. In Albino Rat: An In-Vivo*  
Investigation**

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**Abstract**

Presently, available contraceptives have adverse effects, which drive to search out safer contraceptives with the top priorities according to WHO. The aim of this analysis to explore most potent extract of seed of *Luffa acutangula* for development of hypo-testicular activity in albino rat. The Hydro-methanol (60:40) (HM), hydro-ethanol (60:40) (HE) and aqueous extract (AQ) of seed of *L. acutangula* were administered orally at a dose of 3mg/ 0.5mL /100gm of body weight for 28 days. Parameters like sperm count, motility, viability, HOS, plasma testosterone level, testicular “5,3â-HSD and 17â-HSD activities, oxidative stress biomarkers (SOD, catalase, TBARS), levels of seminal vesicular fructose, GOT and GPT activities of reproductive and metabolic tissues were assessed. Treatment with HE treated group exhibited maximum hypo-testicular activity than other extracts treated groups. Result showed, the treatment with HE showed maximum significant inhibition (p<0.05) in spermiological profile, plasma testosterone level, testicular “5,3â-HSD, 17â-HSD, seminal vesicular fructose, activities of SOD and catalase. Also, levels of TBARS was significantly increased in HE treated group. Non-significant alteration was noted in GOT, GPT activities in above organs in all extract treated group. Our *in-vivo* investigation concludes that HE of seed of *L.*

**Study on the Effects of Training on Anthropometric, Physical Fitness and Physiological Variables of Long Distance Runners**

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**Abstract**

**Background:** The physiological demands of Long distance running (5000m, marathon) require more endurance capacity than the other sports. **Objectives:** The present study was designed to investigate the effects of training on selected anthropometric, physical fitness and physiological variables of long distance runners. **Methods:** A total of 60 male long distance runners (age: 18-20 yrs) included in this study, were divided into control group (CG, n=30) and experimental group (EG, n=30). The volunteers of EG followed a training schedule (2 hrs/d, 5d/wk, for 4 wks), no training was followed for CG. Assessment of selected variables was performed at 0 week and at 4 weeks of the study. Paired sample t-test was performed to find out the differences in selected variables. **Result:** A reduction ( $p<0.05$ ) in body fat (%), fat mass, resting heart rate, peak lactate; and increase ( $p<0.05$ ) in handgrip strength, back strength, leg strength, speed, flexibility, anaerobic power and  $VO_{2max}$  were observed after 4 weeks of training among the EG volunteers. No change in anthropometric, physical fitness and physiological variables was noted in CG after 4 weeks. **Conclusion:** Training may improve the anthropometric, physical fitness and physiological variables, which may be used for assessment of performance of the athletes.

**Therapeutic Effect Of Hexane Fraction Of *Ayapana Triplinervis* Leaves On Indomethacin Induced Gastric Ulcer**

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**Abstract**

Indomethacin (NSAIDs) provokes aggressive ulcerogenic effects. The present study was investigated to search out the gastro-protective effect of hexane fraction of hydro-methanolic extract of leaf of *Ayapana triplinervis* (AT) on indomethacin induced gastric ulcer. Gastric ulcer was induced by oral administration of indomethacin at the single dose of 30 mg/kg body weight. Rats were orally pretreated with *Ayapana triplinervis*(50mg/kg) and positive control drug omeprazole (20mg/kg) for 28 days. Gastric volume, pH of gastric content, pepsin activity and mucin content were assessed in control, gastric ulcerated group, AT treated and omeprazole treated groups. Indomethacin upregulates the inflammation (tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin-6 (IL-6)) levels and gene expression of pro-apoptotic marker p53 while inhibit the mucosal prostaglandin E2 level. Catalase, superoxide dismutase enzyme activities and protein expression pattern were decreased but lipid peroxidation level were elevated in the ulcerated group in respect to control group. Gastric immunohistology shows severe mucosal and submucosal damage in ulcerated group. Glutamate oxaloacetate transaminase and Glutamate pyruvate transaminase activities in serum were significantly corrected towards control in ATpretreated rats. It may be concluded that the hexane fraction of AT has significant protective effect on indomethacin induced gastric damage.

**Study of physical, physiochemical and functional properties of edible mushroom *Pleurotus Sajor-Caju*: cultivated on different types of bed materials**

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**Abstract**

There are different influencing factors behind the cultivation of edible mushroom. The qualitative aspect of bed material is important in this context. In the present study, the edible mushroom *Pleurotussajor-caju* was cultivated on three different bed materials *i.e.*, paddy straw (PS), banana leaf-base (BL) and sugarcane trash (SCT) to assess some physical, physiochemical and functional properties. Studies showed that all the measured properties were different from bed to bed. The incubation time was highest (31 days) in BL bed and lowest (20 days) in SCT bed but the total production of mushroom was maximum in PS bed. The bulk density and water absorption of mushroom powder were highest in BL bed. But the pH, swelling capacity, water solubility and moisture content of mushroom powder was maximum in SCT bed. Results suggest that the bed materials are important behind the properties of fresh and dried powder form of mushroom. Therefore, the BL and SCT may be used as bed materials which may also be a solution of environmental remediation and may leads to waste to wealth. On another aspect, the properties of mushroom according to bed materials may help to establish the standard recipe from edible mushroom.

**Identification of multi-drug resistant *Pseudomonas aeruginosa*  
for urinary tract infections (UTIs)**

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**Abstract**

Catheterization of urinary tract is major source of health-care associated urinary tract infections (UTIs) which affects millions of people throughout world in each year. Among different uropathogenic microbes, *Pseudomonas aeruginosa*, a gram-negative and multi-drug resistant (MDR) bacterium is responsible for chronic infections in urethra. Predominant form of this infection takes place through formation of antibiotic-resistant biofilms. Twenty five urine samples were collected from infected patients from Jungle Mahal districts of West Bengal; isolated by Cetrimide selective media preparation, biochemical analyses and antibiogram. Microcolonies of *Pseudomonas aeruginosa* could be obtained for twenty samples. Further studies are in progress to find out anti-biofilm effects of Cinnamon bark (*Cinnamomum verum*) to prevent this deadly infectious disease.

**Study the effects of yoga on anthropometric, cardio-respiratory variables and mental health status of young male and female volunteers**

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**Abstract**

**Background and Aim:** The cardio-respiratory diseases and mental illness are the leading cause of premature death. This study was designed to find out the effects of yoga on anthropometric, cardio-respiratory variables and mental health status of young volunteers. **Materials and Methods:** For the present study, 120 healthy male and female volunteers (age- 12–16 yrs.) were randomly selected and were divided into two groups- (a) Yoga (n = 60) and (b) Control (n = 60); they were subdivided into i) male (n = 30) and ii) female (n = 30). Only the yoga group volunteers were followed a training schedule (1 hr/d, 5d/wk, for 4 wks). Selected variables were measured before (0 week) and after (4 weeks) training. Paired sample t-test was performed to find out the differences in selected variables. **Results:** A significant increase (P < 0.05) in strength, flexibility,  $VO_{2max}$ , anaerobic power, FVC, FEV1, PEFV; and decrease (P < 0.05) in resting heart rate, systolic blood pressure, depression, anxiety and stress scores were observed in yoga group volunteers. **Conclusion:** Yoga may improve physical fitness, cardio-respiratory fitness and mental health status. Regular practice of yoga may prevent cardio-respiratory diseases, mental illness etc. and improve life expectancy.

## **Life of Microswimmers at Low Reynolds Number Zone**

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### **Abstract**

The world of micrometres is different from the macro-world. In this fluidic world, microorganisms swim at low Reynolds numbers where the viscous force dominates the inertial force. Biological microswimmers, e.g., bacteria and algae, commonly interact with complex interfaces, like deformable liquid-liquid and porous interfaces, for their survival and growth in the natural habitat, which means they technically don't have to do anything to feed themselves. Many microscopic swimmers use one or more appendages for propulsion. The appendage could be a relatively stiff helix rotated by a motor embedded in the cell wall, as in the case of *E. coli*. One standard solution for locomotion at a low Reynold's number is the flagellum. Perhaps even more surprisingly, *E. Coli* uses its flagellum as a corkscrew. The average velocity of microswimmers is in the range of 20-400  $\mu\text{m/s}$ , and their sizes are varying 1-10  $\mu\text{m}^2$ , and they used to stay in the zone where the Reynolds number varies from  $1.4 \times 10^{-4}$  to  $3 \times 10^{-3}$ .

**A Detailed Study of the Solid Waste Dumping Areas of  
Midnapore Municipality and its Impact on Adjoining Dwelling  
Areas**

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**Abstract**

Heavy metals are omnipresent in soil which can be potentially toxic. The source of the water for the people in Midnapore municipality is shallow wells. Solid waste dumping areas are located in the dwelling areas of the township. Hence it is quite primitive that as the soil is contaminated with heavy metals, these heavy metals will also leach into surface groundwater. Therefore, determination of the heavy metal contamination in the waste disposal sites is essential to analyze the health consequences of the dwellers of those adjoining areas. The present study has been designed for the assessment. Five different waste disposal sites have been selected based on their location and load of deposition. Soil samples have been collected randomly, seven samples from each site. Heavy metals contamination has been assessed by different soil pollution indices like  $I_{geo}$ ,  $C_p$ , PEIRF, and EIRF. The most prominently contaminated site is Bus stand and Rangamati dumping site areas. Thus the dwellers of these area are at a high risk.



**Medicinal properties of *Ganoderma lucidum* in human health**

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**Abstract**

*Ganoderma lucidum* source of food and medication, are utilised extensively in contemporary clinical settings to prevent a wide range of human ailments. A widely used medicinal mushroom for longevity and health promotion is *Ganoderma lucidum*, which is a woody *Basidiomycotina* mushroom belonging to the family of Ganodermaceae of polypore, and its bioactive constituents are polysaccharides,  $\beta$ -glucans, lectins, adenosine, triterpenoids, phenols, steroids, amino acids, lignin, and vitamins. Some previous reports demonstrate the immunomodulatory effect *Ganoderma lucidum*, its polysaccharide stimulates immune function both in vivo and in vitro, recent literature showed that a crude aqueous extract of *Ganoderma lucidum* probably administered was effective in enhancing the recovery of leukocytes count, splenic blastogenic responses and splenic CD4 and CD8 T cell subsets in mice subjected to  $\gamma$ -irradiation. A previous study also showed that the anti-tumour effect of *Ganoderma lucidum* was mediated by cytokines released from activated T-lymphocytes and macrophages. *Ganoderma lucidum* presents several mechanisms of action to develop its large number of therapeutically functions and it may help to develop increase the use of natural substances instead of drugs to avoid health hazards.

**Impact of Hydroxychloroquine on Liver Enzymes of Male Albino Rat**

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**Abstract**

On January 30, 2020, three towns in Kerala reported the country's first instances of COVID-19. India was one of the most severely affected nations in the world, with around 27.2 million COVID-19 cases reported as on May 25, 2021. In India, hydroxychloroquine (HCQ) is mostly used to treat autoimmune diseases including rheumatoid arthritis and systemic lupus erythematosus as well as post-viral infectious arthritis like chikungunya arthritis. However, during the COVID scenario, this medication was widely used because it was hypothesized that it might have some antiviral properties. But later on, the use of this drug was restricted. Hence, it is very important to understand the effects of such medications. In this study, HCQ was administered through oral gavage to male albino rats. Then the levels of several distinct liver enzymes, such as serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), and alkaline phosphatase (ALP) were estimated following. These enzymes were found to be significantly elevated in serum, which indicates the impairment of liver function.

**Seasonal Dominance on the Morphometry of *B. bengalensis* from  
Paschim Medinipur District, West Bengal (INDIA)**

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**Abstract**

*Bellamya bengalensis* is the largest living prosobranch animal. It acts as a bio-indicator species. People of West Bengal, mainly Paschim Medinipur, Purulia, Bankura, and some parts of Purba Medinipur, take it as a protein-rich food. Seasonal changes are accompanied by changes in the aquatic environment that influence the morphology of *Bellamya bengalensis*. Morphological characters of *Bellamya bengalensis* were observed for one year. To understand the morphological parameters of *Bellamya bengalensis*, various morphometric character indices like shell shape, shell colour, shell length, shell width and sample weight were determined from the study area. Sinistral coiling as well as a blackish colour were observed in most samples. In February and March, more adult groups were observed, which represented the largest size of the population. Early in the first week of April is the breeding time of *Bellamya bengalensis*. In April, a batch of young snails entered the population. Through this study, we conclude that *Bellamya bengalensis* has a bi-annual life cycle.

**Various genetic disorders and the use of DNA sequencing**

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**Abstract**

Genetic disorder is caused in whole or in part by a change in the DNA sequence away from the normal sequence. The mutation changes the gene's instruction for making protein so, the protein doesn't work properly or is missing entirely. Sequencing DNA & coded transcripts has intensely promoted our understanding of functional genomics & fundamental importance of non coding genomic sequences in causing heritable diseases. Scientists can use sequence information to determine which stretches of DNA contain genes & which stretches carry regulatory instruction, turning genes on or off. The practice of genomic medicine stands to revolutionize our approach to medical care, & to realize this goal will require discovery of the relationship between rare variation of each of the ~20000 protein coding genes & their consequent impact on individual health & expression of Mendelian Diseases. The step wise evolution of broad based,genome wide, cytogenetic& molecular genomic testing approaches (CMA, ES) has driven much of the rare disease discovery to this point, with genome sequencing reprinting the newest number of this point. The unity of genome sequencing (GS) also rely upon further elucidation of the complexities of genetic & allelic heterogeneity, multilocus rare variation, & the impact of rare & common variation at a locus, as well as advances in functional annotation of identified variants.

**Effects of Full Cycle Pandemic on Psycho-Physiological  
Conditions of College Students in West Bengal, India**

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**Abstract**

The COVID-19 pandemic has led to significant changes in daily routine and lifestyle worldwide and mental health issues appeared as one of the consequences of it. This study was aimed to assess the presence of several psycho-physiological parameters among young college going undergraduate and post graduate students due to the lockdown situation. Beside these, the evaluation of autonomous learning capacity as a positive effect of lockdown was also an important aspect of this work. Cross-sectional data was collected through Google-based questionnaire from different college and university students in West Bengal, India from late May to 1st week of July 2021. A total of 315 complete responses were obtained. Among them 11.42% students were under moderate depressive condition, while 27% were suffering from moderate anxiety. Students have to use digital devices for about  $7.5 \pm 3.74$  hours/day, where 16.13% respondents reported an increase in their screen time since the lockdown was declared. Sleep disorders have been reported as 19% respondents referred to have suffered from highly variable sleeping pattern, 15.90% suffered from insomnia. From this study it can be concluded that the social isolation as home confinement had detrimental psycho-physiological effects on the college students.

## **A Review on Blood Cancer Detection Method**

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### **Abstract**

Cancers arise from multiple acquired mutations, which presumably occur over many years. The chemometrics method combined with laser-induced breakdown spectroscopy (LIBS) can be used for cancer detection. However, chemometrics methods were easily influenced by the spectral feature redundancy and noise, resulting in low accuracy rate because of their simple structure. A proposed approach using LIBS combined with the ensemble learning based on the random subspace method (RSM). The serum samples were dripped onto a boric acid substrate for LIBS spectrum collection. The complete blood cancer sample set includes leukemia [acute myeloid leukemia (AML) and chronic myelogenousleukemia (CML)], multiple myeloma (MM), and lymphoma. The results showed that the accuracy rates using k nearest neighbors (kNN) and linear discriminant analysis (LDA) only were 88.14% and 94.45%, respectively, while using RSM with LDA (RSM-LDA); the average accuracy rate was improved from 94.45% to 98.34%. Furthermore, the variable importances of spectral lines (Na, K, Mg, Ca, H, O, N, and C-N) were evaluated by the RSM-LDA model, which can improve the recognition ability of blood cancer types. Comparing the RSM-LDA model and only with LDA, the results showed that the average accuracy rate for cancer type identification was improved from 80.4% to 91.0%. These results demonstrate that LIBS combined with the RSM-LDA model can discriminate the blood cancer from the health control, as well as the recognition the types for blood cancers.

**Antioxidant effect of black rice:An overview**

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**Abstract**

Rice is the main staple food for more than half the world's population. Black rice is the native of the common rice species (*Oryza sativa*) and the scientific name of black rice is *Zizania aqatica*. Before the green revolution, pigmented rice varieties were used as a potential food source of India and other countries also. These rice varieties contain more amounts of micro as well as macro-nutrients along with secondary metabolites. They are named after the pigments present in the rice bran. Around 80% of production are utilised for the domestic consumption. India is the largest consumer of rice. Especially black rice contains essential amino acids like lysine, tryptophan; vitamins such as vitamin B1, vitamin B2, folic acid; it is a good source of minerals including iron, zinc, calcium, phosphorus and selenium. It is a good source of fibre and plant-based protein. Also contains the highest number of antioxidants, protein and dietary fibre. An antioxidant is responsible for preventing, delaying or removing oxidative damage of a target molecule. Antioxidants act as an inhibitors of oxidation process and shows positive physiological effect on the body. So, this rice has a huge nutritional benefit against the several physiological damages leads to potential therapeutic development.

**Ameliorative Effect of Lycopene on Chlorpyrifos Induced  
Hepatotoxicity and Nephrotoxicity in Male Albino Rat**

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**Abstract**

The present study was conducted to investigate the protective effect of lycopene against hepatotoxicity and nephrotoxicity induced by most widely used Organophosphate insecticide Chlorpyrifos (CPF). Eighteen male albino rats were selected for this study and divided into three groups containing six rats in each group. Control group received normal food and water. CPF treated group received 6mg/kg BW/day CPF and lycopene treated group received 10mg/kg BW/day through gavages from 28 days. CPF caused liver and kidney injury evidenced by elevated serum levels of alkaline phosphatase, acid phosphatase, bilirubin, urea, creatinine and uric acid levels. The antioxidant enzyme activities like Catalase, Superoxide dismutase, Peroxidase activities and their expression pattern were decreased significantly but conjugated dienes and malondialdehyde levels in testicular tissue were elevated in respect to control. Histological study revealed significant alteration in liver and kidney in CPF treated experimental group. Glutamate oxaloacetate transaminase and glutamate pyruvate transaminase activities were measured in liver and kidney and it is significantly restored in control group after lycopene treatment. It has been concluded that lycopene has protective effect on Chlorpyrifos induced hepatotoxicity and nephrotoxicity in male albino rats without any side effects.



## **Role of forest resources for improvement of rural livelihood based on forest proximity**

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### **Abstract**

Forest resources are providing wide range of services and product to forest fringe rural people, it constitutes integral part of livelihood framework those living within it. The present study we have selected two forest dominant district of West Bengal, one is Jhargram and another is Paschim Medinipur district, there had 1,700 sq. km forest cover, about 14.31% forest cover among state and villages are classified different stratum consider to distance from forest such as Interim village, Fringe village and Outer village. Through the focussed group discussion and 540 household surveys deeply know about source of local economy, sources of household income, dependency on forest, infrastructure of household and investigate the reason of economy diversification in different village's stratum. We use different statistical analysis like as ANOVAs test for known variance and multivariate analysis to know about variance of forest dependent in different forest range. The results of the study reveals out the forest dependency is significantly differ across the study village stratum ( $F(2,357) = 992.27$ ;  $P < 0.05$ ), Agricultural income was significantly differ ( $F(2,357) = 48.26$ ;  $P < 0.05$ ) and livestock income also significantly differ ( $F(2,357) = 162.64$ ;  $P < 0.05$ ). In this study we also observe outer villager more earn from livestock than interim or fringe villager because transport-communication and market chain are not proper developed in interim village. This study also depicts that source of income and standard living is significantly different (pillai's trace result is  $F=89.056$ ,  $P < 0.001$ ). However the present study contributes significant aspect of rural community and helps the public and private sector to make policy for adjoining forest dominant rural livelihood development.

**Volavetki (*Panna microdon*, Bleeker, 1849) sea fish masses: an emerging anti-diabetic natural source**

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**Abstract**

**Introduction:** Type 2 Diabetes mellitus (T2DM) is a habitual metabolic complaint characterized by patient hyperglycemia. It may be due to disabled insulin stashing, resistance to supplemental conduct of insulin, or both. In 2021, according to IDF 10th Edition that 1/10 people aged 20-79 have diabetes. This equates to 537 million people in the world. By 2045, this number will increase to 784 million. There is a strong need for effective intervention strategies and policies to stall the increase in the number of people developing diabetes. **Objective:** we have formulated a research design with a supplementation of fish mass to control the hyperglycemia of T2DM rats, which will be disseminated among the diabetic population after proper trial and error on human. **Methods:** At first, we prepared the fish mass (SFM) from volavetki (*Panna microdon*, Bleeker, 1849) sea fish and fed to fish mass diet (FMD) to streptozotocin (STZ, 4 mg/100g) induced T2DM rats for 28 days. There were three groups of each group (n=5) rats were subjected to induce T2DM except the control group. After 28 days, we assessed fasting plasma parameters such as glucose (FPG), glycosylated hemoglobin (HbA1c), glucagon-like peptide-1 (GLP-1), dipeptidyl-peptidase 4 (DPP-4), insulin, C-peptide. **Results:** Hypoglycemic activity of volavetki sea-fish mass was proved by significantly (p< 0.05) lowered FPG, HbA1c, and DPP-4 in volavetki sea fish mass supplementation rats than T2DM group of rats. Fasting plasma insulin, C-peptide and GLP-1 were significantly (p< 0.05) increases by sea fish mass supplementation than non supplementation group. **Conclusion:** It has been revealed that volavetki sea fish mass supplementation was confirmed as anti-hyperglycemic supplementation.

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## **Synergistic Antibacterial Activity of a Bacteriocin with Some Medicinal Plant Extracts to Enhance its Therapeutic Efficacy**

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### **Abstract**

Bacteriocins are antimicrobial peptides produced by several bacterial species, including food-grade lactic acid bacteria (LAB) that are heat-stable and ribosomally formed. These antimicrobial peptides have great potential as both medicinal agents and food preservatives. They can be used in place of antibiotics to combat diseases that are multi-drug resistant. They demonstrated antiviral, anticancer, and antibiofilm effects in a few recent studies. The synergistic interactions of these bacteriocins with other bioactive compounds, such as antibiotics, phages, organic acids, nanoparticles, and essential oils, can enhance these capabilities. The combined effect of bacteriocin and extracts from a few medicinal plants that the locals of Medinipur, West Bengal employed during microbial illness on skin is the main focus of this study. Due to the participation of many mechanisms of action, the combined product demonstrated a decreased rate of the development of antibiotic resistance. These synergistic combinations also have the important benefit of lowering the concentration of each antibacterial component, which lessens undesirable side effects like toxicity. Additionally, combining bacteriocins with other substances can increase their efficacy as antiviral or anticancer drugs. The combined effect of bacteriocin and extracts from a few medicinal plants that the locals of Medinipur, West Bengal employed during microbial illness on skin is the main focus of this study. This will assist in the development of more modern, powerful, and affordable antimicrobial agents.

## **Women Education in India: An NSSO analysis**

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### **Abstract**

Women have greater returns than that of men regarding education which can reduce gender inequalities and accelerate the pace of economic development (Balatchandirane, 2003). Besides, women are empowered by education and it enables them to fight against social challenges, to liberate themselves from the bondage of traditional role in households and bring about changes in their life. Not only that they are being discriminated even in terms of caste. In this context our study attempts to analyse the nature and pattern of access to education by women in India across social groups. Unit level secondary data from four national sample survey rounds have been used for the study. Gender parity index and order logit model are used to analyse data.

Result shows that literacy among women gradually increasing over time. There is gradual decrease in gender disparity against female in all level of education. In 2018 gender disparity persists against female only in technical and vocational training and in attending pre-school intervention programme. Studying across social castes-general, SC and ST exhibits that the gender disparity is larger in ST, the most marginalized caste than that in SC and general caste in case of women education.

**An empirical study on impact of Covid-19 pandemic on consumer behaviour on the demand pattern of automobile industry in India and analysing the barriers of consumers while purchasing car using Fuzzy AHP**

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**Abstract**

Due to the covid-19 outbreak, automobile industry is one of major industries which has been affected badly. Buying a car becomes a necessity rather than luxury in this Covid-19 outbreak. Hence the demand for new cars increases day by day and as a result automobile industry are facing huge problem to maintain their supply chain stable enough. In this paper, we aim to determine the impact of SARS-CoV-2 virus on how consumer behaviour changes due to the higher demand pattern and the effect of lead time provided by the automobile industry and to analyse the demand of new and pre-owned cars to ensure the safety and economic stability. To achieve this objective, after developing questionnaire we had collected 340 samples from the market and the collected data was evaluated with the help of chi-square testing. The finding of our result shows that due to higher lead time, a significant effect on demand pattern of automobile industry which leads lesser demand of new car and increases the demand of used car. Additionally, we focus on the barriers while purchasing during covid 19 pandemic. We adopt a flexible decision-making methodology based on fuzzy analytic hierarchy process (FAHP) to categorize and compare the barriers.

## **Gender Inequality in the Status of Child Deprivation in West Bengal, India**

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### **Abstract**

The early childhood is a time of both wonderful opportunity and immense vulnerability. Children need responsive care in order to live, learn, grow, and develop to the best of its ability. Being healthy as a child is essential for a nation to remain healthy as a whole. However, children in developing nations are known to be more susceptible to unfavourable socioeconomic circumstances. Children who lack access to a healthy diet and vaccinations continue to be underweight, stunted, and wasted. It is necessary to analyse their health status in order to fully understand their condition. Further, since discrimination based on gender in every sphere of life is it at home or outside is quite evident in a patriarchal nation like India, therefore an analysis of the child health based on their gender gains momentum. Thus, the present study analyses the status of child health in West Bengal from a multidimensional perspective and disaggregates it on the basis of their gender in order to catch the effect of discrimination persisting in the society. In order to do so, we have considered the NFHS unit level data of the latest two rounds. The present study contributes to the existing literature from methodological perspective as well by formulating a child deprivation index using a multidimensional approach. Together with that, we have unearthed the factors influencing the health status of the children based on their gender. It analyses the role of female education and women's empowerment in reducing gender bias in child health in West Bengal.

## **Continuity and change of patron-client relation in community-based craft industry in present context: a case from West Bengal**

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### **Abstract**

In the present-day context, community-based patron-client relationships are not so common because many changes occur in the rural economy and agrarian structure. The present study reveals that despite various crises and challenges a good number of Malakar craftspeople still associated with these relationships as 'service caste'. Malakar's and their craft products have a significant role in the religious and socio-cultural life of the villagers. The present study is based on an intensive empirical study among the Malakars of four villages of West Bengal, is an attempt to understand the nature of jajmani service in the community-based craft industry in the present context. The study also throws light on the changing generational trends, major factors responsible for the changes in the relationship between service receiver and service giver, and why involvement and position of Malakar's decrease in the present market exchange system. A total number of 301 participants were purposively selected from 68 households of four studied clusters. Data have been collected through using observation method, semi-structured interviews, case studies, and genealogical method employing purposive convenience sampling frame. The present study proposes that sustainable business craftspeople should develop and adopt a cultural industry framework in the present studied contexts.

**Seasonal variation along Damodar River surface water quality,  
West Bengal, India**

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**Abstract**

River water quality is controlled by point and non-point sources of pollution. Point sources are fixed throughout the year, but non-point sources vary with the surface runoff regulated by the amount and frequency of rainfall. This study focuses on the 24 water quality parameters on 11 monitoring sites from 2014 to 2019. Seasonal water quality has been analysed with the Canadian Council of Ministers of the Environment (CCME) water quality index (WQI). The worst water quality is found in the Monsoon season followed by post-monsoon and pre-monsoon. River water is unsuitable for drinking and bathing without conventional treatment (Category-A and Category-B) but can be used after conventional treatment (category C). Linear discriminant analysis (stepwise mode) is used to filter significant variables with seasonal variation. Ammonia, dissolved oxygen (DO), potassium, and coliform bacteria are the most influential variables responsible for seasonal variation. The discriminant function classifies the seasonal variation with 74 % accuracy, and the stepwise discriminant function filters the significant variables with 71 % accuracy. Increasing water volume may not always dilute the pollutant and improve water quality but may degrade the water quality with the contribution of non-point sources.



**Ranking Search Results in Library Information Systems  
considering Popularity Ranking Factors: A Framework based on  
Single Valued Neutrosophic Sets**

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**Abstract**

Search results of the Library Information System (LIS) are not displayed as users like to see them because of poor consideration of ranking factors and weights assigned to them. Consequently, problems with user satisfaction exist with the existing practices. There are six groups of ranking factors, namely, Text Statistics, Popularity, Freshness, Locality and Availability, Content Properties, and User Background. The objectives of the study are to discuss the factors related to the ranking of search results in LIS, to assign the weights of each factor of popularity group considering the subject experts' opinion, and to determine the ranking of search results based on Single Valued NeutrosophicSet (SVNS) theory. A systematic review of the concerned literature shows that there exists no such study that considers all factors and assigns weights to the factors like the proposed study which ensures the novelty of the present work. The factors mentioned can be considered when designing a ranking model for a library information system, designing Web-scale Discovery Tools (DT) or when discussing such a project with an Integrated Library Management System (ILMS) vendor.



## **FT-NIR for rapid, non-invasive detection of adulteration in ghee**

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### **Abstract**

Ghee is one of the most commonly adulterated products in India. The study of the compositional fatty acid analysis of ghee also shows changes in the feeding pattern of the cow. In India, Reichert Meissl value and Butyro Refractometer readings are used to arrest adulteration and food fraud. This study aimed to evaluate the FT-NIR for the rapid detection of ghee and differentiate between adulterated and non-adulterated ghee. For this purpose, in 2019, 36 samples of ghee were collected from markets in West Bengal and analyzed using FT-NIR, and the data were analyzed using the butter-fat calibration model. The results show a significant drop in the lower chain fatty acids. There is a considerable difference in the cis 9-18:1 content, so overall, there was about a 23% drop in saturated fats, an almost 20% increase in monounsaturated fats, and another 4% increase in the polyunsaturated fats for the adulterated ghee sample compared to unadulterated ghee. The findings were also validated along with Reichert Meissl's value and Butyro Refractometer readings. The result highlights the usefulness of the FT-NIR and butter fat model as an alternative to GC-MS/MS analysis which requires costly chemicals.

## Developing Sanskrit as an Object-Oriented Programming Language

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### Abstract

Sanskrit, considered as the greatest treasure was born in India. Sanskrit grammar, Ashtadhyayi is invented by Indian great mathematician Panini. The Ashtadhyayi's unambiguous property led to consider it as a Natural Language for Artificial Intelligence (AI) in Machine Translation (MT). The study found that the application of computers on Sanskrit not only used in MT but coding in the Racket environment and developing OS (SOIL: Sanskrit Operating System for Indian Languages) label also.

The Unicode (UTF-8) standard Consortium for text formats has assigned the Unicode hexadecimal range 0900 - 097F for Sanskrit characters.

**Purpose:** Our main objective is to develop Sanskrit as an Object-Oriented Programming (OOP) language which will glean to the computing system in MT as well as coding in Sanskrit.

#### **Property of OOP on Sanskrit:**

**Encapsulation:** Framework to place the data and the functions together in the same object  
*Example: The word representation in Sanskrit is not done according to the objects.*

**Inheritance:** In C++ language it is called multiple Inheritances, in which a derived class inherits its feature from other many classes.

*Example: "Jal", "Baraf" and "Basphe" these three are different as per their shape but all are inherited from of "Pani".*

**Polymorphism:** One interface and multiple methods.

*Example: Karak, Vibhakti Rule: there is a rule of Sanskrit grammar which states that words having the same vibhakti represent the same object and not different objects.*

**Data Abstraction:** Providing only essential information to the outside.

*Example: Sandhi & Samaas.*

**Practical Implication:** To model, the Paninian procedure requires creating data structures and a framework that allows one to approximate the statement of Paninian rules in an executable language.

**Strategy of Fulfilling Nutritional Requirements of Village Adolescent Girls by Cheap and Commonly Available Fruits and Vegetables at Post Covid-19**

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**Abstract**

The future of any society depends on the pool of teenagers of this age and they are a very important human resource of the future society. A holistic child development plan is needed to make human resource development worthwhile. To make the holistic development plan of adolescent girls successful, health education, nutrition, lifestyle, vocational education, government services should be increased. Covid-19 has been particularly effective in affecting the physical and mental health of teenage girls. Objectives of the study are 1) to find out the nutritional requirement of adolescent girls as proposed by Government norms. 2) to find out the nutritional deficits of adolescent girls in the post covid period. 3) to find out the strategy of fulfilling nutritional requirements of village adolescent girls by cheap and commonly available fruits and vegetables at post covid-19 Period. The Study is a descriptive type. Data is collected from schools, various books, Government orders and statistics. After analysing the data findings are reached. One adolescent girl needs to consume 2010 kcal energy, 55 gm protein, 35 gm fat, 27 mg iron daily (ICMR-2010). Village adolescent girls can easily meet their daily nutritional needs by consuming puffed rice, green vegetables, citrus fruits, milk, egg etc.

## Selecting Alternate Landfill Sites in Midnapore Municipality: A GIS Based AHP Study

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### Abstract

Landfill site is the ultimate destination of municipal solid waste. Landfill site selection is a critical issue in the urban planning process because of its enormous impact on the local environment, human health and economy of the region. Municipal solid waste of Midnapore municipality is openly dumped at Dharma dumping ground without any prior treatment. Capacity of the dumping ground already exceeded which result in spilling of litter to the surrounding areas along with the split of leachates. Soil water and atmosphere of the ambient areas are highly polluted. This necessitates immediate closure of present dumping ground and proper waste disposal at suitable located sanitary landfill. Selecting suitable landfill sites is a complex and time-consuming task, which needs an assessment on multi criteria of environmental and socio-economic component. To select the suitable landfill site, we have used Analytical Hierarchy Process (AHP) method on GIS platforms. The main goal of this study was the initial evaluation and selection of alternate landfill sites through AHP based on multicriteria approach. Entire process follows CPCB guideline which includes environmental criteria as river, water body, forest, land elevation, slope; socio-economic criteria like distance from road, railway, settlement, industry, agricultural land. The identified factors are grouped by sub-criteria according to the appropriateness for solid waste landfill and was ranked under 1-5 scale indicating highest to lowest suitability respectively. The weighted linear combination was performed for modelling suitable sites. Four alternate sites are selected with a comparative assessment. It will help municipality authorities to select the most suitable site based on practicality for execution.

**Variation of Sediment Characters between Beach and Adjacent  
Dune: Study on Jaldha Beach**

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**Abstract**

Beach-Dune complex is the highly interacted part of coastal system. Environmentally and geomorphologically stable beach depends upon the nature of this interaction. Mechanism within the beach-dune complex is understood from sedimentological analysis. In the present study sediment samples from surface as well as vertical walls of the trenches are collected for textural analysis. 5 trenches are cut from different positions of beach cross section. The dune samples are collected surface and vertical layers at 2 cm and 19 cm depth. Collected samples are sun dried and textural fractions are distributed by shieving. Geomorphological setup of the enter system are surveyed by total station. Dune sands are found to be finer than the beach. Beach sands are 'moderately-well' to 'moderately' sorted where dune sands are mostly 'moderately' sorted. Beach sands are deposited under high fluctuating wave condition under variable wave settings, whereas, dune sands are transported form dry beach under low tide condition being selectively picked up by the dominant wind. In the area under study, beach and dune strongly interacted indicating the stable system.

**Demographic and economic status mapping of slum area of small towns: A case study at Purulia Municipality of West Bengal**

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**Abstract**

The condition of slums in urban area is one of the major issue for the urban local bodies (ULB'S). Slums are the face of urban poverty and illiteracy. Demographic pattern and Economic status of the slum people is generally poor and pathetic because lack of basic amenities. This paper present and discusses primary data from a survey of 660 house hold taken from different of slums located under 22 wards in Purulia municipality, West Bengal. It attempts to examine the demographic and socio economic aspects of slums surveyed in this paper in terms of slum population, density, education, caste, religion, housing, health, occupation, income, age sex structure etc. The analysis is based on both primary and secondary data collected from different sources i.e., Census of India, various district statistical hand book, municipality office, remote sensing data and published articles. The statistical data have been analyzed through Excel data tools and GIS techniques for cartographic presentation of the study. Lastly some suggestions were given for inclusive development and improve of slums status.



## **Consequences Of Awareness Intervention Program Depending On Theory Of Planned Behavior Regarding Routine Immunization And Mass Vaccination Among Tribal Community**

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### **Abstract**

Schedule tribes of India have invariably lowest full immunization coverage (FIC) throughout the decades. Present longitudinal quasi-experimental study was TPB-based awareness intervention for behavior change among tribal women regarding routine vaccination. Control and experimental group participants were selected through multi-stage random sampling. Awareness package was delivered twice at six months interval only to the experimental group. Multiple regression analysis, independent sample *t*-test, one-way repeated measures ANOVA tests were performed at  $p < 0.05$  of significant level. At baseline, no statistical difference found between control and experimental group. The experimental group participants had significantly better score of knowledge, subjective norms, and intention except attitude and perceived behavior control scores towards vaccination at midline. At endline, significant improvement had seen in all measured variables in compare to midline except perceived behavior control ( $p = 0.091$ ). Whereas participants in control group did not have significant change in knowledge, attitude, subjective norms, perceived behavior control, intention scores at baseline, midline and endline evaluation. Overall, the TPB-based intervention was effective in improving immunization status of the tribal women without any undesirable negative consequences. Sequential intervention program and continuous support of community health worker would create sustainable environment for full immunization through vaccination in tribal community.

## **Socio-Economic Impacts on Health Status: A Study on Sabar Community in Tulibar Village, Chilkiharh, Jamboni, Jhargram**

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### **Abstract**

Scheduled tribes of Janglemahal, eastern fringe of Chotanagpur plateau region are socio-economically backward and marginalised ethnic groups. The present study aims to understand the impact of socio-economic conditions on health status of Sabar community in Tulibar village, Chilkiharh G.P., Jamboni, Jhargram. To assess the socio-economic condition education, occupation, income, monthly expenditure and landholdings have been considered. Anthropometric parameters like height (m) and weight (kg) have been measured to calculate Body Mass Index (BMI). Medical history and medication system are studied to understand the health conditions. 55 sample from entire Sabar household (29 household) have been studied. BMI shows that 36 % of female and 29 % of male are underweight as per WHO standard level. Socio-economic conditions are represented by using statistical analysis and Engle's ratio. Engel's ratio shows that 30 % of family belongs to relatively poor to poorest category. Most of the family have no land holdings and they are agricultural labour. Lion's share of their family income is spend for their two times meal. Carbohydrate is their staple food. Dietary intakes shows that per day calorie consumption is very less among the Sabar community. Overall general health conditions are not found satisfactory. Most of them suffer from different water borne diseases and deficiency in vitamin A and D. Deficiency in nutritional conditions leads to poor health status of this community which again hinders their further future development.

**Source to sink Sediment connectivity between Soil erosion hotspot and the major Dams in Damodar River Basin**

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**Abstract**

The concept of “connectivity” is increasingly being employed in hydrology, sedimentology, and landscape science. Landscape connectivity is a primary control upon catchment-scale fluxes of water and sediment (Fryirs and Brierley, 2013). The increment of soil erosion intensity and sediment yield in the upper region of Damodar basin has directly related to the capacity loss of reservoir and dams (Maithon, Panchet, Tenughat, Konar and Tilaya) in Damodar catchment. Therefore, it is necessary to examine the linkage between the soil erosion hotspots (SEH) and the sediment connectivity (IC) to the large dams for understanding the capacity loss of reservoir. The analysis has been done for the time period of 1990 to 2021. In 1990, the SEH areas in the catchment of Maithon, Pacnchet, and Tenughat dams are showing 450 sq km, 615.90 sq km, and 1065.01 sq km, respectively, which are increased to 453.97 sq km, 709.93 sq km, and 1264.94 sq km respectively, in 2021. More than 34.12 % areas were showing the very high to high sediment connectivity (SCI) for the year of 1990, whereas, 37.22% and 34.36% areas are showing for the year of 2005 and 2021 respectively. Identical sediment connectivity (SCI) has been found in the sub-basins of sub-basin 6 (SB6), sub-basin 7 (SB7), sub-basin 8 (SB8), sub-basin 11 (SB11), sub-basin 12 (SB12) and sub-basin 19 (SB19) for the period of 1990 – 2021. The SB6, SB7 and SB12 sub-basins are found to be the more connected from the SEH to the main stream network and the major dams.

## **Women Reproductive Health: Role of Cultural Practices in India**

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### **Abstract**

Menstruation is the most crucial component of reproductive health that integrates physical, mental, and social well-being of women. This is a normal physiological process which is differentially perceived in different societies. There are diverse cultural practices with regard to menstrual health and hygiene among different ethnic groups in India. The present article has two objectives: first, to assess the knowledge, attitudes and practices among the adolescent girls towards their reproductive health; and second, to examine the role of cultural practices like myths, misconceptions, taboos, customary laws and superstitions on menstrual health behaviour. Based on the available resources it is found that different socio-cultural practices disseminate negative or misleading information among the adolescence girls, which ultimately hamper their knowledge regarding menstrual hygiene and safe practices. Socioeconomic factors like age, education, and economic background are also found to play a crucial role in shaping the reproductive health behaviour.

## **Study on the Effects of Training on Physiological Variables of Female Football Players**

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### **Abstract**

Background: Playing football required a high level of cardio-respiratory fitness. Training may increase these variables in football players. Objective: The present study has been designed to find out the effects of training on selected cardio-respiratory variables of female football players. Method: A total of 60 female football players (age: 16-18 yrs) participated for this study, were divided into control group (CG, n=30) and experimental group (EG, n=30). The volunteers of EG followed a training schedule (2 hrs/d, 5d/wk, for 4 wks), whereas no training was followed for CG. Selected cardio-respiratory variables were measured at the beginning (0 week) and at the end (4 weeks) of the study. Paired sample t-test was performed to find out the differences in selected cardio-respiratory variables. Results: A reduction ( $P<0.05$ ) in resting heart rate, systolic blood pressure; and an increase ( $P<0.05$ ) in  $VO_{2\max}$ , FEV1, FVC and PEFr were noted after 4 weeks of training among the volunteers of EG. No changes in cardio-respiratory variables were observed in CG after 4 weeks. Conclusion: Training may improve the cardio-respiratory variables. Regular monitoring of cardio-respiratory variables is essential for optimize the health status and improving performance of the female football players.

## **Urban-to-urban interaction and its impact on urban development of Purulia district, West Bengal**

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### **Abstract**

Rapid population increment of towns, increasing demand for urban-related facilities and availability of better transport facilities accelerate the process of urban-to-urban interaction. It will be interesting to understand the pattern of this interaction over a socio-economic deprived region like Purulia district, West Bengal. So, the aim of the present study is to analyse the urban-to-urban interaction of the towns of this district. The district's twenty-eight towns are grouped based on the distance between each other like the North-Eastern, Central, Southern and Western town groups. The Synthesized Gravity Model (SGM) has been applied to identify the pattern and intensity of interaction between the towns for the town groups. To quantify a town's influential factor on another town, the study needed to identify a set of socio-economic variables, and data was collected based on a questionnaire method against these variables. The result of the study shows that in each of the selected town groups, the interaction has occurred from small to big town oriented and this interaction system has a massive impact on urban development. The suggested planning recommendation based on the study will be very helpful for planners for sustainable urban planning of the statutory as well as census towns.

## **Impact of Swasthya Sathi Project on Perceived Service Quality – A Study on Rural Healthcare of West Bengal**

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### **Abstract**

For providing a sustainable healthcare support to the residents of West Bengal – a state of India, Government of West Bengal has introduced a universal health protection scheme named as “SwasthyaSathi” with an objective to save and support the residents from enormous expenditures of treatment at private healthcare units. This study explores its impact on the perceived service quality amongst the residents of five districts of West Bengal. Perceived service quality is measured as the difference between patient’s expectation score of the service and the perceived score of the service they received actually. A tailor-made questionnaire, based on SERVQUAL model, is used to capture the service quality ratings. Data was collected from 227 respondents who haven’t enrolled for the scheme yet and from 432 respondents who have already enrolled. Out of these 432 respondents, 392 respondents have availed the service of this scheme in last 6 months. Data analysis reveals that the implementation of the project has significantly improved the perception of state sponsored healthcare services. Moreover, this project has enabled the people from lower income group to avail the services in private healthcare institutes, which is otherwise out of bound for them.

**Shifting Livelihood Practice to Non-farm activities leading towards Unsustainable Resource Management: Study in Padiha Village of Lalgarh Gram Panchayat, Jhargram District, West Bengal, India**

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**Abstract**

The socio-economic livelihood is the “making of living” which includes capabilities, assets and activities which are the main requirements for the way of living of rural tribal people. The main perspective of this study is to correlate the physical environment with its socio-economic characteristics of the forest fringe Santhal dominated Padiha village and its 1.5 km. buffer zone for understanding the present livelihood and livelihood possibilities of rural people. The study region has moderate dominance of *sal* forest on undulating lateritic terrain. The tribal community of this region is traditionally engaged in cultivating crops and rearing of livestock. A tendency of shifting from farming activities to non-farming activities including 100 days' work and construction labour, liquor making etc. is observed in the present study due to non-profitable nature of farming activities. Farming is constrained out of water stress, infertile soil and undulating land. In this context local tribal people are forced to depend on *sal* forest for both timber and non-timber forest products. Sometimes they commute a long distance in search of job. Previously they could produce their own food by farming in their lands and thus they could ensure their food security. In extreme cases like the prolonged lockdown during Covid-19 pandemic they had to suffer much as the livelihood system shifts towards unsustainable non-farming activities. The age-old traditional livelihood practices based on rational management of natural resources like land, water, soil and forest through community wisdom and traditional environmental knowledge is undermined by the popular practice of non-farming activities which might be non-sustainable in long run.



**A SWAT-based approach on Determining Sediment Inflow and Volume Loss in the Reservoirs of Damodar River Basin.**

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**Abstract**

The Impoundment of the rogue river is one of the major infrastructural works materialised during the early phase of the post-independent period in our country. Damodar river is one of the first rivers in our country which is dammed for flood control and irrigation purposes. The latest hydrographic survey of the reservoirs conducted in the late 1990s and early 2000s. The study shows that close to one-third volume of the reservoirs has been lost to sedimentation. The major objective of this study is to identify the current status of sedimentation in the reservoirs of the Damodar basin. In this study, the SWAT model coupled with a remote sensing-based technique is used to estimate sediment inflow in the reservoir. Multidate satellite images are used to extract the areal spread of water. The trapezoidal formula is used to calculate the new water-holding capacity of the reservoirs. The SWAT model is further calibrated and validated using the daily flow data in Durgapur station with the help of the Nash–Sutcliffe coefficient method.

## **Role of plant growth promoting microbes in enhancing plant tolerance to heavy metals**

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### **Abstract**

Overuse of chemical pesticides in agriculture and other human activities have a direct or indirect impact on heavy metal contamination as a result of fast industrialisation. The ecology and human health are seriously threatened by heavy metal poisoning of soil. Due to their non-biodegradability and toxicity, heavy metal pollution in contaminated soil has a significant negative impact on plants. Physical and chemical procedures are used in traditional treatment of heavy metal contamination in contaminated soil. But they are expensive, time-consuming, and also cause problems with secondary pollution. As a result of its cost-effectiveness and eco-friendliness, microbe-assisted phytoremediation has a substantial impact today. Heavy metals can be effectively immobilised by plant growth-promoting microorganisms (PGPM). The bacterium known as plant growth-promoting rhizobacteria (PGPR) demonstrates a bioremediation method for stabilising and remediating heavy metal contamination.

**Preparation of newly formulated rice fermented food with ameliorative properties against obesity**

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**Abstract**

The present study has been aimed at preparing the rice based fermented food with the herbal starter (0.5% w/w) of *Elephantopus scaber*(root) and examined its therapeutic potentialities against diet induced obesity. Male mice (15.22±0.68g) were randomly separated in four groups like normal diet (ND), high fat diet (HFD), HFD along with microbe's free fermented product (HFDC) and HFD with fermented product (HFDT). After 8 weeks of experiment, the fermented food supplementation (HFDT) leads to significant lowering of body and organs' weight, improvement of the serum glucose, lipid profile, insulin, leptin, adiponectin levels, and histoarchitecture of liver and adipose tissue than the HFD and HFDC group. Upregulation of fatty acid oxidation and simultaneously down regulation of adipocytogenesis and lypogenesis related genes were also revealed by the supplementation of fermented food. These data clearly demonstrated that the newly formulated rice based fermented product is very significant to alleviate obesity and can be explored as a functional food against life style related diseases.

**Micro-morphology of circulating immunocytes of African Giant land snail *Lissachatina fulica*, against yeast**

Soumen Roy<sup>1,\*</sup>, Korak Kanti Chaki<sup>1</sup>, and Kamales Kumar Misra<sup>2</sup>

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**Abstract**

The molluscs possess mainly innate response and phagocytosis of immunocytes is considered as main responsive cells in the immune system. The light microscopy and electron microscopy studies reveal that *Lissachatina fulica* possesses three distinct populations of immunocytes as small Group I cells, Group II cells, and Group III cells. The Group II cells are subcategorised into agranulocytes, small granulocytes and large granulocytes. The Group III cells have three subclasses Type-A, Type-B, and Type-C Group III cells. To study the defence responses of the immunocytes, the yeast (*Saccharomyces* sp) solution is injected into an artery of the snail. The plasma proteins have an important role along with circulating immunocytes against invading antigen/yeast. The circulating immunocytes of the snail possess a memory type response against previously encounter antigen. The SEM studies show prominent phagocytosis/invagination mark of yeast on the cell surface. The TEM studies show the different kinds of nuclear and cytoplasmic characteristics in the immunocytes. The cytoplasm of the cells consists of rough endoplasmic reticulum, mitochondria, Golgi vesicles, lysosomes, glycogen granules, and granulated vacuoles. Time course analyses of yeast treated haemolymph propose that after initial rapid immunologic responses the immunocytes are gradually retarded from defence response against once invading antigen.

**Iron status and prevalence of Anemia in association of genetic polymorphism of multiethnic males and females in some blocks of Jhargram district**

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**Abstract**

In tribal populations, anemia is important risk factor for the health of the backward area of multiethnic males and females in Jhargram district. This study aims to estimate the prevalence of anemia among males and females, to screen the iron status like serum iron, serum ferritin and total iron binding capacity (TIBC) and to assess the genetic polymorphism of rs4820268 of transmembrane protease serine 6 (TMPRSS6) genes. The investigations were carried out in psychologically healthy males and non-pregnant females (a total of 910 with 10-80 years of age). This study reports a high prevalence of anemia, with 58.13% of women from the tribal population suffering from Anemia. Among the total population, 44.96%% showed moderate anemia, 22.11% showed mild anemia and 32.91% showed severe anemia. Significant portions of tribal woman are anemic belonging to the 41-60 age groups. Iron deficiency anemia indicates low serum iron (SI) and serum ferritin (SF) levels with high total iron binding capacity (TIBC) levels. The rs4820268 located at the position of chr.22: 37073551 in the whole genome of human . The alleles are G>A/C/T. Our analysis interpreted that patients group shows A/G transition at the position of rs4820268 whereas control group shows A/C transversion.

**Smart Nanotherapeutic Agent for the Treatment of Anemia and Associated Disorders: Bench-To-Bedside Preclinical Trial**

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**Abstract**

The typical course of treatment for anemia and exclusively for anemia caused by inflammation in patients is supportive care plus lifestyle improvement. It may be severe and even life threatening in some cases. There is no effective therapeutic strategy available till date. As the inflammation, erythropoiesis and oxidative stress is the major issue in this case, it pushes us to use a transition metal oxide nanomaterial having erythropoiesis stimulation and redox modulation properties in physiological milieu. The preventive and therapeutic efficiency of the nanomaterial in physiological system against anemia was evaluated in phenylhydrazine intoxicated C57BL/6j animal model of anemia. Single oral dose of the nanomaterial efficiently prevented the progress of anemia as well as cured from anemia within two days in study mice without any toxicological side effects. In vivo and in vitro data suggests that nanomaterial successfully demonstrated its preventive and therapeutic potential via its dual mechanism of action i.e. enhancing the erythropoiesis and tackling oxidative stress generated in physiological milieu. These preliminary results may therefore open the door to a cost effective and secure therapeutic application of the transition metal oxide nanomaterial as a fast-acting treatment for anemia, particularly anemia of inflammation in patients.

**Olfactory responses of female *Callosobruchus maculatus* (F.) on four varieties of *Lathyrus sativus* L. seed volatiles**

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**Abstract**

*Lathyrus sativus* Linnaeus (Fabaceae), commonly known as khesari, is an important winter pulse crop cultivated for the production of seeds in India, Pakistan, Bangladesh, China, and Ethiopia. *Callosobruchus maculatus* (Fabricius) (Coleoptera: Bruchidae) is an important stored grain pest of *L. sativus*. Volatile organic compounds (VOCs) from the seeds play an important role in insect-seed interaction. Hence, the role of long-range volatiles from four varieties i.e., Bio L 212 Ratan, Nirmal B-1, WBK-14-7, and WBK-13-1 of uninfested khesari seeds was studied, which can act as olfactory cues to attract the insect, *C. maculatus* under laboratory conditions. The volatiles were collected and 23 volatiles were subsequently identified from four varieties of uninfected and healthy khesari seeds. The olfactory responses of female *C. maculatus* towards volatile blends from four varieties of khesari seeds, and individual synthetic compounds and their combinations were examined through Y-shaped glass tube olfactometer bioassays. *C. maculatus* showed significant preference for the whole volatile blends from Bio L 212 Ratan seeds compared to whole volatile blends from other three varieties of khesari seeds. Further, the insect exhibited attraction to five individual synthetic compounds, 3-octanone, 3-octanol, linalool oxide, 1-octanol and nonanal. A synthetic blend of 448, 390, 1182, 659 and 8114 ng/20  $\mu$ l methylene chloride of 3-octanone, 3-octanol, linalool oxide, 1-octanol and nonanal, respectively, was most attractive to *C. maculatus*, and hence, this combination might be used for the development of much needed eco-friendly trapping tools for insect pest management programs such as baited traps of the insect pest in postharvest storage of khesari seeds.

**Microbial ecology and antimicrobial profile of zooplankton  
adherent *vibrio* species: A lesson for sustainable environment**

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**Abstract**

Study of zooplankton associated microbial ecology, an important factor to control the infectious threat in present day. Zooplankton, a biotic carrier of pathogenic bacteria, where copepods are dominant carrier in our study sites. Soar of copepods in aquatic environments depend on changes of varied climatic factors viz., fluctuations of water temperature, pH, DO and other water parameters. 72% of outbreak due to the *Vibrio spp.*, were reported in 5 states of Indian territory, where West Bengal (17%) placed at second position. Present research emphasis on determining the abundance and antimicrobial susceptibility vs. resistant profile of *Vibrio spp.*, inhabiting the waterbodies of West Bengal (East Medinipur district), India. Antimicrobial profile and bacterial association were done by Vitek-2 compact system and Field Emission Scanning Electron Microscope (FE-SEM), respectively. Newly bacterial isolates showed the different antimicrobial profiling against selected antibiotics during the study period. Present outcomes show that the resistivity patterns of *vibrio spp.*, so required proper survey-surveillance programs in the surveyed area. Hence, this research evokes a new dimension in sustainable environment in context of utilization of surface water by common peoples and human health for their safety.



**Natural Suppression of infestation of Mealy bug  
(*Maconellicoccus hirsutus*) in Mulberry and China rose using  
organics inputs**

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**Abstract**

Mealy bug (*Maconellicoccus hirsutus*) is one of the most destructive pests of forest trees, root crops, fruit plants, Leafy vegetables, horticultural crops etc. Incorporation of inorganic fertilizer for an extended period can affect susceptibility of plants to insect pests by altering plant tissue nutrient level. Crops grown in organically soils generally exhibit lower abundance of several insect herbivores. The investigation aimed at the use of organic amendments that might be helpful in pest resistant management strategy for mealybug in China rose (*Hibiscus rosa-sinensis* L), and mulberry (*Morus alba* L). The field experiments had been conducted in lateritic soil condition in specific areas of Midnapur (West) and Bankura Districts, West Bengal. The field experiments were set up in randomized block design having five treatments with three replications. The results revealed that the effect of vermicompost in combination with biofertilizers and reduced doses of inorganic fertilizers imparted significant effect on leaf productivity and infestation of pests of mulberry and China rose. It was observed that the population of the insect pests like mealy bug, significantly reduced below the economic threshold level in the experimental plots treated with different organic manures along with biofertilizers and reduced dose of NPK over control.

**Study on dimethoate hydrolase, a bioremediating amido hydrolase from *Sphingomonaswittichii* strain DC-6: An approach through bioinformatics**

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**Abstract**

Dimethoate is a widely used organophosphorus insecticide often detected in the environment for its frequent use in agricultural practices. Dimethoate hydrolase, a bioremediating amidohydrolase enzyme from *Sphingomonaswittichii* strain DC-6 is responsible for transforming dimethoate to dimethoate carboxylic acid and methylamine. Here we have systematically investigated the molecular evolution, protein structure, compositional analysis, correspondence analysis and codon usage bias of the protein from the *Sphingomonaswittichii* strain DC-6 in fifty-six (56) selected microorganisms. The protein and species-specific phylogenetic trees constructed using amino acid sequences of dimethoate hydrolase and homologous proteins. In multiple sequence alignment (MSA), numerous conserved, semi-conserved and non-conserved sites were identified that indicate acquired mutation during evolution. The correspondence analysis (COA) based on RSCU values demonstrated that the selected proteins prefer G/C ending codons over A/U ending codons *i.e.*, G/C ending codons are comparatively more preferable. These comprehensive computational studies can be beneficial for further studies and conceptual advancement in molecular phylogenetics, genomics and proteomics that may be contributory for better understanding of the evolutionary dynamics of dimethoate hydrolase, one of the key enzymes for Dimethoate-the organophosphate pesticide biodegradation, being prospective in developing a pollutant-free healthy environment.

**Effect of selected two herbicides on the physiological parameters  
of *Xenylla welchi*  
(Borner, 1906)**

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**Abstract**

*Xenylla welchi* was used to assess toxicity of two herbicide formulations, Pendimethalin (30EC) and Pretilachlor (50EC) under laboratory conditions. The RAD values of selected herbicides were 750mg/kg for Pendimethalin and 300mg/hg for Pretilachlor in soil. The acute toxicity test i.e., 24 hours mortality has shown the determined LC<sub>50</sub> value was less than their corresponding RAD. The significant mortality of *Xenylla welchi* was noted which shown that the Pretilachlor is highly toxic over *Xenylla welchi* (LC<sub>50</sub> -72.734 gm/ha) followed by Pendimethalin (LC<sub>50</sub> - 581 gm/ha). For Chronic toxicity study, the sub-lethal doses (mg/kg) were established of both herbicides from RAD value respectively. A significant reduction of hatching success was showed to 1/2, 1/4, 1/6 of LC<sub>50</sub> except 1/8, 1/10 of LC<sub>50</sub> with both herbicide formulations over *Xenylla welchi*. The number of exuvia production was gradually increased in all treatment. Juveniles of *Xenylla welchi* exposed to 1/6, 1/8, 1/10 of LC<sub>50</sub> for Pretilachlor and 1/8, 1/10 of LC<sub>50</sub> for Pendimethalin, depend upon juveniles survived with exposed to Pendimethalin. In case of Pretilachlor, significant reduction of juveniles was noted. 7 moulting in 28 days in both herbicides were noted with the comparison to control. *Xenylla welchi* attained early maturity and short life span in 1/10, 1/8, 1/6 of LC<sub>50</sub> with herbicide formulations.

**Evaluation of enzymatic activity and fungicidal efficacy of  
zooplankton attached bacteria**

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**Abstract**

Present study analysed the diversity and ecology of zooplankton, hydrophytes and zooplankton associate bacteria of freshwater ecosystem. Here, we found four orders (cyclopoida, calanoida, podocopida & anomopoda) of zooplankton under two phyla (Arthropoda, Rotifer). Discontinuous distribution pattern of zooplankton can be seen in the six selected study sites. Total sixty bacterial isolates were screened from zooplankton population, based on their colony morphology (shape, size and arrangement) and Gram nature nine native bacterial isolates were selected for further investigation. These isolates have also been observed to exhibit amylase, cellulase, pectinase, lipase, blood haemolytic activity as well as antifungal activity, in respect of their CZ/CS ratio within the culture medium. All strains are grown at a broad range of pH (3-9), temperature (25°C - 50°C) and salt concentration (1% - 9%) in invitro condition. The study of enzymatic activity shows that in a favourable condition only S3 could produce all possible enzymatic activity except haemolysis property. For determination of antifungal activity newly isolated bacterial species were applied to the lab isolated fungal species. Visual observation of growth inhibition revealed that the isolate S8 performed better antifungal activity in compare to other bacterial strains that is S7, S6, S4 and S5.

**Ultrastructure of the sagitta otolith in different body size groups  
of Banded Gourami *Trichogaster fasciata* (Osphronemidae,  
Anabantiformes)**

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**Abstract**

The otolith morphology is an important tool in taxonomy and various other studies of fishery. Ultrastructural characteristics of the sagitta otolith and the morphometric evaluations of its various descriptors in different body-length groups of the *Trichogaster fasciata* are described by a scanning electron microscope. About fifty-eight sagitta descriptors are studied and analyzed their developmental relationship with the total length of individuals. Development of the thirteen descriptors among the studied sagitta features are directly correlated to the growth of the total length and each of those might be used as an important predictor to evaluate the fish size. Presence of the ortho-rostrum patch in the sagitta is a unique species-specific feature and its development is directly correlated to the growth of the total length. The marginal sculptures of the sagittae are varied in different body length groups. Different shape indices of the sagitta and the sulcus groove are analyzed and established their relative relationship in the different body length groups. The morphostructural features of the sagitta of the *T. fasciata* have some characteristic taxon-specific differences with those of the other Anabantiformes fishes, might be helpful in species identification and in the study of phylogenetic relationships among the fish taxa.

**Effects of heavy metal (cadmium chloride) on freshwater mollusc,  
*Bellamya bengalensis***

<sup>1</sup>Soumyapriya Chakraborty, Swagata Das, Sangita Maity,<sup>1</sup>Sangita Maiti Dutta\*

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**Abstract**

Heavy metals are one of the major persistent, non-biodegradable environmental pollutants that have hazardous impact on living organisms present on this planet. Cadmium and its compounds are extremely toxic to humans as well as aquatic organisms and can produce biotic changes in the aquatic ecosystem. Most of the cadmium discharged to aquatic systems accumulates in sediments where it becomes a risk to benthic biota. *Bellamya bengalensis*, an aquatic gastropod are considered as bioindicator species. In this study, attempt has made to evaluate the biological effects, adaptive abilities and metabolic responses during heavy metal (Cadmium Chloride) stress in aquatic mollusc, *Bellamya bengalensis* in laboratory conditions by testing some biomarkers like Alkaline phosphatase (ALP), Acid Phosphatase (ACP) and Acetyl Cholinesterase (AchE). The main focus is to find out if the effects of heavy metal on aquatic organism like *B. bengalensis* and select one suitable biomarker for environmental monitoring.

**Effects of bifenthrin pesticide on aquatic mollusc *Bellamyia bengalensis***

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**Abstract**

Pesticides are used extensively in agricultural development and controlling different disease causing vectors. Pesticides can be toxic to other non-target and beneficial organisms including human beings. The adverse effects of toxicants produces stress conditions either in the form of physiological and biochemical changes, even death of living organisms. *Bellamyia bengalensis* an aquatic gastropod is considered as bioindicator species, has been selected as experimental model species. The main focus is to find out the effects of pyrethroid pesticides like Bifenthrin on aquatic organisms like *Bellamyia bengalensis* in laboratory condition. LC50 values of bifenthrin have been determined and *Bellamyia* has been treated with 2ppm concentration for 24 hrs to 96 hrs. ALP, ACP activity has been found to increase maximum 1.86 folds and 1.46 folds respectively than control animals. AChE activity has been decrease maximum 0.87 folds than control animals. The data generated from the present investigation could be utilized to develop specific preventive measures for the affected community.

**Study of small indigenous fresh water fish diversity in diggerent villages of Mahishadal block, Purba Medinipur, West Bengal**

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**Abstract**

With numerous small and large ponds, bills, reservoirs, paddy fields, canals, and the estuary part of the Rupnarayan River, Mahishadal is an important location for freshwater fish diversity. The present study focused on availability of the small indigenous freshwater fishes in seven different villages of Mahishadal Block, Purba Medinipur, West Bengal, India. The precise determination of the species in the study area can be obtained from the diversity study. An attempt has been made to present information about their local name, environment, economic value, and conservation status along with colour photographs of as per as fresh fish specimen were provided easy identification of species. During this study, 48 species of freshwater fishes belonging to 11 order, 22 families and 32 genera are recorded. It is obvious that the order Anabantiformes made up majority of the fish species in the Mahishadal Block, contributing to 20.8 % of the total fish species. The most dominant family was Cyprinidae contributing 16.7% of total fish species. Additionally, the study also shows that humans use the most the fish (63%) as food. Out of 48 species, 81% species under Least Concern (LC), 9% species under Near Threatened (NT), 4% species under Data Deficient (DD), 4% species under Not Evaluated (NE), only 2% species that was under Vulnerable (VU) but there is no species which belonging to under endanger. The Shannon-Weiner diversity index and Simpson Dominance index in different sampling Stations of Mahishadal Block shows that fish diversity was high in sampling Stations 3 and 7 as compared to the other 5 Stations. The outcome would certainly improve the understanding of fish species availability in Mahishadal Block for development and conservation processes.



## Introducing a economically sustainable organic Fish preservation technique

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### Abstract

Fish is a globally consumed protein source in our diet. India is the second largest fish producing country in the world with almost 8% of the global production and contributing 1.07 % of India's total GDP. Though India has a large area and also a large fish consuming population, transportation of fish is very costly and risky for the perishable character of Fish. As a solution to this problem we have introduced an organic technique instead of harmful chemical preservatives or high cost physical or other old preservation techniques. During this study we have collected 3 Hilsa fish samples from Shankarpur fishing port. After washing with normal water, 1gm of fish skin is serially diluted upto  $10^{-12}$  and spread into Nutrient Agar plate for isolation of bacteria and spread also into Potato Dextrose Media for fungus isolation. Results of this experiment revealed that the fungal load was  $27 \times 10^{12}$  CFU/gm and the bacterial load was  $38 \times 10^{12}$  CFU/gm. In a 7 days of regular interval we have screened the total microbial diversity of fish samples. Out of total bacteria consortium we have got the *Escherichia coli*, *Streptococcus* sp, *Pseudomonas* sp, *Staphylococcus* sp, *Actinomyces* as responsible for the fish spoilage and out of total fungus we have got *Aspergillus* and *Penicillium* as the spoil causing fungus. After analysis of spoil causing microorganism, different types of natural products are tested as preservatives by disc diffusion method. By applying these organic substances we can introduce a new fish preservation technique which will be more economically sustainable and healthy.

**ZOO-14299871**

**Functional roles of benthic crabs along with their associated microbes in the decomposition process of mangrove plants litter in the integral part of coastal estuarine nutrient cycling**

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**Abstract**

Benthic crabs (Grapsidae, Ocypodidae) in the mangrove ecosystem have been found to play key role as macro decomposers/ degraders of mangrove plant litters by virtue of their foraging activities. The shredding freshly fallen mangrove leaves on the moisture enrich sediments loaded with detritus facilitated the decomposition of mangrove plant litter by the varieties of microbial population which in turn ensure the releasing of readily available nutrients both to the mangrove soil as well as to adjoining aquatic sub-systems. The present paper alongside describing the foraging activities of fiddler crab (*Uca acuta acuta*) and semi aquatic crab (*Sesarm abidens*) and also enumerated the microbial populations from the gut of crabs as well as from the detritus. The major aim the paper is to highlight the functional relationship of water, soil, selected crab species and bacteria.

**A new free-living nematode species *Chronogaster spinata* sp. n.  
(Nematoda, Plectida) from paddy field of East Medinipur,  
West Bengal, India**

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**Abstract**

The genus *Chronogaster* has been found in different habitats like terrestrial, freshwater, marine water and even in hot springs. Along with others morphological characteristics, tail terminus and tail mucro are the key features to identify a new species under this genus. The genus was first described by Heyns and Coomans (1980) and later by Abebe and Coomans (1996). *Chronogaster spinata* sp. n. is characterized by moderate body length, a strong terminal mucro along with two sub-terminal spines. Body wall is strongly annulated, contain strongly developed sub-terminal basal bulb. This newly repoted species has some similarities with *Chronogaster citri* but differ in many morphological characteristics and also in morphometric measurements. *Chronogaster citri* has a conoid tail tip and bears with two spines at the opposite end, carry a small post uterine sac and has only two cephalic setae. On the contrary novel species has a stout mucro (4-5  $\mu$ m) and two spines, cephalic region has four prominent setae and lacks uterine sac. Some species of *Chronogaster* have been reported from India but *Chronogaster spinata* sp. n. will be first from West Bengal.

**Micromorphological and Histopathological analysis of a  
macrobenthic infaunal bivalve- *Glauconome chinensis* from  
West Bengal-Odisha Coast, India**

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**Abstract**

West Bengal-Odisha estuarine mangrove ecosystem represents a productive and dynamic ecosystem enriched with diversified flora and fauna. *Glauconome chinensis*, a macrobenthic bivalve fauna has been presently reported in the intertidal zone of Subarnarekha estuary along the Bay of Bengal. Present study deals with morpho-microanatomical peculiarities of that estuarine infaunal bivalve specimen - *Glauconome chinensis*. The morphological (Shape and sizes of shell, siphon, foot, mantle, gill, digestive system, gonads etc.) and microanatomical (histological features of different parts of body) characteristics of that newly recorded species have been presented. In this present investigation inhalant and exhalent siphons were observed. Shape and microscopic structure of the foot were described. The histochemical and ultrastructural characteristics of mantle were also observed. Internal anatomy and microanatomy of gill were studied. Ciliary and interfilamentar union were observed. Pathological changes of the digestive tubules, channels and connective tissue of the bivalve were recorded. Morphoanatomical features of gonads were also studied. All these observations could benefit the projection and development of that bivalve mollusc, *Glauconome chinensis*.

**Biomonitoring of ecological changes of a protected fresh water wetland through different seasons with study of aquatic insect diversity**

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**Abstract**

Seasonal changes of aquatic insect diversity have been studied for eco-assessment of a natural freshwater wetland within a protected sanctuary, Odisha in order to assign their roles as bioindicators. Comparing the water quality parameters of the wetland, alongside documenting the distribution and abundances of the aquatic insects, through different seasons have enabled to assess the aquatic insects and their interactions with water quality parameters. The methodologies include collection, preservation and identification of aquatic insects following standard methodologies and analysis of water quality parameters (APHA, 2005) from different eco-zones of Rissia Dam, Kuldiha Wildlife Sanctuary, Odisha. A total of 45 different freshwater aquatic insect species of orders Hemiptera, Odonata, Ephemeroptera and Coleoptera have been recorded after undertaking year-long (September'2021 – August'2022) field survey and simultaneous estimation of different ecological parameters have been undertaken. This study highlights the diversity and seasonal occurrences of different aquatic insect species along their functional roles as bioindicators has thrown light in sustaining the ecosystem functioning.

**Ecological and molecular assessment of present status of threatened siluroid fish, *Plotosus canius* (Hamilton,1822) from the Raimangal-Bidyadhari estuarine networks of Sundarban, India**

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**Abstract**

The mangrove estuarine ecosystem of Sundarbans, by virtue of continuous ecological interaction among different structural components (water, soil, flora and fauna), support lives of diversified biodiversity components transforming this unique eco-region as the nursery ground of several fin-fishes and shell-fishes. However, with the continuous and escalating pace of anthropogenic activities, this sensitive and biologically productive ecosystem has been suffering from deterioration of the ecological qualities along with steady decline of the fishery resources. The present study has attempted to undertake detail eco-biological assessment of a threatened fish species (Plotosidae, *Plotosus canius*) through the assessment of their genetical and other morpho-anatomical characteristics with special emphasis on growth rates (length-weight relationships), feeding ( foraging behaviour and gut content analysis) and reproductive activities (breeding periodicity, development of reproductive structures and gonado-somatic index) in the changing ecological conditions, both spatially and temporally. The generated research information are being analyzed to arrive at conclusion relating to the conservation strategy of the same fish species which still is having societal acceptance as revealed from the fact of market surveys.

**Two new species of free living nematode: *Anoplostoma bengalii* sp. Nov. and *Conilia minor* sp. Nov. from the Subarnarekha estuary, Odisha.**

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**Abstract**

Two new species of free living nematode of Sub-order Enoplina are identified from Subarnarekha River estuary: I. *Anoplostoma bengalii* sp. nov. is characterized by elongated buccal cavity with cuticular granule, well developed amphid, cephalated and wavy spicule, strip like gubernaculum, bursal allae with pre-cloacal and post-cloacal papillae, striated male copulatory muscles, female oviparous with protruded vulva. *A. bengalii* sp. nov. distinguish from closely related species *A. paraviviparum* by shorter length in whole body, outer labial setae, gubernaculum, pharynx length, amphid location, weakly cephalated and wavy spicule present, vulvar lip protruded; *A. viviparum* by distinct constriction in head, post-cloacal papillae, vulva anterior, oviparous female, vulvar glands present. II. *Conilia minor* sp. Nov. is specified by elongated body with blunt cephalic end, developed lip, cup shaped buccal cavity with three big teeth, peri-buccal swelling on buccal cavity, obliquely striated single spicule, spatulated gubernaculum, funnel shaped telamons, male tail ventrally bent, glandular pre-cloacal supplement. This species, different from closely related species *Conilia sinensis* by small measurement of organs, presence of funnel shaped proximal spicule and telamons, spatulated gubernaculum, terminal setae on tail; *Conilia monospiculata* by small measurements of organs, presence of striated spicule, spatulated gubernaculum, pre-cloacal supplement, male tail bent ventrally, amphid and telamon absent.

**Optimized Biodegradation of Carcinogenic Fungicide  
Carbendazim by Endosymbiont of *Glyphidrilus tuberosis* from  
Agro-Ecosystem**

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**Abstract**

Carbendazim (methyl 1H-benzimidazol-2-yl carbamate) is one of the most widely used fungicides in agriculture worldwide, but has been reported to have adverse effects on animal health and ecosystem function. Two highly efficient carbendazim degrading bacterial strains were isolated from the gut content of a paddy field earthworm, *Glyphidrilus tuberosis*. Two *Glyphidrilus tuberosis* gut colonies (GTGC), GTGC-1 and GTGC-2, were isolated aseptically and *in vitro* degradation of carbendazim (100 mg-L) by GTGC-1 and GTGC-2 in minimal salts medium (MSM) incubated at 30p C at 120 rpm in shaker incubator. After seven days of incubation, Gas chromatography–mass spectrometry analysis revealed that 99% and 99.5% carbendazim were degraded and only 0.905 mg-L and 0.565 mg-L left for GTGC-1 and GTGC-2. 7,9-Di-tert-butyl-1-oxaspiro(4,5) deca-6,9-diene-2,8-dione and 2-amino-1-phenylethanol are the two major metabolite detected in GCMS.



**Ecology and population distribution pattern of  
*Modiolus undulatus***

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**Abstract**

Population distribution pattern of the species, *Modiolus undulatus* (Mytiloida: Mollusca) are well known. In this present study reflects a new report of the presence of this saline species in riverbank of Haldi river, Purba Medinipur, WB, India. Different body size of *Modiolus* in different parts of the riverbank of Haldi have been found by this study. Different parameters (salinity, pH and DO) of water, depth of shore (m), surface area of brick (sq cm), total colony number, position of colony in the brick have been studied and found a relation with the population distribution. The population distribution is dependent with the salinity & the depth they prefer where the availability of good both the time of high tide and low tide.

**Morphometric and meristic analysis of some puntius species from different villages of Mahishadal block, Purba Medinipur**

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**Abstract**

Four species of the Puntius genus gathered from different villages of Mahishadal Block, Purba Medinipur for morphometric and meristic analysis. In addition to aiding in species identification and determining sexual dimorphism, morphometric and meristic analysis has proven to be very helpful in differentiating species, population, and races. The collected samples were studied for 25 morphometric characters and 8 meristic characters. The Minimum and Maximum Values, Mean, Standard Deviations and Percentages of various characters in Total Length were determined. Few important characters in relation to Total Length, Correlation and Regression analysis was performed. The Correlation Coefficient ranged from 0.213-0.991 for *P. sarana*, 0.290-0.988 for *P. ticto*, 0.243- 0.993 for *P. chola*, 0.583-0.992 for *P. sophore*. The meristic and morphometric characters showed considerable variations in all the four species, helpful for identification, measurement of discreteness and connections between different taxonomic categories.

**Faunal diversity and community structure of aquatic insects in a pond in Paschim Medinipur District, West Bengal, India**

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**Abstract**

The present study was carried out in a manmade weed-infested perennial pond (87°19'5"E and 22°25'9"N) having an elevation of 23 m above sea level. The area of the study site is 1134.75 m<sup>2</sup> with an average depth of 5.4 m. In total 25 aquatic entomofauna were recorded under five orders, 15 families and 21 genera. Order Hemiptera was numerically the most abundant group comprising 52.92% of the total recorded aquatic insects and was represented by six families and 10 species. This order was dominated by the family Notonectidae (29.44%). Order Odonata was the second most dominating group constituting 16.81% and was represented by three families Libellulidae (8.35%), Platycnemididae (4.80%) and Aeshenidae (3.65%). Order Coleoptera, Ephemeroptera and order Diptera were represented by 14.51%, 12.94% and 2.82% respectively. Order Coleoptera was exhibited by four families and six species while orders Ephemeroptera and Diptera both comprised only a single family. Among the aquatic entomofauna one species was subrecedent while recedent, subdominant and dominant groups were represented by fifteen, eight and one species respectively. Community analysis of the aquatic insects revealed that the water body under investigation was in the least stressed condition as indicated by Dominance index (0.11), Shannon-Wiener diversity index (2.76) and Menhinick species richness index (0.81).

**A study on burrow architecture patterns of red ghost crab  
(*Ocypode macrocera*) by casting method and impact of  
developmental activity on a sandy shore at Tajpur, West Bengal**

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**Abstract**

Morphology and architecture of burrow made by *Ocypode macrocera* (red ghost crab) were studied at Tajpur (21.1458° N, 79.0882° E), West Bengal, India. Digging behaviour for making burrow enhances the oxygenation process of soil and act as a bio aid for bioturbation. Shape and size of burrow varies species to species. Each individual has their own burrow. Various patterns of burrow have been observed and they are like 'I' shaped, 'J' shaped, 'Y' shaped. Others unique shaped burrow also have been found. In this present study it was tried to find out the relationship between the burrow size and the tidal action or any other factors which allow them to build different types of burrow pattern. They are highly adapted to various environmental fluctuations.

***Stomastrictus* n.GEN., *indica* n.SP., A new tobrilid, from Haldi River, Geonkhali, West Bengal, India**

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**Abstract**

A new tobrilid, *Stomastrictus n.gen. indica n.sp.* has been described from Haldi River bank at Geonkhali, under Mahishadal block in East Midnapore district, West Bengal, India. It is characterized by comparatively narrower stoma than other genera under Family- Tobrilidae, Triplonchida, followed by two pockets arranged longitudinally one following another. First pocket is attached with base of the stoma and contain two longitudinally arranged teeth, and the second pocket with a small tooth. It is closely related to *Epitobrilus* genus under Tobrilidae but markedly differ in stomatal structure, teeth number and arrangement in pockets. Caudal setae are also absent which also differentiate it from *Epitobrilus*. Besides these morphological features, there are major variations in the morphometric measurements which also make it distinct from others.

**Understanding Behavior and Microhabitat Preference of Dragonfly Larvae Could Help to Control Insect Vectors in Urban Landscapes**

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**Abstract**

Odonata larvae are voracious predators and play an important role as bio-control agents for mosquitoes and flies; thus, can be used to combat vector-borne diseases. Hence it is important to understand the larval behavior and know the microhabitat preferences for species of interest under laboratory conditions. Different dragonfly larvae occupy different microhabitats and are known to be classified as claspers, burrowers, sprawlers and hidiers according to their concealment behavior. The odonata species composition of any waterbody depends on the number of microhabitats present in it. This study was designed to identify the preferred microhabitats by common dragonfly species and to find out the generalist species that can exploit maximum available niches and can be used to control mosquito populations in urban lakes or water-tanks if needed. Larvae of two species of family Libellulidae, *Crocothemisservilia* and *Urothemissignata* was studied under laboratory conditions, in aquariums replicating different possible microhabitats of an urban pond ecosystem. Larvae of both species showed a combination of Claspings and Sprawling behavior. They usually spent time securing themselves attached against substrate like submerged vegetation; stayed immobile when disturbed or kept hiding between leaf litter or submerged leaves. Occasionally the larvae foraged around and grabbed prey actively.

## **Presence of Fly ash in soil decrease paddy plant growth**

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### **Abstract**

Fly ash is considered a hazardous waste, its safe disposal is necessary. The Kolaghat Thermal Power Station (KTPS), located at Kolaghat, Purba Medinipur District, and West Bengal, is one of the largest thermal power stations in Eastern India. Here fly ash is mixed with water, deposited in an ash pond, and further used in irrigation. The current study analyzed the growth of rice plants in the presence of the fly ash in soil under laboratory conditions. We used 1%, 5%, 10%, 50%, and 100% fly ash (collected from KTHP ash pond) mixed with soil and Add 7 days seeds. The lengths of shoots, roots, and chlorophyll content were measured at 7, 15, and 30 days after germination. Drastically deviation was noted in pair sample t-test conducted between differential growths of root, shoot and leaf areas. The leaf area growth deviation shows, (SD = 0.42651),  $t(5) = 2.623$ ,  $p = .047$ , become significant. Rice plant growth significantly decreased even with the presence of as little as 5% of fly ash in laboratory conditions.

**Abstract Volume**

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