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This issue covers Research & Development activities of Dibrugarh University for the Period of 1st April-30th of June, 2022.

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Research Publications in Journals

1. Lakhima Chutia, Narendra Ojha, Imran Girach, Binita Pathak, Lokesh K Sahu, Chandan Sarangi, Johannes Flemming, Arlindo da Silva, Pradip Kumar Bhuyan, ***Trends in sulfur dioxide over the Indian subcontinent during 2003–2019,*** **Atmospheric Environment, 119189.**

2. Binita Pathak, Ankita Khataniar, Barlin Das, Sristisri Upadhyaya, Ankita Medhi, Pradip Kumar Bhuyan, Alak Kumar Buragohain, Debajit Borah, ***Spatio-temporal diversity of biological aerosols over Northeast India: a metagenomic approach,*** **Environ Sci Pollut Res (2022).**

3. Dhruba Jyoti Gogoi, Umananda Dev Goswami, ***Cosmology with a new f(R)f(R) gravity model in Palatini formalism,*** **International Journal of Modern Physics D, Vol. 31, No. 06, 2250048 (2022).**

4. SL Bora, K Bhuyan, PJ Hazarika, J Gogoi, K Goswami**,** ***Analysis of rainfall trend using non-parametric methods and innovative trend analysis during 1901–2020 in seven states of North East India,*** **Current Science 122 (7), 801.**

5. Manashjyoti Konwar, Roktopol Hazarika, Munmi Saikia, Diganta Sarma**,** ***Nickel Chloride Catalyzed Synthesis of Pyrazoles and Phthalazin-1(2H)-ones from Hydrazines at Room Temperature*** **, Tetrahedron Lett., 2022, 98, 153842.**

Abstract: Herein an efficient and simple protocol was developed for the synthesis of pyrazoles and phthalazin-1(2H)-ones from a common precursor hydrazines catalyzed by nickel chloride. The reactions proceeded in water at room temperature. The advantages of the protocol are that both the medicinally important scaffolds could be synthesized with low-cost catalyst, green solvent, relatively lower reaction time and superior yield of the product making the protocol synthetically very useful. Electronically diversed pyrazoles and phthalazinones could be achieved in good to excellent yields in relatively shorter reaction time.

6. Sonia Agarwal, Apurba Dutta, Diganta Sarma, Kalyanjyoti Deori, ***In situ fabrication of HDA-mediated NiFe-Fe_2O_3 nanorods: An efficient and recyclable heterogenous catalyst for the synthesis of 2,3-dihydroquinazolin-4(1H)-ones in water***, **New J. Chem. 2022**.

Abstract: A promising strategy for the synthesis of pharmaceutically important scaffold 2,3-dihydroquinazolin-4(1*H*)-ones through heterogeneous catalysis employing the principle of multicomponent reaction has been presented in this paper. For this purpose, a transition metal comprised catalyst NiFe–Fe_2O_3 has been designed and developed, where Fe_2O_3 is formed *in situ* in the colloidal synthesis of NiFe alloy nanorods at an optimum temperature as confirmed by PXRD, XPS, TEM, HR-TEM, and STEM analysis. For the first time, NiFe alloy-based nanoparticles (NPs) have been synthesized by preparing the nanorod morphology with a mean diameter of 3.57 nm and used in the synthesis of 2,3-dihydroquinazolin-4(1*H*)-ones. Hexadecylamine (HDA) acts as a capping agent, which directs the chain-like assembly of quantum dot-like particles (3–4 nm) and controls the crystal growth only along the *z*- direction to finally design the aforementioned material with a specific morphology. These newly fabricated nanoparticles acted as a highly efficient heterogeneous catalysts in the quantitative synthesis of quinazolinones due to their peculiar exposed surfaces, quantum-sized building blocks, large specific surface area, and porosity. The observed high turn-over frequency (TOF) indicates the availability of highly active surfaces in the catalyst. Hence, an efficient and recyclable catalytic protocol operating at optimum temperature conditions with water as the solvent has been proposed.

7. S. Rohman and R. Kar , ***Excited State Properties of Some Thermally Activated Delayed Fluorescence Emitters: Quest for an Accurate and Reliable Computational Method,*** **J. Phys. Chem. A (2022) 126, 3452-3462.**

8. S. Khargharia, R. Rohman and R. Kar , ***Hybrid molecules of hydroxycinnamic and hydroxybenzoic acids as antioxidant and potential drug: A DFT study,*** **Chemistry Select (2022).**

9. **Bharali** A., Buragohain J., Doley A., QSPR Analysis of Some Novel Extension and Generalization of Sombor Index, Iranian Journal of Mathematical Chemistry, 2022, 13(1), pp.73-84.

Abstract: Although many indices are strongly correlated with various chemical as well as physical properties of a molecular compound but some of them lack proper geometrical interpretations. A newly introduced index called Sombor index is able to catch the attention of the researchers because of its connection with the notion of “2-norm”. In this paper, we propose the status version of the Sombor index. Further, we discuss a generalization of our proposed

index and carry out QSPR analysis. Some mathematical properties of the generalization are also discussed.

10. Chamua, M., Moran, R., Pegu, A., Bharali, A., ***M-polynomial and neighborhood M-polynomial of some concise drug structures: Azacitidine, Decitabine and Guadecitabine,*** **Journal of Molecular Structure, 2022, 1263, p. 133197.**

Abstract: A topological index is a mathematical value associated with a graph. In chemometrics, biomedicine and bioinformatics, it is widely used to predict various physicochemical properties and biological activities of molecules. Neighborhood M-polynomial (NM-polynomial) is one of such polynomials which is used to obtain many degree-based topological indices. Azacitidine, Decitabine (5-aza-20-deoxycytidine) and Guadecitabine (SGI-110) are hypomethylating agents which are used for the treatments of patients with higher-risk myelodysplastic syndromes, chronic myelomonocytic leukemia and acute myeloid leukemia which are not suitable for in-depth treatments such as induction chemotherapy. In this work, we compute some degree-based and neighborhood degree sum-based indices of the three aforementioned drugs in unified manner by using M-polynomial and NM-polynomial. The findings may aid in the development of novel cancer treatment medicines.

11. Mahanta, A., Gogoi, I.J., Bharali, A., ***A note on zagreb spectra and zagreb laplacian spectra of two weighted corona networks***, ***Advanced Mathematical Models and Applications***, 2022, 7(1), pp. 60–68.

Abstract: The paper studies two corona networks, namely weighted corona networks and weighted edge corona networks in association with the Zagreb matrices which have gained popularity in recent times. Herein, we study the Zagreb spectra in terms of two different corona structures and also study their Laplacian and signless Laplacian Zagreb spectrum.

12. Gogoi, I.J., Chamua, M., Bharali, A., ***Computation of Ms-Polynomial and Topological Indices of Boron Kagome Lattice***, **Biointerface Research in Applied Chemistry, 2023, 13(1), p. 59.**

Abstract: In chemical graph theory, numerical encoding of chemical structure associated with topological indices is growing immensely. Prediction of the characteristics specified by the molecule's chemical structure is a salient feature of these topological indices. In this paper, we obtained the M-polynomial of the two-dimensional Boron Kagome Lattice. Some topological indices defined based on the degree of vertices can be computed gradually using the

contemplated M-polynomial of this lattice. Further, we also provide the graphical representation of the M-polynomial and computed topological indices for the same.

13. Laba Handique, Subrata Chakraborty and Farrukh Jamal, ***Beta Poisson-G family of distributions: its properties and application with failure time data,*** **Thailand Statistician, (ESCI, Scopus). E- ISSN: 2351-0676, e-ISSN: 1685-9057. 20 (2): 308-324.**

Abstract:

Poisson-G family is extended to propose beta Poisson-G family of distribution. Useful expansions of the probability density function and the cumulative distribution function of the proposed family are derived as infinite mixtures of the Poisson-G distribution. Moment generating function, power moments, entropy, quantile function, skewness and kurtosis are investigated .Illustrative numerical computation of moments, skewness, kurtosis and entropy are tabulated forselect parameter values. Estimation of model parameters by methods of maximum likelihood is discussed. A simulation experiment is carried out under varying sample size to assess the performance of estimation. Finally, suitability check of the proposed model in comparison to a few recently introduced ones is carried out by considering two life time data sets modeling.

14. Vishwa J. Baruah, Rasana Paul, Dhrubajyoti Gogoi, Nirma Mazumdar, Subrata Chakraborty, Aparop Das, Tapan K Mondal and Bhaswati Sarmah. (2022), ***Integrated Computational Approach towards Discovery of Multi-targeted Natural Products from Thumbai (Leucasaspera) for attuning NKT cells***, **Journal of Biomolecular Structure & Dynamics (SCI, Scopus). ISSN: 0739-1102. e-ISSN: 1538-0254. 40 (7), 2893-2907. 10.1080/07391102.2020.1844056.**

Abstract:

A multiomics-based approach targeting the plant-based natural products from Thumbai (Leucas aspera), an important yet untapped potential source of many therapeutic agents for myriads of immunological conditions and genetic disorders, was conceptualized to reconnoiter its potential biomedical application. A library of 79 compounds from this plant was created, out of which 9 compounds qualified the pharmacokinetics parameters. Reverse pharmacophore technique for targetfishing of the screened compounds was executed through which renin receptor (ATP6AP2)

and thymidylate kinase (DTYMK) were identified as potential targets. Network biology approaches were used to comprehend and validate the functional, biochemical and clinical relevance of the targets. The target–ligand interaction and subsequent stability parameters at molecular scale were investigated using multiple strategies including molecular modeling, pharmacophore approaches and molecular dynamics simulation. Herein, isololiolide and 4-hydroxy-2-methoxycinnamaldehyde were substantiated as the lead molecules exhibiting comparatively the best binding affinity against the two putative protein targets. These natural lead products from L. aspera and the combinatorial effects may have plausible medical applications in a wide variety of neurodegenerative, genetic and developmental disorders. The lead molecules also exhibit promising alternative in diagnostics and therapeutics through immuno-modulation targeting natural killer T-cell function in transplantation-related pathogenesis, autoimmune and other immunological disorders.

15. Subrata Chakraborty, Laba Handique and Farrukh Jamal. (2022), ***The Kumaraswamy Poisson-G family of Distribution: its properties and applications***. **Annals of Data Science, 9 (2):229–247. (Scopus), p-ISSN: 2198-5804; e-ISSN: 2198-5812. . https://doi.org/10.1007/s40745-020-00262-4.**

Abstract:

In this paper, a new family of lifetime distribution named as the Kumaraswamy Poisson-G distribution is proposed. This model is obtained by mixing the distribution of the minimum of a random number of independent identically Kumaraswamy-G distributed random variables and zero truncated Poisson random variable. The density and survival function are expressed as infinite linear mixture of the Poisson-G distribution. Some mathematical and statistical properties such as quantile function, skewness, kurtosis, probability weighted moments, moment generating function, entropy and asymptotes are investigated. Numerical computation of moments, skewness, kurtosis and entropy are tabulated for a particular distribution of the family with select parameter values. Parameter estimation by methods of maximum likelihood is discussed. Extensive simulation study is carried out under varying sample size to assess the performance of the estimation. A selected distribution from the

proposed family is compared with some recently proposed ones by considering two failure time data fitting applications to justify the suitability of the proposed models.

16. Aniket Biswas, Subrata Chakraborty and Viswajyoti Boruah. (2022), ***Estimation of the proportion of true null hypotheses under sparse dependence: Adaptive FDR controlling in microarray data***, **Statistical Methods in Medical Research (SCI, Scopus, Medline). ISSN: 0962-2802. e- ISSN: 1477-0334.**

Abstract:

The proportion of non-differentially expressed genes is an important quantity in microarray data analysis and an appropriate estimate of the same is used to construct adaptive multiple testing procedures. Most of the estimatorsfor the proportion of true null hypotheses based on the thresholding, maximum likelihood and density estimation approaches assume independence among the gene expressions. Usually, sparse dependence structure is natural in modelling associations in microarray gene expression data and hence it is necessary to develop methods for accommodating the sparse dependence well within the framework of existing estimators. We propose a clustering based method to put genes in the same group that are not co-expressed using the estimated high dimensional correlation structure under sparse assumption as dissimilarity matrix. This novel method is applied to three existing estimators for the proportion of true null hypotheses. Extensive simulation study shows that the proposed method improves an existing estimator by making it less conservative and the corresponding adaptive Benjamini-Hochberg algorithm more powerful. The proposed method is applied to a microarray gene expression dataset of colorectal cancer patients and the results show gain in terms of number of differentially expressed genes. The R code is available at https://github.com/aniketstat/ Proportiontion-of-true-null-under-sparse-dependence-2021.

17. Ardhendu Benerjee, Subrata Chakraborty and Aniket Biswas. (2022), ***Statistical issues in modeling happiness level of immigrants: an investigation with WHR, 2018***, **Thailand Statistician (ESCI, Scopus). E- ISSN: 2351-0676, e-ISSN: 1685-9057. 20(1): 195-206.**

Abstract:

World Happiness Report (WHR) released in 2018 among others, ranked the countries around the world with respect to the happiness level of immigrants measured in ladder-score from 0 to 10. Regression analysis with happiness score as response and several important determinants (covariates) has also been reported in that study with usual least square assumptions for finding important covariates and prediction purposes. First, we point the statistical problem out in doing so and attempt modeling this happiness level by first dichotomizing the response (as either happy or unhappy) and then employing binary regression with the given covariates. The risk associated with miss specification of the link functions is demonstrated by considering four popular choices and a new data driven computational routine based on assessment metrics and cross validation is prescribed to choose the best link function. Important covariates are reported thereafter considering the best choice.

18. Kuki Kalpita Mahanta and Pranjeet Borah, ***A Study on Sales of Vishal Mega Mart at the Jorhat Store***, **Assam Economic Journal. Vol-30. ISSN: 0970-7530.**

Abstract:

Vishal Mega Mart is a popular shopping mall in India. The customers get almost all their needed products in the same stores of Vishal Mega Mart. They also offer huge discounts to their customers during festive seasons as well as in normal seasons. So in this study an attempt has been made to study the sales of Vishal mega Mart, Jorhat store established in 2008 and the effectiveness of the discounts during festive season. The data are secondary in nature and it is collected from the records of the store. Simple bar diagram and Correlation analysis are used to analyze the data. Five years predictions of sales of the store are also forecasted here applying exponential smoothing method.

Key words: Vishal Mega Mart, festive discounts, correlation, forecasting, exponential smoothing method.

19. Bhattacharjee, Subham and Arindita Goswami, ***A glimpse into Guar- the secondary mortuary rite of the Saoras of Dibrugarh: A case study***, **Bulletin of the Department of Anthropology, Dibrugarh University, ISSN : 0976-2264.**

Abstract:

Death is an unchanging truth in everyone's life but it is conceptualized differently in different societies. To combat this phase of losing a close one, most societies developed mechanisms of

rites and associated it with the cycle of re-birth and after world. These prescribed rituals try to subvert the status quo from bereavement so that balance and harmony can be re-established in the family. The Saora is a great ancient tribe of India whose mentions are even found in great epics such as Mahabharata, Ramayana and other religious texts by different names. They are mainly distributed in the states of Orissa, Andhra Pradesh, Madhya Pradesh, Bihar, etc. In the 19th century, they must have probably been brought by the British for clearing forests for tea gardening in Assam. The present paper is an ethnographical study on Guar, a secondary mortuary rite of the Saora people of Pathaliabam Saora Line village, Dibrugarh, Assam. It intends to shed light on their beliefs, worldview, norms and values, economy and social networks. The paper provides both conceptual and operational clarity of all the rites of passage, the role of religious functionaries who have specific duties to be performed, important places where the rituals take place, and the antiquities that are required in the rites. Guar can be considered as a hallmark of Saora tradition. Guar is elaborately performed by family members with the faith to liberate the spirits of deceased ones from the human world and proceed towards heaven. The Saora people of Pathaliabam Saora Line village, Dibrugarh, Assam have come a long way from their original place of habitation in and follow an economy different from their counterparts in those places. So, the paper also tries to answer the question of whether such pristine and colossalcustoms and rituals of the Saora people have been touched by the phenomenon of change in the wake of their migration to and establishing permanent settlement in Assam.

20. Geetanjali Devi, ***Temples as Cultural Heritage Monuments: A Study on Sukreswar and Janardan Monuments of Guwahati, Assam***, **Bulletin of the Department of Anthropology, Dibruagrh University, Volume: 49, ISSN 0976-2264.**

Abstract:

The present study concentrates on two Hindu religious monuments or temples namely, Sukreswar and Janardan located at the southern bank of river Brahmaputra at Panbazar in Guwahati. The temples under study were constructed under royal patronage and hence bear architectural, archaeological and historical significance. Researches undertaken on the temples of Assam and also at the mainstream level focuses on the architectural style, sculptural design, origin and development of the temple type at great length. However, elements like the current state of affairs of the temples in terms of structure and function as an integral part of the present time from the anthropological stance also deserves attention. With this standpoint, the present paper attempts to understand the existence of the temples under study with regard to the spaces created for and devoted to specific purposes. After surveying the temples or the religious monuments under study it was found that in spite of the monument's natural aging process, the

modifications due to human inferences was a challenge to the survival of the monuments. It can be said that these temples are adjusting structurally with time. More number of structures are acquiring attached to the temple. Although these structures are constructed keeping in view the exigencies of the devotees and also for successful holding of the religious practices, but since these are historical constructions and an important part of the nation's shared, common cultural heritage, hence their protection and conservation is society's common responsibility so that these can be safely handed to the future generations with full richness and credibility. Anthropogenic modifications especially in an urban landscape further ameliorates the natural inevitable aging process of a monument. The eminence of the monuments shall not get altered in the name of modernization and urbanization.

21. Kalyani Pathak, Ratna Jyoti Das , Neelutpal Gogoi, Riya Saikia, Himangshu Sarma, Aparoop Das, ***A validated high-performance thin-layer chromatography method for the simultaneous determination of quercetin and gallic acid in Annona reticulata L,*** **Journal of Planar Chromatography – Modern TLC. vol. 35, no. 1, pp. 1-7.**

Abstract: A sensitive and reliable high-performance thin-layer chromatography (HPTLC) method has been developed to simultaneously estimate quercetin and gallic acid in *Annona reticulata* L. The methanolic extract of the leaf of *A. reticulata* L. was performed to detect standard marker compounds like quercetin and gallic acid by the automatic TLC applicator. The plate was developed using toluene–ethyl acetate–formic acid (9:10:1.6, *V/V*) as the mobile phase, and detection was performed by densitometric scanning at 254 nm. The system was found to give well-resolved bands for quercetin (standard) at *R*F = 0.71 and gallic acid(standard) at *R*F = 0.63 from other constituents present in the leaf extract of *A. reticulata* L. The spectral analysis of standard gallic acid and sample in the HPTLC study confirmed the presence of gallic acid in the plant extract. The average recovery of quercetin and gallic acid was found close to 99%, suggesting the accurateness of the method. The proposed validated HPTLC method offers a new, sensitive, specific method for the quantification of quercetin and gallic acid in *A. reticulata*L . The presence of the phytochemicals like quercetin and gallic acid in the leaves of *A. reticulata* L. supports the view that the leaves could be a potential source of natural antioxidant, anti-inflammatory, and anti diabetic drugs.

22. Riya Saikia, Aparoop Das, Kalyani Pathak, Neelutpal Gogoi, Tirna Paul, Jon Jyoti Sahariah, Himangshu Sarma , ***In-silicodesign,synthesis and evaluation of hydroxyxanthone derivatives as potential anti-diabetic agents targeting α – glucosidase***, **Current Enzyme Inhibitions http://dx.doi.org/10.2174/1573408018666220627114552.**

Abstract: Glucosidase is a catalytic enzyme that catalyzes, specifically hydrolyses, the carbohydrates to free glucose units in blood in the last step of carbohydrate metabolism. So far, many compounds with α-glucosidase inhibitory activity for example, acarbose, voglibose etc., have been accounted and commercialized for diabetes therapy. However, Xanthones are recognized as efficient glucosidase inhibitors because of their planar structure and thereby opens the door for the researchers to utilize the same for designing and developing potent and novel hybrid xanthones for anti-diabetic therapy. Objectives: The current study aimed to determine and evaluate the anti-diabetic potential of different synthetic hydroxylxanthone derivatives using Nicotinamide and Streptozotocin(60mg/kg i.p.) induced diabetic rats. Methods: The partially purified synthetic hydroxyxanthone derivatives namely A1, A2, A3, A4, and A5 were administered to diabetic rats with a dose of 150mg/kg, per oral(p.o.) and the effect of the fraction on blood glucose level was studied upto 21 days. Further, the synthetic compounds were subjected to spectral analysis for their characterization. Results: The in-silico molecular docking results indicated that the compound A3 has shown the best binding energy score. Also, the in-vivo anti-diabetic potential of the synthetic hydroxyxanthone derivatives have revealed that the compounds A3 and A2 were significantly effective in controlling the blood glucose level when compared to the standard drug miglitol. In addition, compounds A3 and A2 were found to be effective in restoring the enzymes of liver and lipid profile in Streptozotocin-induced Wistar rat models. Conclusion: With an objective to investigate the compounds for predicting biological activity, it was found that the hydroxyxanthone possesses a safety margin for toxicity and acts as a lead towards the development of potential α-glucosidase inhibitors. These compounds show excellent correlation between docking results, synthetic data and in-vivo anti-diabetic activity. However, further modifications can be done to enhance the potency, binding affinity profile and minimize toxicity.

23. Kalyani Pathak, Urvashee Gogoi, Riya Saikia, Manash Pratim Pathak, Aparoop Das, ***Marine-derived antidiabetic compounds: an insight into their sources, chemistry, SAR, and molecular mechanisms***, **Studies in Natural Products Chemistry, http://dx.doi.org/10.1016/B978-0-323-91097-2.00004-2.**

Abstract: Type-2 diabetes (T2DM) is a chronic metabolic disease that can only be managed with a healthy lifestyle comprising diet, exercise, and proper medication. To manage T2DM, a person has to take anti-diabetic drugs for a long time which may result in adverse reactions as well as other associated complications. So, there is a search for antidiabetic drugs from the marine origin which are reported to be highly efficacious in T2DM. Although numerous new marine-derived metabolites and bioactive compounds are being reported to be anti-diabetic, a multi-level approach based analysis on molecular investigations at genomic, metagenomic, transcriptomic, metatranscriptomic, proteomic, and metabolomic levels is essential to discover these resources and further explore key molecular processes involved in their production and action. Due to the lack of proper literature on in-silico elucidation of promising marine

compounds, either some of them show sub-therapeutic activity or some are reported to be cytotoxic in various in-vitro studies. Two compounds (7E)-9-oxohexadec-7-enoic acid and (10E)-9-oxohexadec-10-enoic acid from the marine algae Chaetoceroskarianus were reported to be anti-diabetic however, further synthetic approach following SAR analysis exhibited dual Peroxisome proliferator-activated receptor (PPAR) α/γ agonist activity. Another marine drug candidate, compound 14n, is hypothesized to be a better interaction structure for binding to the Protein tyrosine phosphatase 1B (PTP1B) enzyme with stronger activity and better selectivity if the cyclohexane ring is further modified by adding a long alkyl chain and hydrogen bond donor. Two bromophenols, 2,4,6-tribromophenol and 2,4-dibromophenol, isolated and purified from the red alga Grateloupiaelliptica were found to possess high α -glucosidase inhibitory activity. It is possible that the degree of bromination in these molecules may have a strong relationship with their α-glucosidase inhibitory activity. This chapter deals with the current developments and upcoming challenges in the field of bioinformatics, chemical and molecular analysis of certain marine-derived bio-active compounds showing efficacy against T2DM.

24. Manash Pratim Pathak, Kalyani Pathak, Riya Saikia, Urvashee Gogoi, Mohammad Zaki Ahmad, Aparoop Das, ***Immunomodulatory effect of mushrooms and their bioactive compounds in cancer: A comprehensive review,*** **Biomedecine and pharmacotherapie 149(21): 112901, http://dx.doi.org/10.2174/ 15734080186662 2062711 4552.**

Abstract: Despite enormous development in the field of drug development, cancer still remains elusive. Compromised immunity stands as a roadblock to the successful pharmacological execution of anti-cancer drugs used clinically currently. Recently some breakthrough cancer treatment strategy like nano-formulation, extracellular vesicles treatment, natural antioxidant therapy, targeted immunotherapy, gene therapy, thermal ablation and magnetic hyperthermia, and pathomics and radiomics has been developed and tested pre-clinically as well as clinically. However, clinical efficacy of such therapies is yet to establish and some are too costly to be utilized by patients from poor and developing countries. At this juncture, researchers are heading towards the search of medicines from natural sources that is higher safety margin and multitarget pharmacological efficacy compared to conventional treatments. Mushroom is used traditionally as food as well as drug since time immemorial due to its immunomodulatory effect which is loaded with proteins, low fat content and cholesterol. Mushrooms are recommended as one of the best vegetarian diets for immunosuppressed cancer and HIV/AIDS patients. Mushrooms are well-known for their anti-cancer activity that impacts hematopoietic stem cells, lymphocytes, macrophages, T cells, dendritic cells (DCs), and natural killer (NK) cells in the immune system. This comprehensive review article emphasizes on the molecular mechanisms of cancer genesis, conventional anti-cancer therapy as well as reported some significant breakthrough in anti-cancer drug development, anti-cancer activity of some selected species of mushrooms and their bioactive phytoconstituents followed by a brief discussion of recent anti-cancer efficacy of some metallic nano-particles loaded with mushrooms.

25. Surovi Saikia, Aparoop Das, Yashwant Pathak**,** ***Gold Nanoparticles in Cancer Theranostics***, **Nanocarriers for Drug-Targeting Brain Tumors https://doi.org/10.1016/B978-0-323-90773-6.00010-5.**

Abstract: Removal of cancer tissues does not always leads to disease on early detection promoted by poor prognosis and limited options for therapeutic availabilities. The use of nanoparticles (NPs) as detectors is widely used in recent years for cancer cell detection. Cancer diagnosis and therapy is expected to leap in the coming times with the development of NPs. Gold NPs (AuNPs) exhibit favored physical properties and tailored functionalizations which provide the foundation for developing cancer theranostics. Cancer imaging techniques using AuNPs surface plasma resonance (SPR) are excellent imaging probes and are adaptable by changing its shape, size and compositions. AuNPs are also used to detect target biomolecules, their accumulation while functionalized AuNPs are employed for early stage detection *in-vitro* and *in-vivo*. Nanoporous Au and hollow NPs are other two potent candidates for surface enhanced Raman scattering (SERS) substrate which are highly active, biocompatible, reusable, and stable. Besides imaging cells, AuNPs are also used for *in-vivo* CT scans and decorated AuNPs have transformed the anatomical based cancer diagnosis to molecular imaging. AuNPs have also shown good results in photodynamic (PDT) and photothermal therapy (PTT) along with delivery of drugs. High atomic number and non-toxic nature of AuNPs have made them suitable candidates as radiosensitizers and their usages are dependent on factors such as surface coating, concentration, shape, size and cell types. This book chapter reviews the favoured physiochemical properties of AuNPs, therapeutic strategies employed, their design for early detection and local treatment in using AuNPs as theranostics in oncology.

26. Gahtori A, Pargaien A,Ghosh SK, Bhat HR, Kumar V, Singh UP, Gahtori P**,** ***Implicit, Intrinsic, Extrinsic, and Host Factors Attributing the COVID-19 Pandemic. Part 3-Host Factor GDP: A Systematic Analysis***. **Research square, doi.org/10.21203/rs.3.rs-1498170/v1.**

27. Rudrapal M, Gogoi N, Chetia D, Khan J, Banwas S, B Alshehri, Alaidarous MA, Laddha UD, Khainar SJ, Walode SG, ***Repurposing of phytomedicine-derived bioactive compounds with promising anti-SARS-CoV-2 potential: Molecular docking, MD simulation and drug-likeness/ADMET studies.*** **Saudi J Biol Sci. 2022; 29 (4): 2432-2446.**

Abstract: In view of the potential of traditional plant-based remedies (or phytomedicines) in the management ofCOVID-19, the present investigation was aimed at finding novel anti-SARS-CoV-2 molecules by in silicoscreening of bioactive phytochemicals (database) using computational methods and drug repurposingapproach. A total of 160 compounds belonging to various phytochemical classes (flavonoids, limonoids,saponins, triterpenoids, steroids etc.) were selected (as initial hits) and screened against three specifictherapeutic targets (Mpro/3CLpro, PLpro and RdRp) of SARS-CoV-2 by docking, molecular dynamics simulationand drug-likeness/ADMET studies. From our studies, six phytochemicals were identified as notable ant-SARS-CoV-2 agents (best hit molecules) with promising inhibitory effects effective against protease(Mpro and PLpro) and polymerase (RdRp) enzymes. These compounds are namely,

ginsenoside Rg2,saikosaponin A, somniferine, betulinic acid, soyasapogenol C and azadirachtin A. On the basis of bindingmodes and dynamics studies of protein-ligandinteractions, ginsenoside Rg2, saikosaponin A, somniferinewere found to be the most potent (in silico) inhibitors potentially active against Mpro, PLpro and RdRp,respectively. The present investigation can be directed towards further experimental studies in order toconfirm the anti-SARS-CoV-2 efficacy along with toxicities of identified phytomolecules.

28. Rudrapal M, Celik I, Khan J, Ansari MA, Alomary MN, Yadav R, Sharma T, Trina Tallei TE, Pasala PK, Sahoo RK, Khairnar SJ, Bendale AR, Zothantluanga JH, Chetia D, Walode SG, ***Identification of bioactive molecules from Triphala (Ayurvedic herbal formulation) as potential inhibitors of SARS-CoV-2 main protease (Mpro) through computational investigations,*** **Journal of King Saud University – Science. 2022; 34 (2022) 101826.**

Abstract: Severe acute respiratory syndrome coronavirus disease (SARS-CoV-2) induced coronavirus disease 2019(COVID-19) pandemic is the present worldwide health emergency. The global scientific community facesa significant challenge in developing targeted therapies to combat the SARS-CoV-2 infection.Computational approaches have been critical for identifying potential SARS-CoV-2 inhibitors in the faceof limited resources and in this time of crisis. Main protease (Mpro) is an intriguing drug target because itprocesses the polyproteins required for SARS-CoV-2 replication. The application of Ayurvedic knowledgefrom traditional Indian systems of medicine may be a promising strategy to develop potential inhibitorfor different target proteins of SARS-CoV-2. With this endeavor, we docked bioactive molecules from Triphala, an Ayurvedic formulation, against Mpro followed by molecular dynamics (MD) simulation(100 ns) to investigate their inhibitory potential against SARS-CoV-2. The top four best docked molecules(terflavin A, chebulagic acid, chebulinic acid, and corilagin) were selected for MD simulation study andthe results obtained were compared to native ligand X77. From docking and MD simulation studies,the selected molecules showed promising binding affinity with the formation of stable complexes atthe active binding pocket of Mpro and exhibited negative binding energy during MM-PBSA calculations,indication their strong binding affinity with the target protein. The identified bioactive molecules werefurther analyzed for drug-likeness by Lipinski's filter, ADMET and toxicity studies. Computational (in silico) investigations identified terflavin A, chebulagic acid, chebulinic acid, and corilagin from Triphala.

29. Patowary L, Borthakur MS, Zothantluanga JH, Chetia D, ***Repurposing of FDA approved drugs having structural similarity to artemisinin against PfDHFR-TS through molecular docking and molecular dynamics simulation studies***, **Curr Trends Pharm Res, 2022; 8 (2): 14-34.**

Abstract: Malaria is caused by five species of Plasmodium parasites.It is responsible for causing more than 200 million people malaria positive and kills more than 400,000 people every year. Toxicity, price, bioavailability issues and the emergence of drug resistance have doubled down the suitability of the drugs. To tackle theseproblems, it was aimed to identify FDA-approved drugs having structural similarities to artemisinin and carried out *in-silico* based drug repurposing study against *Plasmodium falciparum* dihydrofolate reductase-thymidylate synthase (PfDHFR-TS). Similarity search, molecular docking, visualization of ligand interactions,

bioactivity prediction, and molecular dynamics (MD) simulationtechniques were used in the study. The co-crystal inhibitor (RJ1) of PfDHFR-TS was used as the positive control. A total of 144 FDA-approved drugs were found to have similar chemical structure with artemisinin. Molecular docking revealed 10 drugswith binding affinities higher than RJ1 and theywere subjected to further studies.Tasosartan, exemestane,metolazone, ketazolam and cloxazolamwere removed from the study from the initially selected 10 drugs as they showed poor ligand interactions and poor enzyme inhibitory potential. MD simulations(10ns)revealed that indapamide formed the most stable protein-ligand complex.Indapamide is a thiazide-like diuretic belonging to the class of sulfonamides. The drug has a high binding affinity for PfDHFR-TS, good ligand interactions and good enzyme inhibitory potential. It has beenconcluded that indapamide has the potential to be repurposed for PfDHFR-TS. Its scaffold may also be used to design and develop newer antimalarial agents.

30. Abhijit Boruah, Nayan M. Kakoty, Tazid Ali & M. B. Malarvili, ***Shape oriented object recognition on grasp using features from enclosure based exploratory procedure***, **International Journal of Intelligent Robotics and Applications (Springer), Volume 7.**

Abstract: The potential of humans to recognize known objects while grasping, without the help of vision, is an exciting supposition to the robotics community. With a focus on reproducing such a natural aptitude in prosthetic hands, this paper reports a kinematic approach to exploring the human hand's object recognition functionality during a grasp. Finger kinematics vary while grasping objects of different shapes and sizes. The authors emphasized learning the variations while grasping different objects through a forward kinematics model of the human hand. Finger joint kinematics for objects of two specific shape categories: spherical and cylindrical, were recorded during grasping experiments using a customized data glove to deduce the fingertip coordinates. An algorithm has been developed to derive novel three-dimensional grasp polyhedrons from fingertip coordinates. Areas of these polyhedrons and finger kinematics have been used as features to train classification algorithms. Comparing the recognition results using only finger kinematics as features revealed that the inclusion of the shape primitives increases the accuracies of the classifiers by 2–6% while recognizing the objects. This work analytically confirms that finger kinematics and the object's shape primitives are vital information for visionless object recognition.

31. M. Tiken Singh, Surajit Borkotokey, Rachid Ait Maalem Lahcen,, Ram N. Mohapatra, ***A Generic Scheme for Cyber Security in Resource Constraint Network Using Incomplete Information Game,*** **Evolutionary Intelligence, Springer DOI: 10.1007/s12065-021-00684-w.**

Abstract: We propose an online learning model that efficiently teaches a defender's agent to learn the attacker's behavior while interacting in the cyber-world. This paper models the interaction between these two agents as a stochastic game with limited rationality. Because of this limited rationality, the proposed model helps the defender's agent learn the unknown communicator's behavior from the feedback obtained while interacting with it. Many models are built to solve the interaction between them by developing a state-oriented stochastic Markov game. However, such models fail due to the state explosion problem, and therefore, this paper discusses a model to solve this game, restricting it to a stateless stochastic game. The model is then compared to check the performance with different algorithms that solve stochastic games. The comparison between them shows that the proposed algorithm converges to an optimal strategy in a brief simulation time span. Finally, our model checks the performance with an existing technique that shows that the proposed algorithm chooses the correct strategy for around 91% of the simulation time compared to 73% of the simulation time by the existing algorithm.

32. Bora, N., Chutia, B., Moran, R., & Pegu, A., ***A note on bifurcation points of two-parameter matrix eigenvalue problems,*** **Advanced Mathematical Models & Applications Vol.7, No.1, pp. 69-75. ISSN: 2519-4445.**

33. Moran, R., Bora**,** N., Pegu, A., & Chamua, M., ***Some results on T-coloring and ST-coloring of generalized butterfly graphs,*** **Advances and Applications in Discrete Mathematics, Vol.**31 **pp. 1-12. ISSN: 09741658.**

34. D. Das, S. Desai, V. Kulkarni, ***Shock/expansion fan interaction with real gas effects for Earth and Mars atmospheric conditions*****, Heat Transfer (2022) 1-17, https:// doi.org/ 10.1002/htj.22555.**

Abstract: Numerical simulations are performed to investigate the real gas effects on shock/expansion fan interaction. Initial perfect gas simulations at low enthalpy capture the flow structures efficiently and outcomes are found to have excellent agreement with the analytical calculations. Furthermore, the simulations with the real gas solver for different enthalpies showed that the variation in enthalpy significantly changes the flow structures. It is observed that an increase in enthalpy leads to a decrease and increase in the post-shock and post-expansion fan Mach numbers, respectively. Another important observation is the decrement in the peak pressure ratio with an increment in the enthalpy. These effects are noted to be more pronounced for Mars's environment due to the higher dependency of specific heat on temperature.

35. D. Das, S. Desai, V. Kulkarni, H. Gadgil, ***Real-Gas Effects for Shock/Shock Interaction in Earth and Mars atmosphere*****, Journal of Spacecraft and Rockets (2022) 1-16. https://doi.org/10.2514/1.A35142**.

Abstract:

Shock/shock interactions of types IV, V, and VI are simulated for Earth and Mars conditions using perfect-gas, real-gas chemical nonequilibrium (real-gas CN), and real-gas thermochemical nonequilibrium (real-gas TCN) solvers for double-wedge configurations. In type IV interactions, the real-gas flow has normal shock closer to the second wedge as compared to the perfect-gas assumption. Similarly, for type V Mach reflection interaction, the Mach disk is noticed to shift downstream for the planet Earth conditions; whereas for the Martian case, transition to the type V regular reflection (RR) is observed. No noticeable change is evident in the type VI shock pattern for either atmospheric case. Increments in the free stream stagnation enthalpy, in both the planetary conditions, transforms the type IV interaction to type V (RR) and type V to a type VI when real-gas CN is assumed. Furthermore, the type VI interaction portrays a thinner shock layer. Although the shock structure is independent of stagnation enthalpy for a perfect-gas, simulations for high-enthalpy airflows using the real-gas TCN solver reveal resistance to shock transformations, unlike what is seen using the real-gas CN solver. But, the shock pattern is analogous for Martian conditions at simulated enthalpies for both of the real-gas models.

36. Parijat Burhagohain, Gitalee Sharma, Prankush Malla Bujarbaruah, ***Investigation of a few oxazolone molecules as corrosion inhibitor for API5LX60 steel in 1N H_2SO_4 solution,*** **Egyptian Journal of Petroleum,2022, 31, 37–45.**

Abstract:

Corrosion is recognized as a notable problem in oil sector where API5LX60 steel transmission pipelines are in frequent use. In this report, three oxazolone derivatives as potential corrosion inhibitors were investigated on API5LX60 graded carbon steel in 1N H_2SO_4 solution in stagnant conditions at concentrations 50–200 ppm. Gravimetric weight loss coupons and electrical resistance corrosion monitoring techniques performed on test samples showed inhibitory properties with best at 200 ppm inhibitor concentration. The results further revealed that the degree of inhibition was concentration dependent. Inhibitor I exhibited the highest inhibition efficiency of 90.70% at 200 ppm concentration. Statistical analysis using multiple linear regression model procreated high R^2 value of 0.998 and p-value < 0.0001 asserting a smooth linear dependence of inhibitor efficiency on oxazolone concentration and weight loss of the steel. Again, surface analysis affirmed the formation of protective coating of inhibitor on steel surface. Furthermore, the oxazolone inhibitor adsorbed physically on the steel surface and obeyed the Langmuir isotherm which is evident from the linear correlation coefficient value of 0.9992.

37. Md Zakir Hussain , Sabah Khan , Pranjal Sarmah, ***Effect of parameters: Milling time and wt. % Al_2O_3 on mass density and hardness of Al_2O_3/Cu micro-composite*****, Materials today: Proceedings, Volume 62, Part 2, Pages 671-678, April 2022.**

38. S. Roy, P. Bhattacharya, R. Bose, H. P. Mondal and I. Sarkar, ***Lockdown: The most effective preventive measurement of Corona Virus pandemic disease through social distancing***, **International Journal of health science and pharmacy, ISSN: 2581-6411, vol-6, No-1, June-2022, (DOI: https://doi.org/10.5281/zenodo.6641781).**

39. K. Goswami, H. P. Mondal, M.Sen, ***Optimized design of multiple bends for maximum power transfer in the optical waveguides,*** **Optik (Elsevier), (SCI, SCIE, SCOPUS indexed, IF-2.44), (ISSN-0030-4026),(DOI: 10.1016/j.ijleo.2022.169448).**

Conference Papers

1. Kuki Kalpita Mahanta, Nityaraj Chetia, ***A Time series analysis of COVID-19 Recovery Rates in India and in the State Assam and forecasting it with the help of ARIMA mode***l, **Internal online conference on Covid-19 Pandemic: Opportunities and Challenges, with special reference to North East India organized by D.H.S.K. Commerce College, Dibrugarh in collaboration with Assam Kaziranga University, Jorhat, Assam. Date: 30th June, 2022.**

Abstract:

Covid-19, the largest pandemic of the decade, which was started in the year 2019 in wuhan, china and has spreaded its influence all across the world and caused millions of death. Till now the whole world has faced two dangerous waves of this pandemic. Analysis death and recovery rates of Covid-19 can give us an idea about the health facilities of the country and predict the future situations in upcoming days. Which will help us to take precautions and necessary action to control it. So in this paper an attempt has been made to perform a time series analysis of the recovery rates of India along with the state Assam and then make a comparison among them for a time period under the second wave of COVID-19 pandemic. ARIMA Methodology is employed here to forecast the future recovery rates and in addition

to this forecasted recovery rates are also compared here with the original recovery rates. According to the diagnostic check analysis the models are adequately fitted to the recovery rate data. Our selected model gives us forecasted recovery rates for next one month and up to some extent they match up with the original recovery rates. So in future, the government and health workers can take the help of these models to predict future covid-19 recovery rates and it might prove really beneficial for them.

Published Book Chapters

1. R. Prasad, Subrata Chakraborty and R. Sarma, ***Lockdown phases and changing clusters of Indian states with respect to number of cases of COVID-19,*** **In: Smart Intelligent Computing and Applications, Volume 2, 71-84. Smart Innovation, systems and technologies, Vol 283.(Scopus) Springer, Singapore.ISSN 2190-3018. ISBN 978-981-16-9704-3. Springer. 71-84. https://link.springer.com/ chapter/10.1007/978-981-16-9705-0_8.**

Abstract:

The novel coronavirus (COVID-19) incidence in India is currently experiencing exponential rise with apparent spatial variation in growth rate and doubling time. We classify the states into five clusters with low- to high-risk category and identify how the different states moved from one cluster to the other since the onset of the first case on January 30th, 2020, till the end of November 30th, 2020. Result clearly shows the impact of the lockdown and the unlock phases in the changing formation of the clusters.

2. Bibhuti Bhusan Kakoti, Kangkan Deka, Rajashri Bezbaruah, Ngurzampuii Sailo, ***Multifunctional Nanocarrier Systems Targeting Brain Tumour : A Review,*** **In : Nanocarriers for drug-targeting brain tumors, ISBN 9780323907736 . June 2022, Elsevier Publication.**

3. Rudrapal M, Chetia D, ***Malaria and Recent Developments in Antimalarial Drugs***, **In: Egbuna C, Akram M, Ifemeje JC. (Eds.).** ***Neglected Tropical Diseases and***

***Phytochemicals in Drug Discovery*. John Wiley & Sons, Inc.; 2022: Print ISBN:9781119616603; Online ISBN:9781119617143.**

Abstract: Malaria remains one of the most devastating infectious diseases causing 200–300 million clinical cases and about 1–3 millions of deaths every year across the globe. During the past few decades, the emergence of multidrug-resistant strains of *Plasmodium falciparum* has become an increasingly serious concern in malaria control and prevention worldwide. *P. falciparum* , the deadliest malaria parasite, is responsible for most of the mortality associated with malaria infections. Artemisinin-based combination therapies (ACTs) are currently considered as the frontline treatments against resistant *P. falciparum* malaria. Because of the widespread emergence of drug-resistant strains of *P. falciparum* , the clinical utility of existing drug therapies including ACTs in the treatment of malaria has been increasingly limited. This issue has become a serious health concern which, therefore, necessitates to develop novel drug molecules and/or alternative therapies to combat particularly resistant *P. falciparum* malaria. In this chapter, basic biological aspects of malaria, prevention and control strategies, drug resistance, and recent developments in antimalarial drugs have been comprehensively reviewed.

Patents

1. R. Bose, S. Roy, M. Ghosh, Haraprasad Mondal, R Dey, P. Bhatterjee, S. Biswas, S. Chattopadhyay, C. Chowdhury, ***A SYSTEM FOR A COMPUTERIZED POULTRY CONFIGURATION FRAMEWORK FOR THE REGULATION OF REAL-TIME SMART POULTRY,*** **2021/09569, (Granted), Republic of South Africa.**

Conferences/ Workshops Hosted

1. **An awareness programme on the subject 'Statistics' among high school students** was organized by **Department of Statistics**, Dibrugarh University on **28th May, 2022**. The programme was held in the conference Hall of Department of Statistics. 38 **Students along with two teachers** in charge from Rupnagar Jatiya Vidyalaya, Duwarah Chuk, took part in the programme.

2. **29th June** is the birth anniversary of great Indian Scientist and Statistician **Prof. Prasanta Chandra Mohalanobis** and for his contributions in the field of Statistics and economic planning in post independent India, this day is celebrated as **the National Statistics Day** in India. This year on 29th June, National Statistics Day was celebrated by **the Department of Statistics,** Dibrugarh University. The programme was attended by

more than 100 students including the PG students from the Dibrugarh University and Schools students from Gyan Vigan Academy, Dibrugarh.

Awards and Recognitions received by Faculty Members

1. **Bondita Robidas**, Madhurjya Phukan, Subrata Borgohain Gogoi and Akashdeep Hazarika received **"Springer best paper award"** for the paper titled ***"Computational Analysis of Crude Oil Pipeline Transportation"*** at **North-East Research Conclave (NERC), 2022, IIT Guwahati (IITG).**

FACULTY OF

EARTH SCIENCES AND ENERGY

Research Publications in Journals

1. Borgohain, K.; Sarmah, R. K.; 10 June, 2022. Provenance, ***Tectonic Setting and Paleoclimate of the Bhuban Formation Exposed in Jampui Hills, Tripura Fold Belt, Tripura, India: Insights from Petrography and Clay Mineralogy.***

Abstract:

The sandstones of the Bhuban Formation (Miocene) exposed in the Jampui hills of Tripura Fold Belt, India has been studied for provenance, tectonic setting and paleoclimate using the petrography, heavy mineral assemblage and clay mineral studies. The detrital mode of the sandstones indicate that the sediments consists predominantly of detrital quartz (avg. 92.19%), with subordinate proportions of feldspar (avg. 4.55%) and rock fragments (avg. 3.25%). The provenance discrimination diagrams depict the derivation of the detritus from both plutonic and metamorphic source rocks having affinity to continental block provenance. The plots of QFR and semi quantitative weathering index of the clastics support a moderate degree of paleoweathering in the source area under humid climatic condition. The presence of zircon, tourmaline, rutile, kyanite, epidote, sillimanite and garnet in the Bhuban sandstones is ascribed to the provenance of plutonic and metamorphic rocks. Dominance of zircon in the heavy mineral assemblage and the ZTR index values (75.13% avg.) indicate towards moderate degree of maturity with long distance of transport. The study of the shale samples by XRD and SEM analyses shows the dominance of illite over kaolinite and montmorillonite. The presence of minor amount of montmorillonite may suggest the addition of tuff and volcanic ash in the sediments under alkaline environment.

2. Goswami, T. K.; Kalita, P; Mukherjee, S.; Mahanta, B. N.; Sarmah, R. K.; Laishram, R. ; Saikia, H.; Gogoi, M.; Machahary, R.; Oza, B. ; 27 June 2022, ***Basement cross-strike Bomdila Fault beneath Arunachal Himalaya: Deformation along curved thrust traces, seismicity, and implications in hydrocarbon prospect of the Gondwana sediments.***

Abstract:

Structural mapping and fieldwork in the Lesser and Higher Himalayan sequences in the western Arunachal Himalaya reveal crucial deformation fabrics in the Main Central Thrust (MCT) and Dirang Thrust (DT) zones. The top-to-SW ductile shear in the MCT and DT zones is correlated with the swing in the trend of MCT and DT from NE to NNW. The curved MCT and DT as traced by previous authors on the regional map of Arunachal Himalaya are studied. It is found that at places where these faults swing, shear senses developed at the meso-scale. These shear

senses are studied in meso- and micro-scales. Seismicity in the western Arunachal Himalaya is influenced by basement cross-strike crustal-scale NW-trending buried Bomdila Fault (BF). Landslides occur frequently along the Bhalukpong-Bomdila–Sela traverse are also linked with the transverse BF. In its southern part, the BF coincides with the Dhansiri Lineament and is the basin margin fault in the upper Assam shelf. The Gondwana sediments extended further south below the Brahmaputra alluvium along the fault is to be explored for hydrocarbon exploration.

3. Chandra Kumar Dutta , Ankita Mahanta, Daisy Roy , Sikhamoni Devi , Jintu Das, Ijaz Ahmed, Porag Jyoti Borah, Kalyan Nath & Ananya Chutia, ***A GIS Based Study of River Bank Erosion and its impact in LULC of Dibru-Saikhowa National Park during 2010-2020,*** **International Journal of Basic and Applied Sciences (ISSN: 2277-1921), Vol. 11. No.2. 2022.**

Abstract: The river island are prone to channel dynamic influencing the physical extension too, as the river is active in its banks throughout the year, mainly affected due to variation in flow perimeters of the river during seasons. The islands in Brahmaputra River are prone to bank erosion, mass deposition due to siltation and deposition elevating the river bed. DibruSaikhowa National Park (DSNP) is located in Dibrugarh and Tinsukia districts, Assam, India is a river island in Brahmaputra river. The Park is bounded by river Siang and Dibang in the North and Lohit, and Dibru River in the south. The natural degradation of the national park is triggered to study with help of secondary sources of data, respectively through geographical Information System (GIS) collected from open source platforms like, the Landsat OLI-8 (30 m) data (for 2020) and Landsat 4-5 TM (30 m) data (for 2010) has been downloaded from USGS (earth explorer) and layer stacking with 6 bands with the help of ERDAS software. With delineation of natural region of DSNP of the temporal years, the spatial techniques were curved out from the satellite imageries and change detection was performed. The land use and land cover analysis were carried out for the identification of change in the study area during the period. The study attempt to understand the literal change in the national park due to river dynamic, and focused for the sustainable development of the Dibru-Saikhowa National Park. It is evident from the present study that the Dibru-Saikhowa National Park has faced severe bank erosion. The total area of the park was 271.73 sq. km in 2010 which reduced to 241.12 sq. km in 2020. In conclusion short and long term strategies were suggested for the sustainability of DSNP.

Conference Papers

1. Vadhan, Ramanpreet Singh, and R. Phukan, ***Carbonated Smart Water Injection for Enhanced Oil Recovery in Sandstone Reservoirs of Upper Assam Basin, India.,*** **Paper presented at the SPE EuropEC -Europe Energy Conference featured at the 83rd EAGE Annual Conference & Exhibition, Madrid, Spain, June 2022.**

Published Book Chapters

1. Ranjan Phukan and Pankaj Tiwari, ***CO2 foams for enhanced oil recovery,*** **In: Nanotechnology for CO2 Utilization in Oilfield Applications, Gulf Professional Publishing, Elsevier, 2022.ISBN: 9780323906517.**

FACULTY OF

BIOLOGICAL SCIENCES

Research Publications in Journals

1. Bora S, Bora DS, P. Bhorali, ***Infection byPseudocercosporamusae leads toanearly reprogramming oftheMusa paradisiaca defense transcriptome***. **3 Biotech, 12:177. https://doi.org/10.1007/s13205-022-03245-9.**

Abstract:

Deep sequencing technologies such as RNA sequencing can help unravel mechanisms governing defense or resistance responses in plant–pathogen interactions. Several studies have been carried out to investigate the transcriptomic changes in Musa germplasm against Yellow Sigatoka disease, but the defense response of *Musa paradisiaca* has not been investigated so far. We carried out transcriptome sequencing of M. paradisiaca var. Kachkal infected with the pathogen *Pseudocercosporamusae* and found that a vast set of genes were upregulated while many genes were downregulated in the resistant cultivar as a result of infection. After transcriptome assembly and differential gene expression analysis, 429 upregulated and 156 down-regulated genes were filtered out (considering fold change ± 2, $p < 0.01$). Functional annotation of the differentially expressed genes(DEGs) enriched the upregulated genes into 49 gene ontology (GO) classes of biological processes (BP), 20 classes of molecular function (MF) and 9 classes of cellular component (CC). Similarly, the downregulated genes were classified into 35 GO classes of BP, 28 classes of MF and 6 classes of CC. The KEGG enrichment analysis revealed that the upregulated genes were most highly represented in 'metabolic' and 'biosynthesis of secondary metabolites' pathways. Additionally, 'plant hormone signal transduction', 'plant–pathogen interaction' and 'phenylpropanoid biosynthesis' pathways were also significantly enriched indicating their involvement in resistance responses against the pathogen. The RNA-seq analysis also depicts that a range of important defense-related genes are modulated as a result of infection, all of which are responsible for either mediating or activating resistance responses in the host. We studied and validated the expression profiles of ten important defense-related genes potentially involved in conferring resistance to the pathogen through qRT-PCR. Almost all the selected defense-related genes were found to be highly and significantly upregulated within 24hpost inoculation (hpi) and for some genes, the expression remained consistently high till the later time point of 72 hpi. These results, thus, indicate that the infection by *P. musae* leads to a rapid reprogramming of the defense transcriptome of the resistant banana cultivar. The defense-related genes identified to be modulated in response to infection are important not only for pathogen recognition and perception but also for activation and persistence of defense in the host.

Keywords: *Musa paradisiaca*, Sigatoka, Host–pathogen interaction, Transcriptome, Differentially expressed genes.

2. Nath Ratul, Tamuly Dulumoni, Sharma Gauri Dutta and Barooah Madhumita, ***Isolation,characterization and evaluation of plant growth promoting activities of bacterial endophytes of tea (Camellia sinensis (L.) O. Kuntze)***, **Research Journal of Biotechnology, Vol. 17 (7) (2022).**

Abstract: In the present study, we are emphasising on isolation, characterization and in vitro evaluation of mineral solubilization and plant growth promoting (PGP) hormone production activities of endophytic bacterial isolates of tea (*Camellia sinensis* L. (O) Kuntze) root, stem and leaves collected from different tea gardens of upper Assam, India. During the study, it was observed that endophytic bacterial population was highest in roots (ranged between 6.3 x 103-10.3 x 103cfu/ml) followed by stem (ranged between 5.6 x 102- 9.86 x 102cfu/ml) and leaves (ranged between 4.2 x 102-8.6 x 102cfu/ml). *Pseudomonas* sp. was found to be highest IAA (16.75 ± 0.04 µg/ml) and GA3 producer. *Bacillus cereus* was found to be the highest (174.33 ± 2.0 µg/ml) phosphate solubilizer and *Acinetobacter* sp. (3.06 ± 0.1) was found to be the most efficient potassium solubilizer among the 40 endophytic bacterial isolates isolated from tea bushes. After *in vitro* screening of endophytic bacterial isolates for their PGP activities, *Bacillus cereus*, *Bacillus flexus* RN 11, *Pseudomonas* sp. and *Pseudomonas rhodesiae* were applied in the pot culture experiment to observe their activity in natural condition and were found to be significant in promoting root, stem and leaf growth.

Keywords*: Endophytes, plant growth promotion, mineral solubilization, biofertilizer.*

3. Jai Gopal Sharma, Moirangthem Kameshwor Singh, Rina Chakrabarti, ***Evaluation of UV-B Ameliorating Properties of Indigenous Plants Ashwagandha, Withania somnifera (Dunal), Amla, Emblica officinalis (Gaertn) and Prickly Chaff Flower, Achyranthes aspera (L.) Supplemented Diets in Prior UV-B exposed Catla Catla, catla***, **Frontiers in Marine Science 9:905147. doi:10.3389/fmars.2022.905147.**

Abstract: Ultraviolet B (UV-B) radiation is a potent environmental stressor and it severely affects the survival, growth, and physiology of aquatic organisms. The UV-B protective properties of three herbal ingredients enriched diets were evaluated in pre-exposed *Catla catla*. Fish (70.38 ± 1.18 g) were divided into five sets with three replicates each. Four sets were exposed to UV-B (80 µW/cm2) for an initial 10 days (20 min/day), and the fifth one remained unexposed (control). On day 11, feeding with enriched diets started. These diets were: diet 1 (D1) containing *Withania somnifera* (0.5%) root powder, diet 2 (D2) containing *Emblica officinalis* (1.25%) fruit powder, diet 3 (D3) containing seeds of *Achyranthes aspera* (0.5%), and

diet 4 (D4) control. There were two batches of D4 diet-fed fish, D4a, UV-B exposed, and D4b unexposed. Blood and tissue samples were collected on days 0, 7, 14, and 21 of feeding. The average weight reduced 26.32% in UV-B exposed catla compared to the unexposed one on day 0. Among the exposed fish, average weight was significantly higher in D3 compared to others throughout the study period. Significantly lower nitric oxide synthase (NOS) and higher thiobarbituric acid reactive substances (TBARS), carbonyl protein, superoxide dismutase (SOD), and heat shock proteins (Hsp) 70 and 90 were observed in D4a compared to the enriched diet fed catla. The NOS level was significantly higher in D3 on day 21. The TBARS level was significantly lower in D3 on days 7 and 14 and in D2 and D3 on day 21. The carbonyl protein, SOD, and Hsp70 levels were always significantly lower in D3 compared to others, and D2 followed D3 treatment. Hsp 90 was significantly lower in D2 compared to others on day 7 and in D3 on days 14 and 21. All three enriched diets helped the fish to overcome the harmful effect of UV-B radiation, and the D3 diet-fed fish showed the best performance.

Published Book Chapters

1. Minakshi Puzari, Pankaj Chetia, ***Nanotechnology based cancer drug delivery***, **In : *Advances in Nanotechnology Based Drug Delivery systems* under Nanotechnology in Biomedicine Series. Publisher: Elsevier Publications. Editor: Jayanta Kumar Patra Page Number: 415-420.ISBN: 978-0-323-88450-1. June 2022.**

Research Grants/Projects received

1. **Project title:** A study on endophytic bacterial community of *Parthenium hysterophorus* L. and evaluation of their potential for promoting plant growth.

PI: Dr. Ratul Nath

Funding Agency : Dibrugarh University (Seed money for Asstt. Professors)

Duration of the project: 18 months

Amount: Rs. 25000/-

Awards and Recognitions received by Faculty Members

1. **Minakshi Puzari,** Assistant Professor, Department of Life Sciences was awarded PhD in Life Sciences on 1st June, 2022.

FACULTY OF

HUMANITIES AND LAW

Recent Papers in Journals

1. Basil N. Darlong Diengdoh , ***Fact and fiction are so interwoven: Corporeal Reimagining of Siegfried Sassoon as Poet and Patient in Pat Barker's Regeneration***, ***Dibrugarh University Journal of English Studies* (*DUJES*), Volume 30, March 2022, ISSN [Print] 0975-5659, ISSN [Online] 2581-7833. https://www.dujes.co.in/p/vol-30-2022-fact-and-fiction-are-so.html.**

Abstract: The paper attempts a close reading of the novel Regeneration by Pat Barker and locates it within representations of the body, trauma narrative and the philosophy of mind and body. The objective of such an exploration is to show how fiction reflects a more articulate reality in relation to deeply-affecting experiences such as the violence of war and the cultural understanding of the body during such events. By revisiting the historical figure of Siegfried Sassoon during his 'treatment' by W. H. R. Rivers, Barker reimagines a more nuanced relation between the men during one of the most significant events of modern history, namely, the Great War.

Keywords: Pat Barker, mind and body, trauma, corporeality, narrative.

2. Basil N. Darlong Diengdoh, ***Visions of a 'Digital North East: Representation, Constructs and Emerging Contestations***, ***Gauhati University Institute of North East India Studies* (*GUINEIS*) Journal, Vol. VII & VIII, 2020-2021, pp. 99-129 | ISSN: 2347-2669, https://journals.gauhati.ac.in/guineis/current-guineis.**

Abstract: Conceiving the North East through the lens of digital expression and communication and technological networks reframes the geopolitical and cultural constructs of the North East. The North East is rarely framed as part of the digital landscapes and imaginaries in the contemporary. References thus far have been limited to the (under)development paradigm, in that the North East is lagging behind on most metrics in terms of mobile and internet infrastructure and connectivity even as this remains a priority in the state- driven policies for the region. As a component of digital and online cultures, the North East still remains thinly explored. This paper aims to engage with the maze of contexts in relation to the digital and online world that is mediating everyday realities, experiences, expressions, and cultural formations located in the North East, and related to, individuals and communities from the region. Even as the North East continues to lag behind in adoption of communication infrastructure, digital tools and information and communication technologies have been increasingly leveraged as a means of creative and cultural expression. The North East, thus, may also be framed as constituting a digital landscape of content creation, aided in large part by the adoption of social media platforms, even as it continues to be perceived of aspart of the

landscapes of (resource) extraction, and as such, a frontier of sorts—is it also a digital frontier is the question the paper explores.

Keywords: North East, Constructs, Digital, Social Media.

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Recent Papers in Journals

1. Kh.Rakesh Singh, ***Effect of Plyometric Exercises and Skill Oriented Exercises on Agility of Regular Practicing Badminton Players,*** **International Journals of Creative Research Thoughts, Volume: 10, Issue: 6, Date/Month/Year: 18th June, 2022.**

Abstract: Badminton is one of the fastest popular games in various corner of the world. The intensity of the game needs various motor fitness components; one of them is the agility. The main purpose of the study was to analyze the effect of plyometric exercises with skill oriented exercises on the agility of badminton players. The study was carried out with 50 badminton players, 25 experimental and 25 control group from northeast region between the age group of 18 to 25 years. Twelve (12) weeks of training program was employed to the experimental group only. Semo Agility test was used as a tool to collect and analyze data before and immediately after completion of 12 weeks of training program. Jamovi 2.0.0.0 version software was used to examine the data, to test the hypothesis dependent t test and ANCOVA for the main effect was employed; the level of significance was set at 0.05. The normality of the data was treated with Shapiro Wilk, $p=0.247$ and it was found no violation, $p>0.05$. In conclusion the result shows that there was significance difference observed between the adjusted mean of the experimental group (ANCOVA, $F=108$, $p<0.001$; which is lesser than 0.05) as compared to control group; So Post hoc tukey test was employed for pair wise mean comparison (MD=0.68, $p<0.001$); insignificance mean difference was observed between pre and posttest mean of control group ($t=0.244^{@}$, $p=0.809>0.05$) but significance difference was established among pretest and posttest mean of experimental group ($t=9.57^{*}$, $p\leq0.001$, much lesser than 0.05) , Thus the researcher suggested to focus on plyometric exercises with skill oriented exercises to improve the agility of badminton players.

Index Terms: Plyometric exercises, Skill oriented exercises, Agility, Badminton.

2. Kh.Rakesh Singh, ***Effect of 12 weeks of Plyometric with Skill Oriented Exercises on Jumping Abilities among Badminton Players,*** **International Journals of Creative Research Thoughts, Volume: 10, Issue: 6, Date/Month/Year: 28th June, 2022.**

Abstract: Legexplosive power is one of the versatile motor fitness component which demands in various games and sports to enhance athletes performance. Badminton is a game in which maximum court area can be covered through proper stepping and jump. The main purpose of the study was to determine the effect of 12 weeks of plyometric with skill oriented exercises on the jumping abilities of badminton players. The study was conducted with 50 northeast region badminton players, 25 experimental and 25 control group from northeast region between the age group of 18 to 25 years. Twelve (12) weeks of exercises program was employed to the

experimental group only. Vertical Jump test was used (score was recorded in centimeter) as a tool to collect and analyze data before and immediately after completion of 12 weeks of exercises program. Jamovi 2.0.0.0 version software was used to examine the data, to test the hypothesis dependent‘t’ test for mean difference and ANCOVA for the main effect was employed; the level of significance was set at 0.05. The normality of the data was analyzed with Shapiro Wilk, p value=0.113and it was found no violation ($p>0.05$). In conclusion the result shows that there was significance improvement observed between the adjusted mean of the experimental group (ANCOVA, $F=49.3$, $p<0.001$; ($p<0.05$) as compared to control group; So Post hoc tukey test was employed for pair wise mean comparison ($MD=4.37$, $p<0.001$); insignificance mean difference was observed between pre and posttest mean of control group ($t=1.929^{@}$, $p=0.066>0.05$) but significance difference was established among pretest and posttest mean of experimental group ($t=10.4^{*}$, $p\leq0.001$;$p<0.05$) , Thus the researcher established significant improvement in vertical jump among badminton players after twelve (12) weeks of plyometric with skill oriented exercises program.

Index Terms: Badminton, Plyometric exercises, Skill oriented exercises, Jumping Ability (Leg Explosive Power).