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Transcriptome profiling uncovers the involvement of CmXyn1, a glycosyl hydrolase 11, in *Cochliobolus miyabeanus* pathogenicity

Gi Hyun Lee[1†], Ju Soon Yoo[1†], Ha-Ram Oh[1], Cheol Woo Min[1], Jeong Woo Jang[1], Soumya Mukherjee[2], Ki-Hong Jung[3], Yu-Jin Kim[4], Yiming Wang[5], Ravi Gupta[6*] and Sun Tae Kim[1*]

Abstract

Necrotrophic pathogen *Cochliobolus miyabeanus* (*C. miyabeanus*) causes rice brown leaf spot disease and drastically affects the yield and quality of rice grains. However, the molecular mechanism of rice-*C. miyabeanus* remains poorly understood due to the limited research conducted on this pathosystem. To elucidate the molecular mechanism of rice-*C. miyabeanus*, a transcriptome analysis was conducted from in vitro and in planta grown *C. miyabeanus*. This analysis led to the identification of a total of 24,060 genes of which 426 in vitro and 57 in planta expressed genes were predicted to encode for secretory proteins. As these 57 genes were specifically expressed in planta and were predicted to be secretory in nature, these were consider as putative effectors, highlighting their possible roles in the fungal pathogenicity. Notably, among these putative effectors, *CmXyn1* which encodes a glycosyl hydrolase 11 displayed the highest expression level under in planta conditions and was thus selected for further functional characterization. Interestingly, the extracellular expression of *CmXyn1* transiently induced cell death in *Nicotiana benthamiana* leaves, while intracellular expression was comparatively lesser effective. In addition, transcriptome analysis on rice leaves during *C. miyabeanus* infection and comparing it to the rice leaf transcriptome data obtained during hemibiotrophic pathogen *Magnaporthe oryzae* infection led to the discovery of 18 receptors/receptor-like kinases that were commonly expressed in response to both pathogens, indicating their key roles in rice defense response. Taken together, our findings provide new insights into rice-*C. miyabeanus* interaction as well as the unique and common defense responses of rice against hemibiotroph and necrotroph model systems.

Keywords *Cochliobolus miyabeanus*, Rice, Transcriptomics, *Magnaporthe oryzae*, Abscisic acid, Receptors

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Generalized Ricci Solitons on $N(\kappa)$-contact Metric Manifolds

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Abstract. In the present paper, we study generalized Ricci solitons on $N(\kappa)$-contact metric manifolds, in particular, we consider when the potential vector field is the concircular vector field. We also consider generalized gradient Ricci solitons, and verify our results with an example.

1. Introduction

The notion of a κ-nullity distribution (in brief, KND) on a Riemannian manifold (RM, in short) was coined by Tanno [12]. A KND in a RM $\mathbf{M}$ is described by

$$N(\kappa) : q \longrightarrow N_q(\kappa) = \{V_3 \in T_q\mathbf{M} : R(V_1, V_2)V_3 = \kappa[g(V_2, V_3)V_1 - g(V_1, V_3)V_2]\},$$

for vector fields $V_1, V_2 \in T_q\mathbf{M}$, κ being a real number, and $T_q\mathbf{M}$ being the tangent space of $\mathbf{M}$ at q. A (2m+1)-dimensional contact metric manifold (CMM, in short) is called $N(\kappa)$-contact metric manifold (NCMM, in short) if the Reeb vector field θ satisfies KND. So, for a NCMM, we have

$$R(V_1, V_2)\theta = \kappa\{\tau(V_2)V_1 - \tau(V_1)V_2\}. \tag{1.1}$$

For $\kappa = 1$, the manifold is a Sasakian manifold and when $\kappa = 0$ it is locally isometric to the product of an m-dimensional manifold of scalar curvature 4 with a flat $(m+1)$-dimensional manifold, provided $m>1$. If $m = 1$ and $\kappa = 0$, the manifold is flat [1]. NCMMs have been studied by many authors [1, 2, 3, 5].

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Love & Women Sentiment : A Re-reading of Bhasa's Pratigya-Yaugandharayana

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Abstract

Bhasa (A.D.300) is a remarkable dramatist of Sanskrit literature who introduced various structural devices to drama that were followed by most of Sanskrit dramatists. We know very little about him as there are no written records of his life or biography of Bhasa exists**.** He wrote thirteen beautiful plays in his credit. His plays occupied an important place in Sanskrit drama. Though Pratigya-Yaugandharayana is an extant political play, social issues like love, marriage and portrayal of men and women are equally important. Mahasena, the King of Ujjayini had made a secret plan to give marriage of his daughter Vasavadatta with Udayana, the king of Vatsas. But Udayana would surely reject this proposal. So, Mahasena decided to make Udayana a captive and force him to teach vina to Vasavadatta in the hope that he would surely fall in love with her and marry her. Mahasena executed his plan properly and Udayana was captivated. As expected, the Guru and Sishya loved each other. Udayana forgot his kingdom and enjoyed the secret company of his pupil cum lover Vasavadatta. Bhasa, with his profound knowledge of human nature, give a twist at the end of the story. He shows a typical portrayal of the woman sentiment in the character of Vasavadatta. In this paper I try to explore Udayana and Vasavadatta's love and its' social justification. At the same time I have try to explore Vasavadatta's sentiment which helps Yaugandharayana to execute his plan smoothly.

Keywords: Influential, Love, Marriage, Sentiment, Human nature and social justification.

Introduction:

Bhasa is the earliest in the long line of Sanskrit dramatists. He can be regarded as the father of Indian drama. He wrote plays with a good variety of characters and events. Bhasa's Pratigya-Yaugandharayana in four acts is apparently a political play. Yaugandharayana, the minister, unfolds the machinery of his political plan designed with a view to rescue king Udayana from the captivation of Mahasena and bring him back to the kingdom. But the story is interesting not merely for its exotic political setting; it treats an exciting theme of love- a strange and true passion of love. Udayana was in love with Vasavadatta. His passion of love for her was irresistible but he could not get her without incurring the king Mahasena's wrath. With the kept of his minister Yaugandharayana, a strong and stubborn soldier, he at last took away Vasavadatta from the protection of Mahasena. The soldiers of Mahasena were given a hot chase but with the will of Mahasena they had ensured the elopement. The spirits of the lover and his beloved were full of emotion and passion.

Objectives: Main Objective of my study is to focus on the Love & Woman Sentiment of Vasavadatta, a legendary woman figure in Sanskrit literature. Her nobility and devotion to her husband are unquestionable based on her sacrifice and love. We find Vasavadatta's selfless sacrifice only for love to King Udayana in the development of the story of Bhasa's Pratigya-Yaugandharayana. The paper mainly focuses on the function of confrontation with self for the sake of love in the character of

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Review Article

CONTEMPORARY DRIFTS IN DIABETES MANAGEMENT

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ABSTRACT

Diabetes mellitus is a cumulative effect of various cellular and biochemical malfunctions which trigger the blood glucose level far beyond the normal range. From 1980 to 2014, more than 314 million individuals had diabetes. Epidemiology states that it is becoming more prevalent in low-income, middle-income, more specifically, third-world countries than the first-world countries. It showed mortality rate increased by 5% in premature ages. It was the 9th leading reason for almost 1.5 million deaths. The diagnosis clearly suggests the replacement of insulin-producing pancreatic endocrine cells. Stem cell treatment substitutes the infected or destroyed cells from pluripotent stem cells or multipotent stem cells. One of the favourite ways to understand and treat diabetes mellitus is embryonic stem cells, including pluripotent cells. The *in vitro* demonstration of iPSC-derived pancreatic cells for treating infection is a grizzled dream of scientists. Luckily, iPSC-derived cells combat the major problems that arose in this field and still, there are no legal and ethical bindings as well as immunological rejections. Later, the β cell of the pancreas has derived from PSCs from various patients who have diabetes. The study proves there is a wide possibility of demonstrating and rectification of clinical administration of these newly developing trends. The use of stem cell therapy *in vitro*, which is explicit patient research, shows various concerns related to the pathophysiology of diabetes. Successful application of procedures of screening of the apoptosis of β-cells from inbuilt cell retrieval needed to be a proper arrangement of new cell lines.

Keywords: β-cells, Insulin, Nanotechnology, Diabetes mellitus, Stem cell therapy

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INTRODUCTION

Diabetes is of two types, namely diabetes mellitus and diabetes insipidus. Sources specify that ancient Indians, Egyptians, and Greeks knew about this disease. The Latin word "Mellitus" means sweet and the Greek word "Mellitus" defines sweetness, as honey is called "Mellita". Greeks noted that people suffering from such lesions excrete sweet urine as they used to taste the patient's urine for diagnosis. The patient used to show tendencies to drink excessive water, which could not remain in their body for a very long period. The immediate excretion was demonstrated as siphoning, which was studied as "Diabetes". In the Indian subcontinent, the "Madhumeha" name was famous as the physicians noticed patients' urine enchanted ants, flies, and other insects. So, clinically these were the primitive tests to identify glucose in patients [1].

In Africa, almost 5.1% of individuals from the sub-Saharan region have diabetes. In the Caribbean and North American regions, the percentile is 11.4. This state of affairs is about to strike 8.3% of grown-up individuals aged from 20 to 79 worldwide. Third-world countries or low-income countries follow the WHO STEP wise approach to surveillance (popularly known as STEPS) tool, which was launched in 2005, whereas countries of the first world do not follow these properly. Proper lifestyle, Basal Metabolic Rate, blood pressure, and waist circumference are very important risk factors demonstrated by WHO with STEPS. FPG, along with OGTT, is advised to conduct nationwide. BMP type-1 receptor inhibitors, namely dorsomorphin and retinoic corrosive, could be the effective treatment that enhances the differentiation into PDX1 positive β-cells [2, 3]. A small molecule called Indolactum V is isolated, which initiates the differentiation of PDX1-positive cells from hESCs. The ministration of these kinds of cells is administered with SB431542, which is a TGFβ type 1 receptor. Hence this takes action on their differentiation from NGN3-positive precursor cells of the pancreas. Medications with tetrabenazine and reserpine inhibit the vesicular monoamine 2, separating PDX1 responsive cells into NGN3 responsive ancestors. For the ultimate step, these potentially separate pancreatic β-cells [4].

Pathology of diabetes

Initially, diabetes was characterized by unrestrained thirst, halitosis (a clinical term for bad odour in breath), profuse urination, presence of sugar or sweetness in urine. Back then, the biochemical pathways of diabetes were unknown to physicians. Statistical investigation shows that about 60% of the mass is distressed by diabetes. Patients who are suffering from it chronically may show various syndromes of hyperosmolar glycemia and diabetic ketoacidosis (DKA) [5]. Blurred vision, loss of vision, and floating dark strings, the red flag of diabetic retinopathy, may also occur. Acute diabetes affects the functional unit of the kidney (nephron), as a result, its function is impaired, and proteins are leaked into the urine, which is clinically termed diabetic nephropathy. In the United States, diabetes is the prime key to peripheral neuropathy.

People suffering from diabetes mellitus type-2 have a high risk of segmental bone injury. The prime regulating factor of the biochemical pathway of diabetes is insulin, which plays a pivotal role. The absence or imprudent quantity of this hormone produces diverse corporeal abnormalities and collateral damage in the body. The surplus in body weight and insufficient physical exertion leads to non-insulin-dependent diabetes, popularly called diabetes mellitus type-2. In this case, the body becomes incompetent to the effect of insulin. More than 95% of the human population has diabetes, suffering from non-insulin-dependent diabetes mellitus (NIDDM). Insulin is produced and released by the β-cells of the pancreas [6]. In an auto-immune disease where β-cells are destroyed, insulin production will be halted. In chronic pancreatitis, the cells of this organ become inefficient in producing insulin which regulates blood sugar levels. The illegitimate modification in insulin receptors also plays a crucial role as it is also responsible for insulin-dependent diabetes mellitus (IDDM), which is widely known as

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Growth response of *Bacillus coagulans* on TiO_2 nanoparticles by RNA-Seq analysis of the customary probiotic strain

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Keywords:
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ABSTRACT

The phosphoenolpyruvate sugar phosphotransferase systems in bacteria are complex enzyme systems carrying out various important functions like detection, phosphorylation and transport of several sugar substrates including mono and disaccharides, amino sugars, etc. This key enzyme complex prevents the efflux of sugar substrates by phosphorylation and prepares them for energy production and metabolism. In this study, a high throughput RNA sequencing method was used to compare the gene expression in *Bacillus coagulans* treated with nano titanium dioxide (TiO_2) rutile. Out of 3175 genes, 499 were differentially expressed. Gene Ontology analysis revealed 239 significant genes. In the biological process category, we found the phosphoenolpyruvate-dependent sugar phosphotransferase systems are the dominant ones and are involved in the uptake of specific carbohydrate sources. In our previous study, we showed increased growth of bacteria in presence of nano TiO_2 anatase with a sharp rise in ATP concentrations. We know that, among metal oxide-based nanoparticles, TiO_2 is placed at the topmost position in the agri-food sector based on its use and their reactivity with human beneficial gut flora, commonly known as probiotics, becoming a major concern. Hence, the interaction of TiO_2 rutile nanoparticles on *Bacillus coagulans* was studied thoroughly at the transcriptomics level; with depth.

Key Points

1. *B. coagulans*–probiotic, balanced microbial ecosystem in the gut, healthy immune system.
2. NanoTiO2-increased bacterial growth, high ATP.
3. Transcriptomics study reveals phosphoenolpyruvate-dependent sugar phosphotransferase system, is the dominant one and is involved in the uptake of specific carbohydrate sources for TiO_2rutile nanoparticle treated bacteria.
4. Transcriptomics study reveals upregulation of cytochrome c oxidase subunit II.

1. Introduction

The phosphoenolpyruvate (PEP): sugar phosphotransferase system (PTS) is an important transporter for sugar and sugar derivatives in many bacteria (both gram positive and gram negative) and archaea. The membrane mediated carbohydrate transport in bacteria occurs via PTS, which provides a tight coupling of translocation and phosphorylation of carbohydrates; thus, preventing their efflux and preparing them for energy production via metabolism. The phosphate group is attached to the PTS protein either at a histidine residue or at a cysteine residue. This signal transduction pathway involves the transfer of the phosphoryl group from PEP to the translocated carbohydrates via a series of protein-protein complexes [1]. Usually, the phosphotransferase system contains one membrane spanning protein and a few soluble proteins. The *ptsHI*

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Article

Intramolecular Hydroarylation of Arenes via Imidazole-Directed C−H Activation in Aqueous Methanol Using Rhodium(III) as the Catalyst and Mechanistic Study

Nilotpal Sinha, Prasenjit Mistry, Sukanya Das, Tanmoy Datta, and Brindaban Roy*

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ABSTRACT: A mild and greener approach for intramolecular regioselective hydroarylation is described for the efficient and elegant preparation of a number of dihydrobenzofurans and dihydrobenzo[*b*]thiophenes using imidazole as a directing group and Rh(III) as a catalyst. Moreover, the protocol may be extended to the formation of indoline and chromane derivatives. Deuterium scrambling experiments and characterization of isolated rhodacycle intermediate were explored to understand the mechanism in a better way.

INTRODUCTION

Transition-metal-catalyzed approaches have allowed a considerable number of transformations using neighboring directing group participation.[1] Among the various directing groups following this protocol, many new substrates have been set up for C−H functionalization at the selective C−H bond in a predictable manner among multiple C−H bonds.[2,3] This has been illustrated by the directing ability of several mono and bidentate directing groups to accommodate co-ordinately unsaturated metal catalyst in close proximity to the desired inert C−H bond which typically proceeds via five-to seven-membered metallacyclic intermediates.[4] In this regard, a number of different directing groups have been reported and still being reporting for C−H functionalization at arene systems, and the development of inter and intramolecular hydroarylations, olefinations, amidoarylations, and halogenations[5,6] using the transition metal catalysis strategy has come into the limelight in recent times. This have been elaborately illustrated by Ellman and Bergman,[7] Rovis,[8] Cramer,[9] Glorius,[10] Sahoo,[11] Yoshikai,[12] and López[13] using different directing groups (amides, imines, sulfoximines, aldehydes, and carboxylic acids) for olefin hydroarylation via Rh, Ru, Co, or Ir catalysis. Although significant research has been carried out in this area for the last decade, there remains room for further developments regarding the introduction of a new directing group for the intramolecular hydroarylation reaction, thereby elaborating the substrate scope and understanding the reaction pathway by mechanistic studies. Few limitations were noticed during directing group-assisted intramolecular cyclization reactions and the foremost one is the (a) necessity of inert and dry conditions, (b) use of toxic chlorinated solvents, (c) use of additives like $AgNO_3$, PivOH, AcOH, $AgSbF_6$ etc., and lastly, (d) removal of directing groups after the C−H activation step, which sometimes becomes more challenging during the synthesis of target molecules. We thus realized that the above shortcomings could be overcome if we would identify conditions using such a directing group which would constitute a part of the target molecule without the burden of removing the directing group at late-stage functionalization.

Intrigued by the above shortcomings and our recent work using transition metal catalyzed C_{sp^2}-H functionalization in aqueous media using 3-amino-1-methyl-1*H*-pyridin-2-one as a directing group;[14] we envisioned to use transition metal as a catalyst for the imidazole-assisted intramolecular hydroarylation reaction. Actually, the selection of 2-phenyl-imidazole as a core structural motif was motivated by the compound SB 202190, a synthetic inhibitor of p38 kinase and therapeutics for the treatment of inflammatory and immunological disorders.[15] Moreover, arylated azole motif[16] can be observed in fluorescent and chemiluminescent probes. Thus, we were inspired to show that systematic and comprehensive intramolecular hydroarylation using 2-phenylimidazole could be feasible, and in this context, a new directing group for

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Article

Perusing Buchbinder–Lyakhovich Canonical Formalism for Higher-Order Theories of Gravity

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Abstract: Ostrogradsky's, Dirac's, and Horowitz's techniques in terms of higher-order theories of gravity produce identical phase-space structures. The problem with these techniques is manifested in the case of Gauss–Bonnet–dilatonic coupled action in the presence of higher-order term, in which case, classical correspondence cannot be established. Here, we explore another technique developed by Buchbinder and their collaborators (BL) and show that it also suffers from the same disease. However, when expressing the action in terms of the three-space curvature, and removing 'the total derivative terms', if Horowitz's formalism or even Dirac's constraint analysis is pursued, all pathologies disappear. Here, we show that the same is true for BL formalism, which appears to be the simplest of all the techniques to handle.

Keywords: higher-order theory; canonical formulation

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1. Introduction

The canonical formulation of higher-order theories was developed by Ostrogradsky almost two centuries ago [1,2]. However, it did not draw much attention, since other than toy mechanical models, practically no such physical theories were proposed at that time. Exactly a century had elapsed when it was applied to a physically motivated problem, such as a fourth-order harmonic oscillator [3]. The real physical problem in this context appeared for the first time, while an attempt was made to formulate a renormalized quantum theory of gravity [4]. The higher-derivative theory of gravity is usually considered a model of quantum gravity. The reason is that Einstein–Hilbert action is supplemented by curvature squared terms (R^2, $R_{\mu\nu}R^{\mu\nu}$) to ensure renormalizability [4] and asymptotic freedom [5–7]. Unfortunately, curvature-squared gravity theories have been found to suffer from the unresolved problem of physical unitarity in perturbative analysis, which is typical for higher-derivative theories. However, possibilities to overcome this difficulty were also discussed in the literature [6,8] and references therein. It is also ascertained that curvature squared gravity would arise as a low-energy effective theory derived from superstring theory in $D = 10$ dimensions [9–11]. Over the last couple of decades, higher-order theories of gravity, e.g., $F(R)$, $F(\mathcal{G})$, $F(R,T)$, etc. (R, $\mathcal{G}$, T being the Ricci scalar, the Gauss–Bonnet term, and the torsion term, respectively) have drawn lot of attention in the search for alternatives to the dark energy issue. Nonetheless, it is always suggested to test the viability of such modified theories of gravity in different contexts. In the context of the very early universe, a canonical formulation is required as a precursor, especially to study quantum cosmology.

Since Ostrogradsky's technique does not apply in the degenerate case of singular Lagrangian, for which the Hessian determinant vanishes, Dirac's constraint analysis [12] may be applied for the purpose. Nonetheless, a host of theories have been formulated over the years to bypass constraint analysis. One such approach in this direction was originally proposed by Boulware [13], and later reshuffled by Horowitz [14] in the context of a higher-order theory of gravity, in particular. Since the canonical formulation of higher-order

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Inflation and cosmological evolution with $F(R, \mathcal{G})$ gravity theory

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In the last decade Planck PR4 data together with ground-based experimental data such as BK18, BAO and CMB lensing tightened constraint of the tensor-to-scalar ratio, starting form $r < 0.14$ to $r < 0.032$, while the spectral index lies within the range $0.9631 \leq n_s \leq 0.9705$. Viability of modified gravity theories, proposed as alternatives to the dark energy issue, should therefore be tested in the light of such new result. Here, we explore $F(R, \mathcal{G})$ gravity theory in regard to the early universe and show that it is not compatible with newly released constraints on r and n_s simultaneously. Further, it also fails to produce a feasible radiation-dominated era. It therefore questions the justification of using the model for resolving the cosmic puzzle.

Keywords: Modified theory of gravity; canonical quantization; inflation.

Mathematics Subject Classification 2020: 83D05, 81S08, 83F05

1. Introduction

The challenge to explain the issue of dark energy is now almost three decades old. In the first decade, cosmologists tinkered with different exotic dark energy models. However, despite tremendous efforts, no trace of phi (the non-interacting scalar field) has yet been found in the sky. Cosmologists now started believing that the puzzle may be resolved by modifying the left-hand side of Einstein's equation, namely the geometric part of the theory. The problem is, as for different dark energy models, almost all the modified theories of gravity can associate acceleration at the late stage of cosmic evolution. It is therefore required to test such models from different astrophysical observations. In recent years, we have taken up the task to

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Re-imagining, re-conceptualising and re-shaping cities in post-pandemic India: interpreting the urban space

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Abstract: The COVID-19 pandemic has busted the myth of the invincibility of globalisation. Borders are suddenly no longer that significant. Open spaces are becoming pertinent in urban reconstruction. At present, post-pandemic recovery is an important challenge globally. The need to develop modern urbanisation with planned cities that accommodate all sections of people is being universally acknowledged by experts. These cities need to be resilient, inclusive and sustainable. For cities to be sustainable, they need to utilise public spaces judiciously. The paper focuses on what makes cities sustainable in a post-pandemic world order and how India is navigating the challenges of urban reconstruction. The paper brings up the binary between public and private space and points out that wellness of individuals is very significant pointer in newly planned cities. The paper concludes that big cities are here to stay whatever be the predictions of naysayers.

Keywords: cities; urbanisation; urban space; sustainable; resilient; density; India.

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Gender-based violence in Afghanistan: a distraught state in denial

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Abstract: Gender-based violence implies physical, sexual and mental harm or suffering to women including threats of such acts, coercion or arbitrary deprivation of liberty whether occurring in public or private life. Moreover, when this is culturally embedded or rooted in societal structure (as Galtung argues), it is expansive and often invisible as 'tranquil waters'. In war-ravaged Afghanistan, which has paid the price of external interventions, dominance of regional military factions, brutal insurgent forces like the Taliban, and a state that has failed to give legal and medical protection to half of its citizens (read women); structural violence as found in gendered forms are quite common. This chapter identifies structural violence as the most widespread form of violence in Afghanistan and how it is deeply rooted in gender inequality. It focuses on case studies of violence where it is essentially gendered and how health of women is getting affected.

Keywords: gender-based violence; right to health; human rights; distress; domestic abuse; structural violence; survivors; invisibility of women; 'baad'; 'baadal'; gender activism; Taliban; sexual violence; Afghanistan.

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Biographical notes: Koyel Basu is an Assistant Professor in the Department of Political Science; Jangipur College affiliated to the Kalyani University. Her book titled *Human Rights and State Politics in India: Case Studies of West Bengal, Punjab and Assam (1970–2000)* were published by Authorspress, New Delhi in 2021. ISBN: 978-93-90891. At present, she is working as an Honorary Visiting Fellow of Nepal Institute of International Cooperation and Engagement, a leading apolitical think tank of the world. She has also written articles for Khabarhub.com, Nepal's most trusted digital platform.

Jangipur College

Details of Publication in Journals for the year 2022

Elucidating the Strategies for Isolation of Endophytic Fungi and Their Functional Attributes for the Regulation of Plant Growth and Resilience to Stress

Published: 27 March 2022
Volume 42, pages 1342–1363, (2023) Cite this article

Journal of Plant Growth Regulation

Aims and scope →
Submit manuscript →

Prabha Toppo, Rewaj Subba, Kuheli Roy, Soumya Mukherjee & Piyush Mathur

Abstract

Accumulating evidences from investigations in the last decade have revealed the significant role of endophytes in regulation of plant growth, communication and stress tolerance. Endophytes establish a mutualistic relationship with plants which is known to be beneficial for both the organisms. A large number of endophytic fungi inhabit various plant parts such as leaf, stem, roots. These endophytic fungi are highly assorted in terms of both diversity and specificity with respect to host association. Meta-genomics has made the procedure of identification of these endophytic fungi quick and reliable and furthermore, critical assessment of endophytic diversity associated with different crop plants and in different ecological niches has helped in developing gene pool of beneficial endophytic fungi. Endophytic fungi have been well characterized and offers great advantage to host plants in sustaining growth and development under diverse climatic conditions. Fungal endophytes play an active role in agriculture as biostimulants for augmenting crop production and protection. This will provide eco-friendly ways to the farmers to enhance both quality and quantity without compromising to plant health as well as without harming ecosystem. The present review summarizes the diverse roles of endophytic fungi in enhancement of growth, plant development and stress tolerance to adverse environmental conditions. Our current understanding of the diverse roles of endophytes shall appear beneficial in crop improvement and sustainability.

plant biology

Review Article

Hydrogen sulphide (H_2S) in the hidden half: Role in root growth, stress signalling and rhizospheric interactions

P. Mathur, S. Roy, M. Nasir Khan, S. Mukherjee

First published: 25 March 2022 | https://doi.org/10.1111/plb.13417 | Citations: 5

ABSTRACT

Apart from nitric oxide (NO) and carbon monoxide (CO), hydrogen sulphide (H_2S) has emerged as a potential gasotransmitter that has regulatory roles in root differentiation, proliferation and stress signalling. H_2S metabolism in plants exhibits spatio-temporal differences that are intimately associated with sulphide signalling in the cytosol and other subcellular components, *e.g.* chloroplast and mitochondria. H_2S biosynthesis in plant organs uses both enzymatic and non-enzymatic pathways. H_2S generation in roots and aerial organs is modulated by developmental phase and changes in environmental stimuli. H_2S has an influential role in root development and in the nodulation process. Studies have revealed that H_2S is a part of the auxin and NO signalling pathways in roots, which induce lateral root formation. At the molecular level, exogenous application of H_2S regulates expression of several transcription factors, *viz.* LBD (Lateral organ Boundaries Domain), MYB (myeloblastosis) and AP2/ERF (Apetala 2/ Ethylene Response Factor), which stimulate upregulation of *PpLBD16* (*Lateral organ boundaries domain 16*), thereby significantly increasing the number of lateral roots. Concomitantly, H_2S acts as a crucial signalling molecule in roots during various abiotic stresses, *e.g.* drought, salinity heavy metals (HMs), etc., and augments stress tolerance in plants. Interestingly, extensive crosstalk exists between H_2S, NO, ABA, calcium and ethylene during stress, which escalate plant defence and regulate plant growth and productivity. Hence, the present review will elaborate the role of H_2S in root development, stress alleviation, legume–*Rhizobium* symbiosis and rhizosphere signalling. The review also examines the mechanism of H_2S-mediated abiotic stress mitigation and cross-talk with other signaling molecules.

CONFLICT OF INTEREST

All the authors declare that they have no conflict of interest.

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June 2022
Pages 559-568

Salicylic acid and silicon impart resilience to lanthanum toxicity in *Brassica juncea* L. seedlings

Original paper | Published: 20 January 2022

Volume 100, pages 453–466, (2023) Cite this article

Plant Growth Regulation

Aims and scope →

Submit manuscript →

Manzer H. Siddiqui, Soumya Mukherjee, Bander M. A. Al-Munqedhi, Ritesh Kumar & Hazem M. Kalaji

This article has been updated

Abstract

Lanthanum (La) is a chemically active and naturally occurring rare-earth element (REE) known to exert both beneficial and deleterious effects to plant growth and physio-biochemical functions. Not much information is available to substantiate the integrative role of salicylic acid (SA) and silicon (Si) in alleviating La toxicity in plants. Therefore, the current study was planned to evaluate the role of SA and Si in mitigating the La toxicity in mustard (*Brassica juncea* L.) seedlings. Different physiological and biochemical parameters like the estimation of chlorophyll, nutrients content and osmotic compounds, and analysis of antioxidative enzymes and non-antioxidative enzymes were used in this study. Mustard seedlings grown under La toxicity conditions exhibited reduced growth attributes and impaired photosynthetic metabolism. However, the combined application of SA and Si synergistically suppressed hydrogen peroxide (H_2O_2) content, electrolytic leakage, malondialdehyde and improved the content of nutrients (nitrogen, phosphorus,

Part of a collection:
Signalling and Communication Cascade of Micronutrients in Plants

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Transparent exopolymer particle production by diatoms and its relation with CO_2 flux in mangrove waters of Sundarban, West Bengal

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Short communication

Abstract

Diatoms play an important role in the process of the photosynthetic conversion of carbon dioxide to transparent exopolymer (TEP). This study revealed that the formation of TEP is encouraged during the maximum population of diatom with a greater relative abundance of *Skeletonema cf costatum*, *Dytilum brightwellii*, *Chaetoceros* sp. in the post-monsoon. The concentration of TEP ranged from 120.4 to 203.5 μg gum xanthan equivalent/l with the maximum level in the post-monsoon, while fugacity of CO_2 (fCO_2, μ atm) was minimum (304.5 μ atm) and the study area acted as a sink for atmospheric CO_2 (-5.25 μ M/m^2/h) in contrast to the pre-monsoon (364.0 μ atm; 13.3 μ M/m^2/h) and monsoon (432.5 μ atm; 10.6 μ M/m^2/h). Thus TEP production by diatom is related to the uptake of CO_2 during available phosphorus-limited environments and may participate in other ecological processes.

Keywords *Diatom, transparent exopolymer particle, carbon dioxide, estuary, sundarban mangroves*

Introduction

The TEP is a microscopic, transparent organic particle that consists mainly of acid polysaccharides and is an exopolymer of diatom and bacteria (Passow, 2000; Passow, 2002a). Grossart and Simon (1997) and Berman-Frank *et al.* (2007) observed TEP formation in senescent or nutrient-stressed algae and cyanobacteria. TEP production by diatom could be related to the uptake of CO_2 under nutrient limitation (Raven and Johnston, 1991). The TEP may be an important component of carbon cycles, as its concentration tends to increase along productivity gradients from oceanic to coastal regions. Bhaskar and Bhosle (2006) reported that the mean % of TEP-C contribution to the annual average organic carbon production for 1998-2000 was 6.9% ±5.8%, next only to phytoplankton-C (33.1±22.1%) and greater than bacterial-C (4.6%±4.6%) or Carbon coming from other sources (<3.8%) in the west coast of India. The TEP carbon contributes to 16% of the total organic carbon pool (Wetz *et al.*, 2009) and their aggregation and sinking could contribute significantly to the flux of carbon to depths and may have far-reaching consequences for the sequestration of carbon.

In the northeastern region of the Bay of Bengal, the estuarine systems of the river Ganges are dominated by the highly productive Sundarban mangrove ecosystems. Here, seasonal variability of diatom showed the highest levels during post-monsoon periods with a greater number of definable Bacillariophyceae species over Dinophyceae taxa (De *et al.*, 1994; Biswas *et al.*, 2010). The Biological pump for CO_2 has a very active presence here (Biswas *et al.*, 2004) and the organic carbon production of small-sized diatom was found by De *et al.* (1991) to be more than 70% of the total primary production. Copepods were the most abundant taxa (54.6% of total zooplankton abundance) and Chowdhury *et al.* (2012) explained the inter-annual variations in diatom abundance by a simple predator-prey relationship with zooplankton. Passow and Alldredge (1999) reported that the zooplankton genera, *Euphausia pacifica* preferred TEP rather than grazing small-sized diatom *Thalassiosira weissflogii*. The previous study by Chowdhury *et al.* (2016) in the Sunderban Mangrove waters was mainly based on 1) finding possible sources and 2) temporal and seasonal variation of TEP in the water. Our study reports the TEP formation relating diatom production with increased CO_2 uptake under a limited supply of available nutrients in the

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Diarylazooxime complex of cobalt(III): synthesis, structure, ligand redox, DFT calculations and spectral characteristics

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Received: 24 September 2021 / Accepted: 23 November 2021

Abstract
By using a multifunctional diarylazooxime ligand L^{NOH} **1**, incorporating electron deficient azo chromophore in conjunction with a pendant π-electron-rich naphthyl group, the *trans* dichloro bis complex of type $[Co^{III}(L^{NOH})(L^{NO-})Cl_2]$ **2** has been synthesized. The structure of the chelate has been determined by X-ray crystallography, thereby authenticating the presence of oxime-oximato hydrogen bond within the coordinated moiety. The stability of this complex is attributed to intra-molecular hydrogen bonding as well as due to strong Ph_π–Ph_π stacking interactions. The complex has been characterized by several spectroscopic techniques, and their electrochemical properties have been reported. These are further complemented by theoretical studies in the form of DFT and TDDFT. The visible excitation for the complex arises from mainly mixed singlet manifold ^{1}ILCT and ^{1}LLCT transitions.

Introduction

The exploration of coordination chemistry of cobalt oximes has gained significant importance after the reports of Schrauzer et al. [1] since they have similarities with cobalamins (vitamin B_{12}) [2–4]. The cobaloximes have also been recently employed as cheap materials to bring about electrocatalytic proton and water reduction [5–9] owing to the ability of the metal center to span redox states from $3+(3d^6)$ to $1+(3d^8)$. Furthermore, cobalt oxime complexes have also been reported to catalyze H-transfer from H_2 [10–15]. Lately, the tris complexes of cobalt with diarylazooxime possessing polycyclic aromatic hydrocarbon (PAH) moieties derivatized with electron-poor azo chromophores as well as oxime function have been employed as robust catalyst to carry out electro-catalytic oxygen reduction reaction (ORR), and it has also been observed that the catalytic activity may be varied by suitably changing of one of the aryl groups [16]. In this regard as well as a part of our pursuit for understanding molecular and electronic structures of diverse cobalt complexes with diarylazooximes, we were prompted to study the electron transfer properties that may be exhibited within the metal–ligand framework in such complexes.

In the present work, we have selected a multifunctional diarylazooxime ligand L^{NOH} **1** incorporating an electron deficient azo chromophore in conjunction with oxime function along with a pendant π-electron-rich naphthyl group. We have been able to isolate the *trans* dichloro bis complex of type $[Co^{III}(L^{NOH})(L^{NO-})Cl_2]$ **2** (Scheme 1), and its structure has been authenticated by X-ray crystallography. There is an oxime-oximato hydrogen bond in the coordinated framework that gives additional stability to the complex, and there is further stabilization via strong intramolecular π–π stacking interactions [17–19]. Characterization of **2** was performed by several spectroscopic techniques, and their electrochemical properties have been scrupulously monitored, and these are further complemented by theoretical means. It is worth mentioning that the chemistry of such dichlorobis complexes of both rhodium(III) and iridium(III) have been well understood but the corresponding cobalt chemistry has not been developed [17, 20].

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A REVIEW ARTICLE ON A PPLICATION OF PREBIOTICS IN AQUACULTURE

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Abstract

Aquaculture productivity is increasing rapidly and it has been a exploding sector among all kind of aquatic food. To get economic profit, farmers uses several kinds of chemicals, drugs or antibiotics to increase the rate of production within a very small period of time. Because of these reasons; the aquatic environment of aquaculture is in loss. Not only that, the condition of water becomes poor. And by following this way, lots of disease arises in fish, affect the growth of fish and even several environmental stress condition appeared. Disease control in fish culture, rather aquaculture is more important to counter the economic losses as well as public health. Use of drugs, antibiotics and chemicals are old method to prevent disease. These type of method is not so much beneficial. So, new method is necessary to release these environmental stress and provide suitable environment for this culture. This review will present the effectiveness of application of pre and probiotics to improve better growth of fish, helps in growing beneficial bacteria and present infective bacteria.

Keywords: Productivity; Aquaculture; Organic pollution; prebiotics; Inulin.

1. Introduction:

The world population is increasing with the time, that is why the demand of food is Very high nowadays. It has been seen that the food production in aquatic medium; Play a major role to supply the food and also fulfil the demand of food in large scale (Pandiyan et al.,

2013). The Global demand of fish as a food consumption is Increased at the rate of 3.1 percent yearly from the year 1961 to 2017, and this rate is About twice the rate of yearly world population growth i.e. 1.6 percent in the same Period of time, it's higher than from all other animal protein food consumption which Increased in the rate of 2.1 percent every year (FAO, 2020). In most of the countries,aquaculture is the base of their economy. In recent studies we

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The Curse, Crisis and Control: A study of Kalidasa's *Abhijnanashakuntalam*.

Biplob Das, West Bengal

Abstract:

Abhijnanashakuntalam is one of the most well-known plays by Kalidasa. It is generally considered to be the greatest Indian literary work of any period. It was composed about the 5th century CE. It is the first Indian classical play ever to be translated into western languages. Sir William Jones translated it in English language by in the year 1789. Abhijnanashakuntalam is the most famous and is usually judged the best Indian literary effort of any period in Indian classical drama. The story of the drama is taken from the epic Mahabharata, and it presents tale of the seduction of the nymph Shakuntala by King Dushyanta, his rejection of Shakuntala and his child, and their subsequent reunion in heaven. In the development of the whole story Rishi Durvasa's curse on an innocent maiden, Shakuntala plays a pivotal role. The curse brings a disaster in Sakuuntala's life. Shakuntala was once daydreaming about her lover, King Dushyanta. She was so lost in the thought of Dushyanta that she missed seeing Rishi Durvasa arrive there. She forgot to take care of the sage. Enraged, Rishi Durvasa cursed her that her lover would forget her. Horrified, she pleaded for pardon and her friend tried to mollify the Rishi, who softened the curse, saying that Dushyanta would remember her when he saw the ring he had gifted her. Accidentally she had lost the ring. Sure enough, Dushyanta forgot all about her. He remembered everything only when he saw the ring. Finally, the two lovers reconciled and lived together happily ever after, along with their son, Bharata. According to Hindu Mythology, the Sage or Rishi possesses the power to bless and curse. Curse is the most undesirable things or situations that one is bound to suffer mostly because of a mistake he/she made or a crime that he/she committed.

Keywords: Hindu Mythology, Rishi, Rage, Curse, Crisis, Control, Emotional, Love, Reunion.

Introduction:

Mahakavi Kalidas, the Shakespeare of India, is the well-known classical Indian author. He is a dramatist, an epic writer and a poet. He is probably the greatest Indian writer of any epoch. He was a creative genius who had made his characters multi-dimensional and expanded their scope with imaginative flights. In his writing, the characters appear as common men of blood and flesh, and their actions are governed by well-conceived notions of beauty. The characters are real and life-like. The hero and heroine fall in love at first sight. Heroine plays leading role and surpass their male counterpart. She is endowed with wit, common sense, human feelings and noble qualities of head and heart. She knows how to fulfil her love and resolve the crisis. Kalidasa gave depth to his works by highlighting Shakuntala's separation from Duhsanta. The separation caused by the loss of memory and the token ring due to the curse. The curse complicates Shakuntala's love for Duhsanta. When Shakuntala asks Duhsanta to accept her as his wife, Duhsanta, under the influence of the curse does not recognise Shakuntala. He does not recall his love affair with Shakuntala and refuses to acknowledge her as his wife. Duhsanta expresses his extreme consciousness concerning the impact of the denial of her rights. Thus it sincerely reveals an emotional crisis in her life. She is suffering agonies over his lost love. Dushyanta is not responsible for their separation; he acts only under a delusion caused by a sage's curse. The curse causes crisis in Shakuntala's life.

Curse appears frequently in traditional Hindu literature. If you look deep into Hindu Mythology, you will see that no power was bigger than the curse of a pious or saintly person. A curse is a warning and a wish to inflict adversity upon an enemy, using supernatural powers like a mantra, a prayer or a magic spell. Curse has the life-changing power. Curses have a reason and sometimes they shape the future of millions. Even gods were not spared from the power of a curse. Curses explain some natural phenomenon's and tell us why things are the way they are. In the Puranas, Durvasa, also known as Durvasas, was an ancient Rishi - the son of Atri and Anasuya. He is known for his extremely short temper and tendency to curse, and he was always received with great reverence by cursing. Rishi Durvasas cursed Shakuntala because of her inhospitality. Durvasa was also known for granting boons to those who pleased him. As Rishi Durvasa storms off, *Anasuya* attempts to plead with the sage and requested him to modify

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Research article

Bactericidal activity of lactic acid *Bacillus* in presence of oxide nanoparticles

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ABSTRACT

The bactericidal activity of human beneficial gut bacteria commonly known as probiotics plays an important role in the era of multidrug-resistant bacteria as the rising antimicrobial resistance has been identified as a top health threat. The probiotic organism plays an important role not only in infection but also in the development of immunity and its impact on inflammatory diseases. Besides digestion and absorption, it eliminates pathogenic microorganisms by their bactericidal activity and thus maintains a proper balance in the gut ecosystem. Along with that, multiple applications of nanotechnology in the agri-food sector, drug delivery, and medical sectors are growing rapidly. The biosafety study of those nanoparticles was tested on several human cell lines, but the fate and behaviour of nanoparticles in the human gastrointestinal tract, especially on beneficial gut flora or probiotics need attention along with its antimicrobial activity. Here, in this study we have tested the effect of titanium dioxide (TiO_2), silicon dioxide (SiO_2) and zinc oxide (ZnO) nanoparticles (as those nanoparticles used mostly in the agri-food sectors and health sectors) treated *Bacillus coagulans* (used as probiotic) cellular supernatant on *E. coli* MTCC 1610 strain with respect to untreated *Bacillus coagulans* cellular supernatant. We found reduced bactericidal activity in the case of TiO_2 and SiO_2 nanoparticles treated *Bacillus coagulans* whereas the bactericidal activity of ZnO nanoparticles treated *Bacillus coagulans* cellular supernatant showed more or less similar result with respect to untreated *Bacillus coagulans* cellular supernatant. Hence, the bactericidal activity of nanoparticle-treated *Bacillus coagulans* was studied thoroughly.

Keywords: Bactericidal activity of gut bacteria, nanoparticles, pathogenic bacteria.

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INTRODUCTION

Nanotechnology has become one of the developing industries with its multiple applications in electronics, medical diagnosis, agri-food sector, healthcare, etc. These particles have huge importance due to their high surface area, size flexibility, biocompatibility and versatile functional ability. In the agricultural food sector, nanotechnology leads to technological advancement for higher growth of crop with high quality and higher nutritional value [1]. In plant science mainly two groups of nanoparticles are used, they are metal based and carbon-based nanomaterials [2]. Among metal-based nanomaterials titanium dioxide (TiO_2) nanoparticles stand top based on their uses [3]. Our gastrointestinal tract seems to be the most relevant space for the absorption of TiO_2 nanoparticles as food products, water, liquid beverages, and drug carriers [4,5]. Our gut contains greater than a thousand phylotypes of bacterial components, among which Bacteroidetes and Firmicutes represent greater than ninety percent of the total microbiota [6]. Gut bacteria have a growing interest in various areas of research but they have been considered recently in connection to the probable toxicological effects of consumed food. Regarding the fate and behavior of nanoparticles in the gastrointestinal tract very little is currently known. In our previous experiment, we have studied the effect of TiO_2 anatase nanoparticles on *Bacillus coagulans* (the beneficial gut bacteria, commonly used as probiotics) in dark conditions for its safe doses. The data show the enhancement of bacterial growth in presence of 1 ppm concentration of TiO_2 anatase nanoparticle with a moderate amount of oxidative stress, thickening of the cell wall and biofilm formation [7]. We have also tested the effect of zinc oxide (ZnO) nanoparticles on *B. coagulans* for their safe doses, as these nanoparticles are extensively used as antibacterial and antiviral agents [8-10]. Along with that, nano ZnO has positive feedback on explants culture and plant root production [11]. The silicon dioxide (SiO_2) nanoparticle was also tested on *B.*

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Full Length Research Article

Micelle-based Extraction of Cr (III) from Water and Sediment

Rajib Joarder*[1]

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A B S T R A C T

Miceller Extraction of metalion from aqueous to Trition X-100 is carried out as a sample preconcentration and prior to determination in different matrices coupled with atomic absosopion spectroscopy (AAS). The metalion-Schiff base complex formation and it was subsequently transferred from the aqueous phase to the surfactant phase. The pH, concentration of the surfactant as well as the ligand, incubation time and temperature etc. play a vital role in this extraction. The cloud point temperature (CPT) was established in presence of different salts with varying their concentrations and its role like salting-in and salting-out effect were tested and optimized. The efficiency of extraction was more than 86%. The change of -ΔG indicates that the process was spontaneous and favorable. Application of this process was applied for extraction and recovery of Cr (III) from water and sediment sample.

Key words: Cloud point extraction (CPE), Cr (III)-Schiff base complex, Surfactant, Water and sediment, AAS

The chromium containing liquid effluent from leather industry is treated with ferrous sulphate (or) sodium sulphide to convert all Cr (VI) to Cr (III) form. Recently, inadequate use of this compound in the industry led to discharged large quantities into the environment. Cr (III) is an essential nutrient for living animal and shortages may cause heart conditions, disruptions of metabolisms and diabetes. But the too much uptake of Cr (III) symptom and causes sleep disturbance, irregular heartbeat, allergic reaction, for instance skin rashes and mood change etc. [1]. As an analytical chemist separation and preconcentration and reduction of load of hazardous substances in the environment some technique like [2], liquid extraction [3], coprecipitation [4], cloud point extraction [5,6], solid phase extraction [7], is necessary prior to determination step for overcome this problem. The most popular and traditional methodology used for extraction and/or separation of solute is the liquid-liquid extraction (LLE). However, the technique has serious drawbacks, like excess amounts of toxic and flammable organic solvents used, slow extraction speed and high dilution factor that lead to low extraction efficiency for solute. A considerable attention has recently been paid towards the development of simple and rapid extraction methods together with the use of minimum of solvents, reducing the analysis step, increasing the sample throughput and improving the quality and the sensitivity of the analytical methods.

Currently, CPE has been put forward as a clean and alternative to conventional technique for extraction of both metal ions and organic compounds. The first use of the CPE methodology for metal ion was pioneered by Watanabe and co-workers [8-10]. The concept of CPE that arises from the use of organized molecular assemblies [11] have received wide acceptance in different fields of analytical chemistry. The different reported methods sows that critical temperatures of nonionic surfactants depend on the nature of the surfactants and experimental conditions [12]. Substrate solubilization in micelles has traditionally been treated in terms of a two-phase process [13-16]. Solute distribution between two extreme sites is considered in this model. In CPE, for separation of metal ion several complexing reagent were used with maintained solution buffered. Watanabe and coworkers [17-18] were the first to study the extraction of copper, cadmium, nickel, iron, and zinc for preconcentration via complexation with some ligand. The micellar solubilization equilibrium of some analytical reagents in aqueous solution of non-ionic surfactants [19]. The process involves several equilibrium and chemical species. The equations presented below represent in a simplified way the acid dissociation step of chelating reagent (HL) and the formation of a hydrophobic chelate following by its transference into a micellar phase [20]. During separation of the surfactant-rich phase containing the micelles from the aqueous bulk, there is a decrease of the solubility of the amphiphile in water or to a sharp increase in the micelle aggregation number [21-24]. The phases consist of a surfactant-depleted (or dilute) phase and a surfactant rich aggregate (or concentrated) phase, sometimes also referred to as the coacervate phase that appears only in the vicinity of the CPT [25]. The actual physical separation of the phases is facilitated by the difference in density between the two (dilute aqueous and surfactant-rich) phases. The phase separation process is reversible and, upon cooling the mixture to a temperature below the cloud point, the two phases again combine to form an isotropic, homogeneous solution [26]. Thus, separation of Cr(VI) and Cr(III) could be

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Potassium and melatonin-mediated regulation of fructose-1,6-bisphosphatase (FBPase) and sedoheptulose-1,7-bisphosphatase (SBPase) activity improve photosynthetic efficiency, carbon assimilation and modulate glyoxalase system accompanying tolerance to cadmium stress in tomato seedlings

Manzer H. Siddiqui [a], Soumya Mukherjee [b], Ritesh Kumar [c], Saleh Alansi [a], Anis Ali Shah [d], Hazem M. Kalaji [e], Talha Javed [f h], Ali Raza [g]

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Highlights

- Cadmium (Cd) toxicity impairs photosynthesis capacity and glyoxylase system in tomato seedlings.
- Potassium (K) and Melatonin (Mel) improve photosynthetic carbon fixation in the Calvin cycle.
- K plus Mel improve Chl biosynthesis and glyoxylase system in tomato seedlings.
- K plus Mel enhance high GSH levels in GSH pool and antioxidant system in seedlings.
- K in association with internal Mel brings about tolerance of seedlings against Cd toxicity.

Abstract

The mechanism of the combined action of potassium (K) and melatonin (Mel) in modulating tolerance to cadmium (Cd) stress in plants is not well understood. The present study reveals the synergistic role of K and Mel in enhancing physiological and biochemical mechanisms of Cd stress tolerance in tomato seedlings. The present findings reveal that seedlings subjected to Cd toxicity exhibited disturbed nutrients balance

Environmental and Experimental Botany
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Review

Auxin-mediated molecular mechanisms of heavy metal and metalloid stress regulation in plants

Piyush Mathur [a 1], Durgesh Kumar Tripathi [b 2], František Baluška [c 3], Soumya Mukherjee [d 4]

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Highlights

- Auxin plays a key role during HM and metalloid stress in plants.
- Auxin protects the plant from oxidative stress and increase the production of antioxidative enzymes.
- Auxin concentrations in roots are increased by various rhizospheric microorganisms and mitigate plants from HMS.
- A crosstalk exists between various other phytohormones such as ABA, Et, SA, BRs, etc. and auxins during HMS.
- Auxin also interacts with other signalling molecules like NO, melatonin, CO and H_2S during stress conditions.

South African Journal of Botany
Volume 150, November 2022, Pages 14-25

Calcium and jasmonic acid exhibit synergistic effects in mitigating arsenic stress in tomato seedlings accompanied by antioxidative defense, increased nutrient accumulation and upregulation of glyoxalase system

Manzer H. Siddiqui [a], Soumya Mukherjee [b], Saud Alamri [a], Hayssam M. Ali [a], Zafarul Hasan [c], Hazem M. Kalaji [d e]

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Highlights

- Arsenic (As) impaired growth, physiological and biochemical attributes of tomato seedlings.
- Application calcium (Ca^{2+}) with jasmonic acid (JA) suppressed ROS and methylglyoxal overproduction under As stress conditions.
- Combined application of Ca^{2+} and JA enhanced chlorophyll and glycine betaine biosynthesis As-tressed tomato seedlings.
- Exogenous Ca^{2+}+JA regulated nutrients homeostasis in tomato seedlings under As toxicity conditions.

Palestine Journal of Mathematics

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SOME CURVES ON THREE-DIMENSIONAL ALMOST KENMOTSU MANIFOLDS

Ashis Mondal

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MSC 2010 Classifications: 53C15, 53C25.

Keywords and phrases: Almost Kenmotsu manifolds, ϕ-symmetric, Legendre curve, slant curve, C-parallel.

The author is thankful to the referee for his/her valuable suggestions in the improvement of the paper.

Abstract. The object of the present paper is to study some curves on three-dimensional almost Kenmotsu manifolds with the $(\kappa,\mu)'$-nullity distribution. In this paper, we study biharmonic almost contact curves and slant curves on three-dimensional almost Kenmotsu manifolds with the $(\kappa,\mu)'$-nullity distribution. We also study ϕ-symmetric curves on almost Kenmotsu manifolds and a nontrivial example of Legendre curve is given.

1 INTRODUCTION

The notion of k-nullity distribution was first introduced by Gray [9] and Tanno [22] in the study of Riemannian manifold (M,g), which is defined for any $p\in M$ as follows

$$N_p(k)=\{Z\in T_pM : R(X,Y)Z=k[g(Y,Z)X-g(X,Z)Y]\}, \tag{1.1}$$

where X,Y and Z denote arbitrary vectors in T_pM and $k\in R$. Blair et al. [5] introduced a generalized notion of the k-nullity distribution named the (k,μ)-nullity distribution on a contact metric manifold $(M^{2n+1},\phi,\xi,\eta,g)$, which is defined for any $p\in M^{2n+1}$ as follows

$$\begin{aligned} N_p(k,\mu)=\{Z\in T_pM : R(X,Y)Z =& k[g(Y,Z)X-g(X,Z)Y] \\ &+\mu[g(Y,Z)hX-g(X,Z)hY]\}, \end{aligned} \tag{1.2}$$

where $h=\frac{1}{2}L_\xi\phi$ and L denotes the Lie differentiation and $(k,\mu)\in R^2$. Later, Dileo and Pastore [7] introduced another generalized notion of the k-nullity distribution which is named $(k,\mu)'$-nullity distribution on an almost Kenmotsu manifold $(M^{2n+1},\phi,\xi,\eta,g)$ and is defined for any $p\in M^{2n+1}$ as follows

$$\begin{aligned} N_p(k,\mu)'=\{Z\in T_pM : R(X,Y)Z =& k[g(Y,Z)X-g(X,Z)Y] \\ &+\mu[g(Y,Z)h'X-g(X,Z)h'Y]\}, \end{aligned} \tag{1.3}$$

where $h'=h\circ\phi$ and $(k,\mu)\in R^2$. If both k and μ in relation (1.2) are smooth function on M^{2n+1}, then such a nullity distribution is called a generalized (k,μ)-nullity distribution.

In [1], M. Atceken studied warped product semi-slant submanifolds and proved non-existence of such submanifolds in Kenmotsu manifolds. The geometry of warped product pointwise semi-slant submanifolds of locally product Riemannian manifolds were studied in [27]. The warped product semi-slant submanifolds of Kenmotsu manifolds and bi-slant submanifolds of Kaehler manifolds were studied in ([6], [23], [24], [25]). Also the Classification of totally umbilical slant submanifolds of a Kenmotsu manifold were studied in [26].

After the work of Baikoussis and Blair [2], the study of curves on contact manifolds has become a popular topic. They have studied Legendre curves on contact three-manifolds. Initially, Legendre curves were studied only on contact manifolds. Later, the Legendre curves on almost contact manifolds have been also studied on almost contact manifolds. Legendre curves have been given the name almost contact curves. For detailed we refer the references given in [19]. Legendre curves have been studied on manifolds with Lorentzian metric side by side of Riemannian metric. In [3], the authors have studied Legendre curves on Lorentzian Sasakian manifolds.

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CERTAIN CURVES ON SOME CLASSES OF THREE-DIMENSIONAL TRANS-SASAKIAN MANIFOLDS ADMITTING SCHOUTEN-VAN KAMPEN CONNECTION

ASHIS MONDAL

Abstract. In the present paper we study biharmonic Legendre curves and locally ϕ-symmetric Legendre curves with respect to Schouten-van Kampen connection on three-dimensional trans-Sasakian manifolds. Also we study mean curvature vector of Legendre curves and C-parallel slant curves in a three-dimensional trans-Sasakian manifold with respect to Schouten-van Kampen connection. Finally, we constract an example of a geodesic Legendre curve on a three-dimensional trans-sasakian manifold with respect to Schouten-van Kampen connection.

1. INTRODUCTION

In the study of contact manifolds, Legendre curves play an important role, e.g., a diffeomorphism of a contact manifold is a contact transformation if and only if it maps Legendre curves to Legendre curves. Legendre curves on contact manifolds have been studied by C. Baikoussis and D.E. Blair in the paper [3]. Originally the notion of Legendre curve was defined for curves in contact three manifolds with the help of contact form. This notion of Legendre curves can be also extended to almost contact manifolds [22]. Curves satisfying the properties of Legendre curves in almost contact metric manifolds are known as almost contact curves [10]. J. Welyzcko [22], studied Legendre curves on three-dimensional trans-Sasakian manifolds with respect to Levi-Civita connections. In [10], the authors have introduced a 1-parameter family of linear connections on three-dimensional almost contact metric manifolds to study biharmonic curves on almost contact manifolds. The author has studied some curves on three-dimensional trans-Sasakian manifolds with semi-symmetric metric connection [19]. The author of the present paper has also studied some curves on α-Sasakian manifolds with indefinite metric [20]. Slant curve with C-parallel mean curvature vector fields have been studied in [14]. Again in [8] slant curves with C-parallel mean curvature vector field have been investigated. It is known that [11] trans-Sasakian structures of type (0,0), $(0, \beta)$ and $(\alpha, 0)$ are cosymplectic, β-Kenmotsu and α-Sasakian respectively. The local structure of trans-Sasakian manifolds of dimension $n \geq 5$ has been completely characterized by J.C. Marrero [15]. He proved that a trans-Sasakian manifold of dimension $n \geq 5$ is either cosymplectic or α-Sasakian or β-Kenmotsu manifold. So proper trans-Sasakian manifolds exist only for dimension three. In the present paper, we are interested

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Key words and phrases: Legendre curves, trans-Sasakian manifold, locally ϕ-symmetric, Schouten-van Kampen connection, slant curve.

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Research article

The biosafety study of SiO_2 nanoparticle on lactic acid bacillus– an approach towards safety on human gut immunity

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ABSTRACT

The increasing applications of nanoparticles such as Silicon dioxide nanoparticles (SiO_2 nanoparticles) are found in the various biotechnological and biomedical fields like drug delivery, disease diagnostics, imaging, biosensor development, cosmetics, foods, etc. In the new era of nanotechnology, we get new dimensions in medical and pharmaceutical fields such as vaccine design (as nano materials show good performances in antigen delivery, as it mimics viral body and also it acts as adjuvant). Thus, a systematic and mechanistic evaluation of the possible biotic and toxic effects of SiO_2 nanoparticles needs to be tested for their safe applicability in human life. In the era of multiple drug resistance and the simultaneous outbreak of new bacterial, viral and other zoonotic strains, human beneficial gut bacteria play a major role in developing the body's immunity. It controls mucosa-associated immune cells and produces a large number of antibodies. Thus, probiotic treatment becomes crucial for maintaining the human body's proper balance on immunity. The biosafety study of SiO_2 nanoparticles was tested on several human cell lines. But, the effect of SiO_2 nanoparticles on human beneficial gut flora, used as probiotic has never been tested before. *Bacillus coagulans* is a spore-forming, dominant, lactic acid bacillus used as a probiotic worldwide. Here, we report SiO_2 nanoparticles (15 nm) inhibits the growth of bacteria even at a smaller dose (0.1 mg/L), electron microscopy images and enzyme study also reveal changes in bacterial cell wall integrity due to stressful condition. Hence, bacterial interaction with silicon dioxide nanoparticles was studied thoroughly.

Keywords: Silicon Dioxide Nanoparticle, Gut Bacteria, Biosafety.

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INTRODUCTION

Particles having at least one dimension within the range of 1-100 nm with novel and distinctive physiochemical properties can be considered as nanoparticles (NPs) [1]. NPs have various applications in the field of industrial, biomedical and biotechnological for their flexibility in size, structure, high surface area, versatile functional ability and biocompatibility. This research field revolutionized our lifestyle from medicine to the agricultural field, from sensors to water remediation technologies. Now, in the global pandemic period nanotechnology has an immense role in vaccine design as NPs are suitable for antigen delivery and as adjuvant [2]. Among various NPs metal oxides play a very crucial role in different fields like antimicrobial agent, anticarcinogenic agent, in cosmetics, chelating agent etc. They have restricted size and high density which affect their eccentric chemical and physical properties [3]. Silica nanoparticles have a large specific surface area and controlled particle size along with pore volume.

They have good bio compatibility. The preparation of large scale low-cost hydrophilic nature silica nanoparticles is easy that's why they are used in various applications [4,5]. Silica nanoparticles are considered for drug delivery and DNA conjugation as they are nontoxic safest particles [6]. The oxide form of silica nanoparticles (SiO_2 NPs) is being developed for lots of biotechnological and biomedical applications like cancer therapy, enzyme immobilization, DNA transfection and drug delivery [7-10]. In certain diseases like ulcerative colitis target-based SiO_2 NP loaded drugs are used for treatment [11]. However, the safety and the mechanism of interaction of nanoparticles on cell lines and the human body were tested several times but its effect on human beneficial gut flora has never been tested before [12-14]. As we know, probiotic organisms play a key role to boost up body's defense and maintaining a symbiotic relationship with humankind, only the intestines of our gut contain a dynamic and

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The Dispersive Liquid–Liquid Extraction Method Coupled with HPLC and its Application in Determining S-triazine Group of Herbicides in Soil Samples

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ABSTRACT

The dispersive liquid-liquid extraction (DLLE) is an environmentally benign process, which is based on simple, sensitive and rapid sample pre-treatment technique, coupled with HPLC-UV. This unique method has been designed for the separation of s-triazine as a herbicide residue in environmental soil samples. The influencing parameters which have been used to optimize the extraction efficiency include type, extraction solvent (ES) volume, dispersive solvents (DS), extraction time (mainly centrifugation time), pH, ionic strength for the addition of different salts. Firstly, tetrachloroethane was taken as exreaction solvent (ES) to extract pesticide residues from target samples. Furthermore, acetonitrile acted as dispersive solvent in the DLLE method. The value of linearity that has been reported with concentration range of 0.05-200 μgL^{-1}, and value of correlation coefficient (r) lies in between 0.9997. The recovery of the herbicide from three soil samples spiked between 20 and 100 μgL^{-1} were in the recovery in between the range 88.02% to 95.90.0% and the relative standard deviations (RSDs) were 2.7%. Limit of quantitations (LOQs) obtained in this method was 0.09 μgL^{-1}. These results significantly revealed that DLLE is a very accurate and reliable method to estimate the desired pesticide, even at trace amounts, in soil samples.

Keywords: Dispersive liquid-liquid extraction, HPLC-UV, Herbicide, Soil.

INTRODUCTION

Some common agro-chemicals extensively applied in agricultural field for the improvment of production of vegetables, result in great environmental concerns. The spread of problem is serious as over insecticide, fungicide and herbicide applied in the field of agriculture and may found at far distance affecting the non-target species such as air, water, soil and vegetable[1-3]. Development of resistance to pest clean of unwated grass in the timee of cultivation is another big problem. Now several new pesticides have been generated or greater dose of pesticide is administrated to counteract the pest resistance. In order to protect the lives on earth and to maintain the ecological balance, pesticide application must be regulated on utmost necessary, at least to control misuse. Now, determination of pesticide in water, soil and vegetable matrices proceeds in two-step processes like transfer of solute from parent solution to some desirable phase enrichment of solute to reach the

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Full Length Research Article

Comparative Studies Revealing Arsenic Concentrations in Cooked as well as Raw Rice and Rural Bengal Cooking Method using both Arsenic Contaminated Rice and Ground Water

Rajib Joarder*[1]

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ABSTRACT

The rice, specially *Oryza sativa*, is significantly known as a staple food in rural as well as urban areas of Bengal. The conventional cooking method is usually practiced to prepare cooked rice for meals and tiffins. The present study suggests that selection of both water and rice plays an important role in order to avoid Arsenic (As) exposure from food article specially rice. It is important to note that the presence of ground water with low or very low As concentration has been used for drinking purposes in several parts of rural Bengal. Additionally, several rice varieties have also been identified contaminated with As. This study also emphasizes that the uses of As free water and rice are remarkable protocol for cooking to minimize the exposure of As from both.

Key words: Arsenic, Cooking method, Atomic absorption spectrophotometer, Rice

Groundwater is the main source of drinking water for about 90% of the total population (130 million) of Bangladesh and West Bengal and million of people are consuming this groundwater which is contaminated with arsenic [1-2]. The sources of arsenic contamination in this groundwater remain undiscovered. However, it is believed that long term geological changes have led to release arsenic from its core compound called arsenopyrities due to its oxidation by air reaching the underground aquifers through the tube wells conduits [3-5]. A vast portion of populations in these areas have been consuming arsenic contaminated ground water not only for drinking purposes but also for rice cultivation, particularly during summer [6]. In these countries, arable lands are under the facility of irrigation which is performed mainly with very high level of arsenic contaminated (>50-5000 ppb) underground water [7-8]. During Irrigation with arsenic contaminated groundwater, the arsenic concentration is likely to increase in top soils of paddy fields and eventually in different varieties of rice grains [9-11]. The drinking water is not only the main source of arsenic, but the intake of arsenic contaminated rice grain also greatly contributes in increasing arsenic concentration in human body as the major portion of populations consuming rice as an essential diet for their caloric intake [12-14]. The residents of these areas cook rice using both arsenic contaminated water and arsenic enriched rice grain and this cooking process eventually increases the level of arsenic concentration in their bodies. Thus, concentration of arsenic in rice grain is a raising concern in these areas [15]. There are some reports in literature on arsenic content in cooked rice [16]. However, reports on estimation of arsenic concentration in cooked rice are very rare. This work reveals the effects of traditional cooking methods on arsenic retention in cooked rice.

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MATERIALS AND METHODS

Reagents

The chemicals (HCl, NaOH, HNO_3, H_2O_2 and $HClO_4$, KI, $NaBH_4$) used in this report were of analytical grade and obtained from E. Merck, India, DM (MiliQ water) which was used in AAS method (VGA). Silver diethyldithiocarbamate (SDDC), stannous chloride, Zinc, I_2-KI, Lead acetate, Arsenous oxide used for preparation of standard solution.

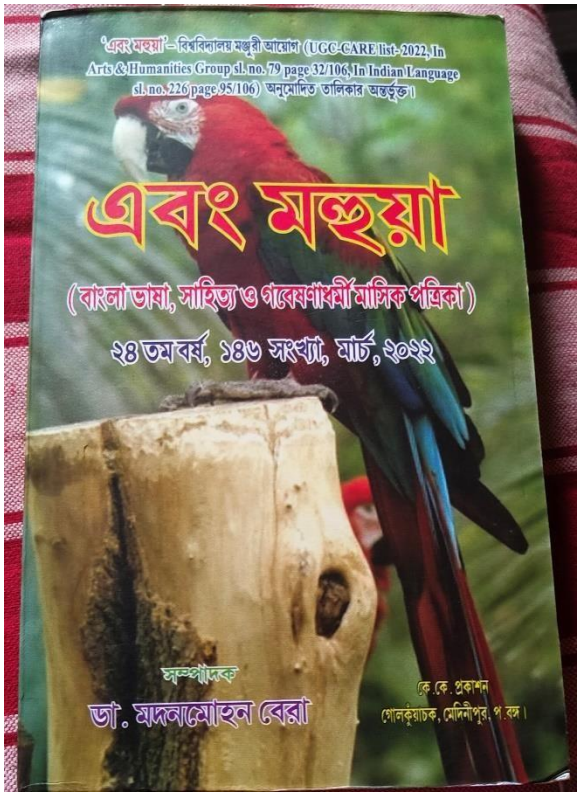
Instrumentation

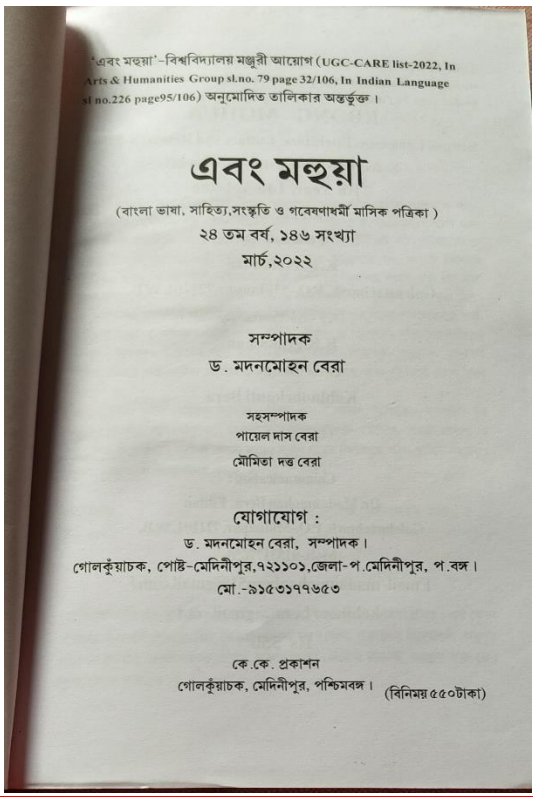
The spectral measurements were performed in a UV-Vis spectrophotometer (Model Shimadzu, UV-2401PC). Arsenic concentration in the experimental solution was determined by flame atomic absorption spectrophotometer (Varian AA1407) using an air-acetylene flame and hollow cathode lamp as the radiation source. Systronics digital pH meter (Model 335) was used for pH measurements.

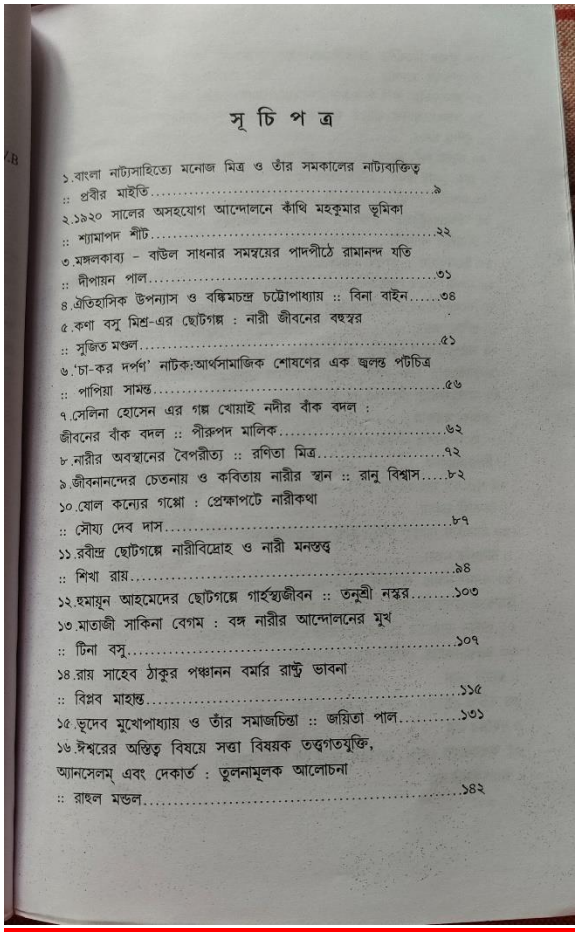
Sampling and analytical technique

Study area

The study area is a component of the Bengal delta plain







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PLANT & CELL PHYSIOLOGY

Special Issue – Review

Functions of Melatonin during Postharvest of Horticultural Crops

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Melatonin, a tryptophan-derived molecule, is endogenously generated in animal, plant, fungal and prokaryotic cells. Given its antioxidant properties, it is involved in a myriad of signaling functions associated with various aspects of plant growth and development. In higher plants, melatonin (Mel) interacts with plant regulators such as phytohormones, as well as reactive oxygen and nitrogen species including hydrogen peroxide (H_2O_2), nitric oxide (NO) and hydrogen sulfide (H_2S). It shows great potential as a biotechnological tool to alleviate biotic and abiotic stress, to delay senescence and to conserve the sensory and nutritional quality of postharvest horticultural products which are of considerable economic importance worldwide. This review provides a comprehensive overview of the biochemistry of Mel, whose endogenous induction and exogenous application can play an important biotechnological role in enhancing the marketability and hence earnings from postharvest horticultural crops.

Keywords: Horticultural crops • Low-temperature storage • Melatonin • Postharvest • RNS • ROS scavenging systems • Sensory and nutritional quality

Introduction

Horticultural crops, such as fruits, vegetables, flowers, as well as aromatic and medicinal plants, encompass a wide range of plant species. Many of these crops, which provide important nutrients and also have medicinal properties, are important sources of food worldwide (Mahajan et al. 2017). Fruits and vegetables provide a wide range of nutrients including vitamins, minerals, carbohydrates, fats and proteins, in addition to important phytonutrients such as phenolic compounds and carotenoids, which are necessary for the maintenance of human health (Brandt et al. 2004, Jacob et al. 2012, Willett and Stampfer 2013). However, inappropriate postharvest management and storage can result in a significant reduction in their quality and shelf life, which can lead to infections and rejection by consumers, with concomitant significant economic losses (Aghdam et al. 2020b). For example, while low-temperature storage has been used extensively to extend their postharvest life, horticultural crops are subject to chilling injuries and fungal decay under these same conditions (Aghdam et al. 2018, 2020b). In recent years, novel eco-friendly strategies to generate tolerance to chilling injuries and fungal damage to horticultural products have been explored in order to delay senescence and to preserve the nutritional quality of horticultural crops (Zhao et al. 2017b, Aghdam et al. 2018, 2020b, Sharafi et al. 2019).

Since melatonin (Mel) was identified as an animal hormone in the 1950s, other functions of this molecule have been discovered. In 1995, Mel was identified in higher plants where it performs a wide variety of functions, ranging from seed germination, root development, plant growth, leaf senescence, flowering and fruit ripening to environmental stress response mechanisms (Arnao and Hernandez-Ruiz 2014, 2019a, 2019b, 2021, Gong et al. 2017b, Ke et al. 2018, Hasan et al. 2018, 2019, Qiao et al. 2019, Xia et al. 2021b, Imran et al. 2021a, 2021b, 2021c). All these regulatory functions depend on Mel's capacity to modulate the expression of key proteins and genes as well as its interactions with plant growth regulators including abscisic acid (ABA), ethylene, gibberellins or gibberellic acids (GAs), jasmonic acid (JA) and salicylic acid (SA) (Arnao and Hernandez-Ruiz 2018, Arnao and Hernández-Ruiz 2019b, 2021a, 2021b, Zhao et al. 2021a, Ma et al. 2021a), as well as signaling molecules such as hydrogen peroxide (H_2O_2), nitric oxide (NO) and hydrogen sulfide (H_2S) (Zhou et al. 2016a, Mukherjee and Corpas 2020, Mukherjee and Bhatla et al. 2020, Pardo-Hernández et al. 2020, Iqbal et al. 2021, Mishra et al. 2021, Siddiqui et al. 2021, Sun et al. 2021b).

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Environmental Pollution
Volume 292, Part A, 1 January 2022, 118268

Molybdenum-induced endogenous nitric oxide (NO) signaling coordinately enhances resilience through chlorophyll metabolism, osmolyte accumulation and antioxidant system in arsenate stressed-wheat (*Triticum aestivum* L.) seedlings

Saud Alamri [a], Manzer H. Siddiqui [a], Soumya Mukherjee [b], Ritesh Kumar [c], Hazem M. Kalaji [d], Mohammad Irfan [e], Tatiana Minkina [f], Vishnu D. Rajput [f]

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Highlights

- Arsenate (As^V) toxicity impairs photosynthesis and chlorophyll (Chl) metabolisms.
- Molybdenum (Mo) induces nitric oxide (NO) signaling in As^V -stressed wheat seedlings.
- Exogenous Mo and endogenous NO regulate Chl and photosynthesis metabolisms.
- Mo and NO triggers nitrogen and proline metabolism under As^V toxicity.
- NO provides more efficacy to Mo to alleviate As^V toxicity in wheat seedlings.

Insights into the beneficial roles of dark septate endophytes in plants under challenging environment: resilience to biotic and abiotic stresses

Review | Published: 25 March 2022

Volume 38, article number 79, (2022) Cite this article

World Journal of Microbiology and Biotechnology

Aims and scope →

Submit manuscript →

Nahid Akhtar, Atif Khurshid Wani, Daljeet Singh Dhanjal & Soumya Mukherjee

Abstract

Dark septate endophytes (DSE) exert a plethora of effects in regulating plant growth, signalling and stress tolerance. The advent of metagenomics has led to the identification of various species of DSE to be associated with plant organs. They are known to modulate growth, nutrient uptake, phytohormone biosynthesis and production of active bioconstituents in several plants. The interactions between the DSE and host plants are mostly mutualistic but they can also be neutral or exhibit negative interactions. The DSE has beneficial role in removal/sequestration of toxic heavy metals from various environmental sites. Here, we discuss the beneficial role of DSE in enhancing plant tolerance to heavy metal stress, drought conditions, high salinity and protection from various plant pathogens. Furthermore, the underlying mechanism of stress resilience facilitated by DSE-plant interaction has also been discussed. The article also provides insights to some important future perspectives associated with DSE-mediated phytoremediation and reclamation of polluted land worldwide thus facilitating sustainable agriculture.

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Full Length Research Article

Ethnomedicinal Practices of the Santal Tribe Living Around Biharinath Hill in the District of Bankura, West Bengal, India

Suman Karmakar[1] and Chowdhury Habibur Rahaman*[2]

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ABSTRACT

The present investigation encompasses the ethnomedicinal uses of plants utilized by the Santal people living adjacent to Biharinath hill in the district of Bankura, West Bengal. Ethnomedicinal data were obtained from the Santal informants (medicine men and knowledgeable persons) through semi-structured interviews. Before collection of the data Free, Prior Informed Consent (FPIC) was taken from each informant to ensure their intellectual property rights. The collected data have been evaluated using suitable statistical indices, viz. Informant Consensus Factor (Fic) and Cultural Value Index (CV) to recognize the most significant ethnomedicinal plant species used in the surveyed region. In total, 78 plant species have been recorded and they are utilized in the area for treatment of 37 health disorders. The root (31.6%) is the most recurrently used plant part in the recorded formulations. The Birth/Puerperium Disorders and Sensory System Disorders obtained the highest F_{ic} value, i.e., 1. Based on the values of the CV index, the top ranked 25 taxa have been identified, namely *Asparagus racemosus* Willd., *Soymida febrifuga* (Roxb.) A. Juss., *Byttneria herbacea* Roxb., etc. The documentation of such ethnomedicinal knowledge will enrich the data base of the district as well as the country, but scientific validation of the documented ethnomedicinal claims is needed.

Key words: Ethnomedicinal uses, Biharinath hill, Informant consensus factor, Cultural value index

Ethnomedicine is the study of human health, related illnesses and healing systems traditionally practiced in a particular culture. This practice is based on the beliefs and experiences of ethnic people. Ethnomedicinal knowledge is passed on orally from competent peers to the next generation. Over time, the flow of such ethnic knowledge has been gradually diminished due to cultural erosion, modernization and lack of interest of the younger generation in learning such age-old cultural tradition. Thus, documentation of such knowledge is gaining more and more priority around the world in order to conserve ancient cultural practices. Like other parts of the world, Ethnobotanists from all over India are engaged in documenting ethnobotanical information. Similarly, in West Bengal, a good number of ethnobotanists are working in this field. But a few scattered ethnobotanical works have been performed [1-5] till date in the Bankura district. But no such type of research work has been carried out in the tribal-infested villages surrounding Biharinath Hill in Bankura. In this background, the present research programme was planned to document the traditional knowledge regarding the therapeutic uses of medicinal plants in treating various disorders of human beings. This study will also help in preparation of the district's ethnomedicinal database.

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MATERIALS AND METHODS

The district Bankura is one of the five districts of the Medinipur administrative division of West Bengal. It is located between 22°46' to 22°38' N and 86°36' to 87°46' E. The geographical area of the district is 6882 km^2 and its total forest area is 1482 km^2 (21.53% of the entire land area of the district). Total population of the district is 3596674 and district's scheduled tribe population is 368690 (10.25% of overall population of the district) [6]. Bankura district is designated as a minor ethnobotanical hotspot or traditional knowledge hot spot based on forest cover and scheduled tribe population of the district [7]. The district lies between the plains of West Bengal and the Chhota Nagpur plateau. The district's physiography is divided into 3 parts, viz. the hilly areas on the west, the central undulating zone and the alluvial plains on the east. The remarkable hills of the district are Susunia and Biharinath. Biharinath hill is the tallest hill (448 m) in Bankura district. It is situated at Saltora block in the northern part of Bankura district. The forest of the hill is tropical dry deciduous type. The hill is rich in a variety of plant resources especially medicinal plants. Thirty different types of tribal communities live in Bankura district like Santal, Bhumij, Kora, Savar, Lodha, etc. [8]. The Santal represents the dominant tribe among the different tribal communities. The total Santal population of the

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Short Communication

Extended Distribution of *Habenaria gibsonii var. foetida* Blatt. & McCann (Orchidaceae) from Southern West Bengal, India

Suman Karmakar[1] and Chowdhury Habibur Rahaman*[2]

Received: 03 Jan 2022 | Revised accepted: 01 Mar 2022 | Published online: 17 Mar 2022

Key words: Distributional record, *Habenaria* sp., Orchidaceae, Susunia hill, West Bengal

The genus *Habenaria* Willd. has c. 891 accepted species scattered in tropical and subtropical to South Siberia [1]. In India, it is represented by c. 83 species [2]. Seventeen species were recorded from the then undivided Bengal [3]. Choudhury et al. in 2011 reported about 12 species from West Bengal [4]. Although in recent past, Kumar *et al*. in 2013 have recorded 9 species from the state [5]. Bankura is a westward district of West Bengal state. The district is located between 22°38′ and 22°38′ N latitude and between 86°36′ and 87°46′ E longitude. It occupies an area of 6882 sq.km. During floristic explorations in Bankura district, the authors noticed a few individuals of *Habenaria* Willd. species in the forest of Susunia hill in association with other elements of ground flora. On critical study, it was identified as *Habenaria gibsonii* var. *foetida* Blatt. & McCann.

At the time of floristic study in different areas of Bankura district a few specimens of *Habenaria* Willd. were collected from the forest floor of Susunia hill at an elevation 330 m After laboratory examination and consultation of the pertinent literature [2, 6, 7] the plant species was identified as *Habenaria gibsonii* var. *foetida* Blatt. &McCann. The voucher specimen has been housed in the herbarium of Department of Botany, Visva-Bharati, Santiniketan, West Bengal.

A brief description along with a photo-plate of dissected floral parts of the species has been presented here for easy identification of it.

Habenaria gibsonii var. *foetida* Blatt. & McCann, J. Bombay Nat. Hist. Soc. 36: 16 (1932). (Fig 1).
Habenaria foliosa var. *foetida* (Blatt. & McCann) Bennet, J. Econ. Taxon. Bot. 5: 452 (1984).
Habenaria thailandica Seidenf., Dansk Bot. Ark. 31: 78 (1977).

Terrestrial, annual, tuberous herb, 43-50 cm high. Leaves alternate, ovate to oblong-lanceolate, 3.6-9.4 × 1.1-3.5 cm, acute apex, entire wavy at margins; leaf base sheathing. Flowers many, laxly arranged in raceme, white with a green tinge, with a foetid smell during the day time, very shortly pedicellate. Sepals' unequal; dorsal sepal ovate-elliptic, concave, ca. 7 × 7.5 mm, greenish, hooded over the column; lateral sepal obliquely ovate-lanceolate, ca. 9 × 3.1- 3.6 mm, white, tinged with green, drooping, keeled; reflexed at apex, rolled at margins. Petals 2-partite; upper pair ca. 10 × 1 mm, green, sickle-shaped, bending upwards; the lower pair ca. 9.5 × 0.5 mm, linear, white with green tips. Lip tripartite at the base with narrowly linear-filiform, subequal and wide-spreading segments; mid segment 13 – 15 × ca. 1 mm, slightly curved at obtuse apex, narrowly linear; lateral segments ca. 12.5 × 0.75 mm, spreading and narrower with pointed tips. Spur ca. 17 mm long, clavate at the base. Stigmatic processes diverging sideward, oblong, with numerous whitish appendages. Rostellum shorter than anther cells, green, 3-lobed; mid-lobe broadly triangular; lateral lobes narrow, slightly bent upwards, lying immediately below anther-cells. Anther cells diverging below, separated from each other; connective green. Pollinia obliquely obovate, 1.5 × 7.5 - 1 mm, yellow; caudicle filiform, ca. 3mm long, hyaline, curved and dilated at apex; viscidium reniform, brownish. Ovary twisted, green, curved, ribbed, 17 – 20 × ca. 2 mm.

Flowering: Late July.

Field note: The flowers release a foetid smell.

Specimen examined: West Bengal: Bankura district: Susunia hill, 23.39670°N, 86.98092°E, 330m, 29.vii.2014, coll. S. Karmakar 155.

Habitat and ecology: It grow in the tropical dry deciduous *Sal* (*Shorea robusta* Gaertn.) forest of Susunia hill in association with *Croton persimilis* Müll.Arg., *Curculigo orchioides* Gaertn., *Peristylus constrictus* (Lindl.) Lindl., *Hemidesmus indicus* (L.) R.Br., *Lagerstroemia parviflora* Roxb., etc.

Distribution: Indian subcontinent: India: East Himalaya (Darjeeling District, West Bengal), Jharkhand [8], Karnataka [9], Madhya Pradesh [10], Maharashtra [11-12], Odisha [2,6] Rajasthan [13] West Himalaya [1]; Indo-China Region: Cambodia, Laos, Thailand and Vietnam [7].

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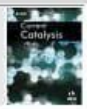
Current Catalysis, 2022, *11*, 94-114

REVIEW ARTICLE

Recent Advances in Direct Pyridine C-H Activation Strategies



Sushmita Roy[1,*]

[1]*Department of Chemistry, Jangipur College, Jangipur, 742213, Murshidabad, WB, India*

Abstract: ***Background:*** Pyridine is one of the most ubiquitous hetero-aromatic moieties in pharmaceutical chemistry and it has enormous importance in a plethora of fields. From a synthetic chemistry standpoint, pyridine moiety has been used as a directing group in C-H activation strategies to functionalize various rings. However, this unique feature to participate as a directing group hinders developing methodologies to carry out C-H activation on the pyridine ring itself. One of the simplest solutions is to block the activity of ring nitrogen at the cost of two extra steps. Here, in this review, along with the blocking, we will briefly mention some interesting ways to get around this problem and the remaining challenges ahead.

Objective: The coordinating ability of pyridine *N* poses a big challenge toward C-H functionalization on the pyridine ring. This review summarizes some of the recent methods towards this challenge.

Methods: Some key ideas towards that goal have been described. Here, the C-H activation strategies are categorised as follows: (1) Pyridine *N*-oxide mediated C-H activation, (2) Dimerization of C-H activation of pyridine, (3) Direct Pyridine C2-H activation, (4) Direct Pyridine C3-H activation and (5) Direct Pyridine C4-H activation.

Results: Several methods have been highlighted that can be utilised to prepare C-H functionalized products with regiospecificity that subsequently may be manipulated into interesting products which are difficult to attain easily.

Conclusion: This review explores various new direct C-H activation methods on pyridine which attempts to fill the void of traditional synthetic protocols in regard to regioselective pyridine functionalization. This review also explores the limitations of current methodologies which must be wiped off to attain a mature state in need of the pharmaceutical industry.

ARTICLE HISTORY

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Keywords: Pyridine, C-H activation, coupling, directing group, site selectivity, catalysis.

1. INTRODUCTION

Since its discovery in 1846 by Anderson [1], pyridine has been one of the most studied hetero-aromatic moieties due to its enormous importance in a plethora of fields. Most of the interest is dictated by the enormous biological relevance of pyridine, for example, the core pyridine moiety is a central part of Vitamin B6, Oxido-reductase systems like NADH-NADPH, various naturally occurring alkaloids, terpenes, enediyne and polypeptide families. In the pharmaceutical industry, numerous drugs have surfaced based on pyridine core, showing a wide range of anti-inflammatory [2, 3], anti-depressant [4], antiasthmatic [5], HIV protease inhibitory [6], acetylcholine esterase inhibitory [7], hypertension and hypotension inhibitory properties [8, 9], to just name a few. It also has applications as various herbicides, insecticides, and antifungal agents in agrochemistry [10-12].

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Due to its massive importance and influence from the dawn of synthetic organic chemistry development, researchers have closely looked upon various possible approaches toward pyridine moiety. Although pyridine is structurally related to benzene, the presence of *N* in the ring renders itself more electron-deficient and results in a substantially different reactivity pattern. Therefore, pyridine is difficult to functionalize *via* aromatic electrophilic substitution (SEAr) pathway and that led to the discovery of a number of methods of substituted pyridine synthesis from smaller synthetic fragments [13, 14]. Recent developments of C-H activation have opened the door to functionalizing pyridine at various positions regioselectively. This can have a profound effect on pyridine-based drug development in the pharmaceutical industry. Pyridine and its derivatives have in fact found their place as one of the most important chelating agents to accomplish C-H activation on other ring systems as well as aliphatic C-H bonds [15, 16]. Herein, we would review some important discoveries which instead accomplished C-H activation on the pyridine ring itself, demonstrating the reach and power of C-H activation methodologies. We will restrict

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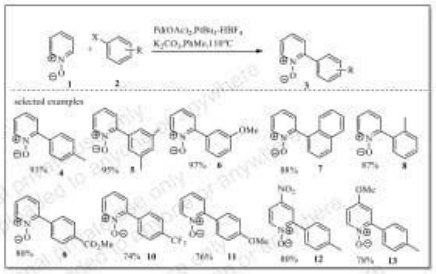
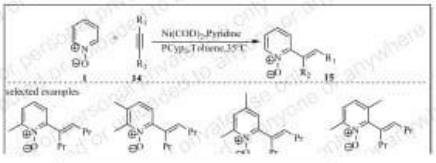


Scheme 1. C2-H arylation of pyridine-N-oxides with $Pd(OAc)_2$-$PtBu_3$-HBF_4.



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MIAO-TAM EQUATION ON ALMOST COKÄHLER MANIFOLDS

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MIAO-TAM EQUATION ON ALMOST COKÄHLER MANIFOLDS

Tarak Mandal

Abstract. In the present paper, we have studied Miao-Tam equation on three dimensional almost coKähler manifolds. We have also proved that there does not exist non-trivial solution of Miao-Tam equation on the said manifolds if the dimension is greater than three. Also we give an example to verify the deduced results.

1. Introduction

Recently, the study of differentiable manifolds endowed with certain structures, namely almost contact and almost complex structures has become a subject of growing interest due to their applications in relativity, cosmology, string theory etc. An odd dimensional differentiable manifold M equipped with a $(1,1)$ tensor field ϕ, a vector field ξ, a 1-form η satisfying

$$\phi^2 X = -X + \eta(X)\xi, \quad \eta(\xi) = 1 \tag{1}$$

for any $X \in \chi(M)$, the set of all vector fields on M, is known as an almost contact manifold [4].

If the 2-form Φ given by $\Phi(X,Y) = g(\phi X, Y)$ for any X, $Y \in \chi(M)$ and the 1-form η both are closed, then the almost contact manifold is called an almost coKähler manifold [3]. Due to additional properties that Φ and η are closed almost coKähler manifolds show some special properties which are not found generally in almost contact manifolds. Therefore almost coKähler manifolds need special attention. In 1967, Blair [3] introduced the notion of almost coKähler manifolds. The almost coKähler manifolds are odd dimensional analogues of the almost Kähler manifolds [17]. So many examples of almost coKähler manifolds have been constructed by various authors. For instance, the Riemannian product of a real line and an almost Kähler manifold admits an almost coKähler manifold [19, 23, 24]. Many authors such as Blair [5], De and Sardar [11], De, Majhi and Suh [10], Dacko [8], Dacko and Olszak [9],

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Key words and phrases. Almost coKähler manifold, critical equation, Miao-Tam equation, Einstein manifold.

Ricci–Yamabe solitons on (κ, μ)-almost coKähler manifolds

Published: 29 March 2022

Volume 33, article number 38, (2022) Cite this article

Tarak Mandal

Abstract

In the present paper, we have studied Ricci–Yamabe solitons on (κ, μ)-almost coKähler manifolds. Also we have studied second order parallel tensor, gradient Ricci–Yamabe solitons in (κ, μ)-almost coKähler manifolds. Finally, we give an example.

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CERTAIN RESULTS ON THREE-DIMENSIONAL f-KENMOTSU MANIFOLDS WITH CONFORMAL RICCI SOLITONS

TARAK MANDAL

ABSTRACT. In the present paper, we have studied conformal Ricci solitons on f-Kenmotsu manifolds of dimension three. Also we have studied ϕ-Ricci symmetry, η-parallel Ricci tensor, cyclic parallel Ricci tensor and second order parallel tensor in f-Kenmotsu manifolds of dimension three admitting conformal Ricci solitons. Finally, we give an example.

1. Introduction

In 1972, the notion of Kenmotsu manifolds was introduced by K. Kenmotsu in the paper [16]. f-Kenmotsu manifold is the generalization of Kenmotsu manifold. f-Kenmotsu manifolds has been studied by several authors such as Hui,Yadav and

Human rights as an issue in international politics: charting its history to present times

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Abstract: Human rights, a significant issue in international politics has not received due attention until recently. Post-1945 world order made promises to keep citizens' rights secured but the COVID-19 pandemic exposed and deepened the already existent fissures in society. There is a humanitarian crisis across nations where egalitarian measures are few and far between. In South Asia, India and Pakistan are two important nations that witness rampant human rights violations, which aggravated in this pandemic. One country experiences civil-military rule desperate to flaunt its democratic credentials and the other, its bête noire, is carrying on its exclusionary policies in the garb of tackling the crisis as it has unleashed its authoritarian measures despite being the largest democracy in the world. Both countries have failed its citizens.

Keywords: civil and political rights; international politics; COVID-19 pandemic; democracy; fundamental freedoms; mass murders and misery; security and sustenance; the right to have rights; freedom of speech.

Reference to this paper should be made as follows: Basu, K. (2022) 'Human rights as an issue in international politics: charting its history to present times', *Int. J. Human Rights and Constitutional Studies*, Vol. 9, No. 3, pp.257–271.

Biographical notes: Koyel Basu is an Assistant Professor at the Department of Political Science, Jangipur College for more than 12 years. She has been extensively writing on human rights and state politics, which is her specialisation. She completed her dissertation in 2015 from Jadavpur University, Kolkata. She has written in several UGC care listed journals and recently Authorspress, New Delhi, published her dissertation as a book.

1 Introduction

Rights are those inalienable non-transferable claims that have legal and moral validity, which all human beings are entitled to have by virtue of their birth. They are fundamental

Inflation with F(T) teleparallel gravity

Regular Article | Published: 06 December 2021

Volume 136, article number 1213, (2021) Cite this article

The European Physical Journal Plus

Aims and scope →

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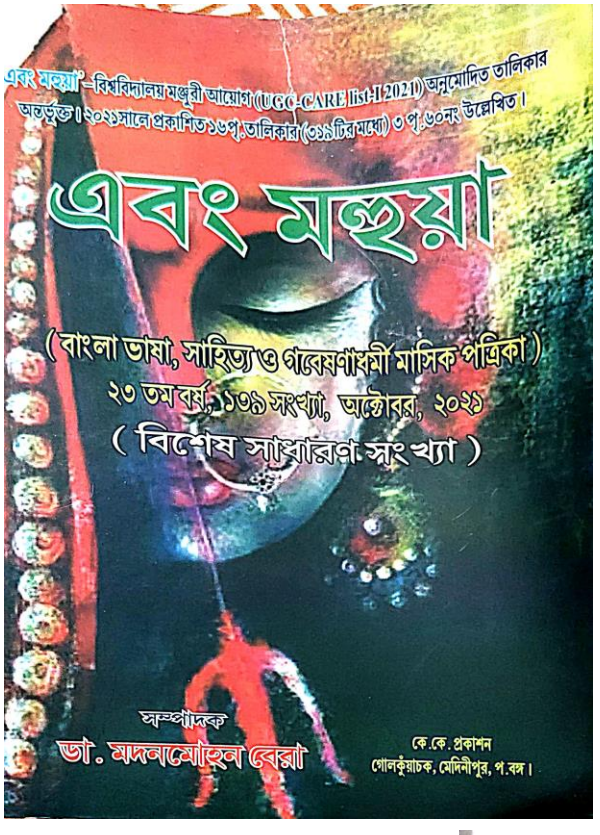
Manas Chakrabortty, Nayem Sk, Susmita Sanyal & Abhik Kumar Sanyal

A Publisher Correction to this article was published on 03 January 2022

This article has been updated

Abstract

We study early universe with a particular form of F(T) teleparallel gravity theory, in which inflation is driven by a scalar field. To ensure slow rollover, two different potentials are chosen in a manner, such that they remain almost flat for large initial value of the scalar field. Inflationary parameters show wonderful fit with the presently available Planck's data set. The energy scale of inflation is sub-Planckian, and graceful exit from inflation is also administered. The chosen form of F(T) administers late-time cosmic acceleration too. In the process, unification of the early inflation with late-time acceleration is ensured. Unfortunately, a decelerated radiation-dominated era is only possible with a different form of (quartic) potential, which being devoid of a flat section does not admit slow rollover.



সূ চি প ত্র

সৎকার্যবাদ ও অসৎকার্যবাদ সম্পর্কে ন্যায় ও সাংখ্য মতের তুলনামূলক আলোচনা

রণিতা মিত্র

ভারতীয় দর্শন ও পাশ্চাত্য দর্শন উভয় দর্শনেই, কার্যকারণ সম্পর্ক সম্বন্ধে আলোচনা করা হয়েছে। ভারতীয় দর্শন সম্প্রদায়ের মধ্যে একমাত্র চার্বাক ছাড়া আর সকল আস্তিক ও নাস্তিক সম্প্রদায় কার্যকারণ সম্পর্ক স্বীকার করেছেন। সকল দর্শন সম্প্রদায়-ই কার্য-এর দুটি কারণ স্বীকার করেছেন সেগুলি হল যথাক্রমে উপাদান কারণ ও নিমিত্ত কারণ। যে বিষয়ে এদের মধ্যে মতভেদ তা হল কার্যটি কি উৎপত্তির পূর্বে কারণের মধ্যে বিদ্যমান থাকে? না থাকে না। অর্থাৎ উপাদান কারণের সাথে কার্য-এর সম্পর্ক বিষয়ে দার্শনিকদের মধ্যে মতভেদ আছে। এই সম্বন্ধের সম্বন্ধী হল কার্য ও কারণ। এই কার্য ও কারণ সৎ না অসৎ তা নিয়ে দার্শনিকদের মধ্যে মতভেদ আছে। এই কথার প্রতিধ্বনি সাংখ্য দর্শনে পাই, ঈশ্বরকৃষ্ণ তাঁর সাংখ্যকারিকার অষ্টম কারিকাতে বলেছেন কার্য হেতুর দ্বারাই তার প্রধানের অনুমান করা হবে।[১] কার্য এর দ্বারা কারণ মাত্রের অনুমান হয়। এক্ষেত্রে প্রশ্ন ওঠে মহৎ ইত্যাদি কার্য এর দ্বারা কী প্রধানের অনুমান সম্ভব? এর উত্তরে বলা হয় যে, ধূমের দ্বারা বহ্নির অনুমানের ক্ষেত্রে যে কোন বহ্নির অনুমিতি স্থলে যদি ইতরবাধনিশ্চয় হয় তাহলে ঐ বহ্নি মাত্র বিষয়ক অনুমিতিতে পর্বত এর বহ্নির বিষয়কত্ব সিদ্ধ হয় তেমনি যে কোন কারণ বিষয়ক অনুমিতির ক্ষেত্রে লাঘব জ্ঞান বশত তাদৃশ প্রকৃতিকত্ব সিদ্ধ হবে। বাচস্পতি মিশ্রের মতে ঐরূপ হত যদি সবাই কার্য কারণ ভাব সম্পর্কে এক মত পোষণ করত। কিন্তু এক্ষেত্রে বিপ্রতিপত্তি বর্তমান।[২]

১) একদল বলেন অসৎ কারণ থেকে অসৎ কার্য উৎপন্ন হয়। এটি বৌদ্ধ মত।

২) অন্যদল বলেন অসৎ কারণ থেকে সৎ কার্য উৎপন্ন হয়। এটি বিবর্তবাদীদের মত।

৩) আবার একদল বলেন সৎ কারণ থেকে অসৎ কার্য উৎপন্ন হয়। এটি ন্যায়, বৈশেষিক ও মীমাংসকদের মত।

৪) সর্বশেষ মতটি হল সৎ কারণ থেকে সৎ কার্য উৎপন্ন হয়। এটি সাংখ্য মত।

এই পত্রে আমি শুধুমাত্র ন্যায় ও সাংখ্য মতের বৈপরীত্য-এর প্রতি আলোকপাত করব। এই দুটি মতবাদ নির্বাচনের কারণ হল এদের সুখশৃংখল আলোচনা। প্রথমে আমি সাংখ্য মতটি আলোচনা করা হবে তারপর ন্যায় মত আলোচনা করা হবে।

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Miao-Tam equation on normal almost contact metric manifolds

Tanuk Mandal

Abstract. In the present paper, we have studied Miao-Tam equation on normal almost contact metric manifolds and obtained several results on the said manifolds. Also we give an example to verify deduced results.

M.S.C. 2010: 53C15, 53D05.
Key words: Contact metric manifolds; normal almost contact metric manifolds; Miao-Tam equation; Einstein manifolds.

1 Introduction

The total scalar curvature functional $\mathcal{A} : \mathcal{M} \to \mathbb{R}$ defined by

$$\mathcal{A}(g) = \int_M r_g dv_g,$$

where $\mathcal{M}$ denotes the set of all Riemannian metrics on (M^n, g) of unit volume, r_g is the scalar curvature of g and dv_g the volume form of g. Einstein and Hilbert proved that the critical points of the total scalar curvature functional restricted to the set of smooth Riemannian structures on M^n of unit volume are Einstein [2].

Let (M^n, g), $n>2$ be a compact orientable Riemannian manifold with a smooth boundary metric ∂M. Then g is said to be a critical metric if there exists a smooth function $\lambda : M^n \to \mathbb{R}$ such that

$$-(\Delta_g \lambda)g + \nabla_g^2 \lambda - \lambda S = g \tag{1.1}$$

on M and $\lambda = 0$ on ∂M, where Δ_g, ∇_g^2 are the negative Laplacian, Hessian operator with respect to the metric g and S is the $(0,2)$ Ricci curvature of g. The function λ is known as the potential function. The equation (1.1) is known as Miao-Tam equation and the metrics which satisfy (1.1) are known as Miao-Tam critical metrics[11].

In [11], Miao-Tam have proved that any Riemannian metric g satisfying the equation (1.1) must have constant scalar curvature. They have also classified Einstein and conformally flat Riemannian manifolds satisfying the equation (1.1) [12]. Many authors work on Barros and Ribeiro [1], Chen [6], Ghosh and Patra [7], [10], Patra

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Improvement of a 'SSQuEE' Method for Recovery and Preconcentration of Pesticides from Environmental Samples

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A simple, sensitive, quick, easy and efficient (SSQuEE) analytical technique based on cloud point extraction (CPE) has been developed for the determination of different pesticides present in soil and water with high performance liquid chromatography separation and ultraviolet detection. The environmentally friendliness surfactant like Triton X -100, compared to Tween series of non-ionic surfactant can effectively extract imidacloprid (insecticide), flusilazole (fungicide) and atrazine (herbicide) at cloud point temperature at 67 °C, 82 °C and 62 °C, respectively. To reach the optimum extraction efficiency, different experimental parameters like surfactant concentration, salt type and its concentration, equilibrium time and temperature, pH were observed. At the optimum conditions, linear regression coefficient of the standard curves was greater than 0.9924. The limit of detection of imidacloprid, flusilazole and atrazine were 0.10 μg L^{-1}, 0.24 μg L^{-1}, 0.15 μg L^{-1} and recovery percent are 99.71 %, 88.1% and 89.74%, respectively.

Keywords: Pesticides, Environmental samples, Surfactants, Cloud point extraction.

INTRODUCTION

Humans are exposed to pesticides as a consequence of their applications in farming as well as their persistence in different environmental components *viz*. air, water, soil and plant system. The interaction of pesticide with environmental factors may result in alteration of their physico-chemical properties. Trace amount of pesticides in water and soil compartment together with residue analysis sometimes become challenging in terms of compatibility with the determination tool. To increase the production of vegetable the application of agro chemicals for agriculture as well as for plant protection and animal health has converted the problem of environmental pollution into national and international issues [1]. Sorption is one of the most important factors that affects the fate of pesticides in the soil and determines their distribution in the soil/water environment, which is widely used to describe the process of a pesticide partitioning between water solution and soil [2]. Imidacloprid, [1-(6-chloro-3-pyridylmethyl)-*N*-nitroimidazolidin-2-ylideneamine], flusilazole, [1-((*bis*(4-fluorophenyl)methylsilyl)methyl)-1H-1,2,4-triazole], atrazine, [1-chloro-3-ethylamino-5- isopropylamino- 2,4,6-triazine] are systemic insecticide, fungicide and herbicide, respectively which were used with different mode of action. These pesticides were used as seed-dressing, soil treatment and foliar treatment in different crops and extensively used in agricultural areas. It is necessary to drawn attention to the pesticides [3]. The transport, retention, mode of action and transformation are more and more of a public concern. This pesticide residue is highly persistent and can survive many years in soils, waters and organisms [4]. Migration of the pesticides into groundwater *via* soil layers has therefore become one of the primary approaches leading to the widespread contamination to ecosystems [5]. The massive accumulation of pesticides in ecosystems not only affects the quality of crops which are directly exposed to the pesticides, but also serves as a food chain to pose a threat to human health [6]. Thus far, the extraction and analysis of pesticide residues have been established using liquid to liquid [7], solid-phase [4,8], single-drop micro extraction [9,10], hollow fiber-based liquid-phase micro extraction [11], dispersive liquid-liquid micro extraction [12], *etc*.

It is, therefore, of great importance to develop sensitive and efficient analytical methods to detect pesticides from multimedia. Several analytical methods have been reported including gas chromatography [13], high performance liquid chromato-

Optical and Magnetic Properties of Cubic Double Perovskites Ba_2RSbO_6 (R= Dy, Gd) Coordinated to Lattice Dynamical and Crystal-Field Computations

Yatramohan M. Jana, Saikat Nandi, Aksar A. Biswas, Hem C. Gupta, Rajnikant Upadhyay, Chandan Upadhyay, and Debabrata Samanta*

Herein, optical (e.g., UV–Vis reflectance spectra, infrared and Raman spectroscopy) and magnetization properties of the double-perovskite compounds Ba_2DySbO_6 (BDS) and Ba_2GdSbO_6 (BGS) are reported. Optical bandgap is determined to be 4.524 eV for BDS and 4.465 eV for BGS using Kubelka–Munk function fit to the UV–Vis spectra. The lattice dynamical calculations on the force-field model are undertaken for assigning the observed infrared and Raman modes. The dc susceptibility does not exhibit magnetic ordering down to 2 K for the two compounds. The dc magnetization at $T = 2$ K does not saturate for BDS even at a magnetic field of 11 T, but saturates at 5 T to a value of $7\mu_B/Gd^{3+}$ for BGS. A frequency-dependent cusp in the ac susceptibility appears at 3.3 K, that is unlikely generic spin-glass-like freezing, and may be attributed to the short-range correlations among Dy^{3+}-moments in BDS. Crystal-field (CF) computations are performed to analyze the magnetic data for BDS. The obtained CF level scheme of Dy^{3+} ions demonstrates the observed susceptibility and isothermal magnetization curves very well. The field-dependence of the two lowest CF levels along different principal axes does not exhibit any level crossing, consistent with the lack of ordering in Ba_2DySbO_6.

1. Introduction

Double perovskites (DPs) having the chemical formula $A_2B'B''O_6$, exhibit diverse physico-chemical properties due to their versatile crystal structural properties.[1,2] These compounds have received a paramount interest, as they are suitable materials for vast scientific and novel technological applications,[2] for example, in microwave dielectric resonator in telecommunication,[3] photocatalytic,[4] luminescent, solid-oxide fuel cells,[5] magnetocaloric materials for adiabatic demagnetization refrigerator,[6] substrate to high T_c superconducting thin films,[7] in spintronics due to large magnetoresistance,[8–10] half-metallic features,[8,11–15] etc. The multifunctional properties of the DPs are highly dependent on the ionic dimension and valences of the A-site, and B′- and B″-sites cations as well as on their compositional flexibility and versatile structural features, varying from cubic, tetragonal, orthorhombic to monoclinic, including cation ordering and defects.[1,2] It is pertinent that the degree of cation order is largely dependent on the difference of size and valence states of the B-site ions and stoichiometric complexity in these materials.[1,2,16] Therefore, to realize the origin of the physical properties as well as to fully discern the possible applicability of the DPs, it is important to establish a complete illustration of dynamical, electronic, and magnetic behaviors of the atoms in these materials.[17]

Of particular interest, Ba_2RSbO_6 (R^{3+} = rare-earths) were extensively studied in the past.[7,17–29] It is found that these compounds display phase transition from rhombohedral symmetry when R ions are the largest lanthanide (R = La–Nd) to the cubic symmetry when smaller lanthanides, Sm–Lu and Y, occupy the R-site.[18–20] To investigate the RO_6 and SbO_6 cation ordering and the structural phase transition from monoclinic to rhombohedral to the cubic symmetry, Raman and infrared (IR) spectroscopy techniques have been employed for Ba_2RSbO_6 (BRS).[23,24,30] Furthermore, since R^{3+} sub-lattice forms

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স্বাধীনতা পূর্বকালে জন-সচেতনতা প্রচারে মালদার লোকসংগীত গম্ভীরা

ড. বিশ্বজিৎ দাস

সারসংক্ষেপ :

ঔপনিবেশিক কালে মালদায় একাধিক লোকসংগীত চর্চা হতো যার মধ্যে কিছু আজও তাদের যৎসামান্য অস্তিত্ব বজায় রাখতে সক্ষম হয়েছে। জনপ্রিয়তার নিরিখে 'গম্ভীরা' হল এমনই একটি লোকসংগীত। এটি তৎকালীন জনসাধারণের চিত্ত বিনোদন করেছিল ঠিকই তবে এর মাধ্যমে গম্ভীরার কবি-গায়করা সমকালীন সমাজের গুরুত্বপূর্ণ সমস্যা গুলিকে জনসমক্ষে তুলে ধরেছিলেন আন্তরিকতার সঙ্গে। অর্থাৎ এই লোকগান নৈতিক আদর্শের অপর ভিত্তি করে উন্নত সমাজ গঠনে পরোক্ষভাবে সহায়তা করেছিল। বর্তমান প্রবন্ধের উদ্দেশ্য সামগ্রীকভাবে গম্ভীরা লোকসংগীত চর্চা নয়। ইতিহাস আলোচনায় সমাজ গঠন, সমাজের বিবর্তন বিশেষ ভাবে আলোচিত হয়ে থাকে। সেই দৃষ্টিকোণ থেকে সাংস্কৃতিক ইতিহাস চর্চার অঙ্গ হিসেবে এই প্রবন্ধের মাধ্যমে অন্বেষণ করার প্রয়াস করা হবে যে সমাজ পরিবর্তন তথা অগ্রগতির ক্ষেত্রে লোকসংগীত গম্ভীরা পরাধীন মালদা জেলায় কী বিশেষ ভূমিকা পালন করেছিল।

সূচকশব্দ :

মালদা, গম্ভীরা, কবি-গায়ক, লোকসংগীত, ঔপনিবেশিক, সমাজ

প্রতিপাদ্য বিষয় :

(১)

জেলা মালদা যেমন তার রেশমের জন্য বিখ্যাত, যেমন অর্থকরী ফসল আম বিশেষত ফজলীর জন্য বিখ্যাত তেমনি লোকসংগীত গম্ভীরার জন্যও বিশেষভাবে পরিচিত। মালদার এই বিশেষ পরিচিতি দানে গম্ভীরার কবি-গায়কদের গুরুত্বপূর্ণ ভূমিকা ছিল কারণ এই কবি-গায়কদের অধিকাংশই শিক্ষিত, অর্ধ শিক্ষিত, নিরক্ষর হলেও তাৎপর্যপূর্ণভাবে তারা রসিকতার ছলে গম্ভীরা গানের মাধ্যমে তৎকালীন সমাজের

ঔপনিবেশিক কালে মালদার শেরশাবাদিয়া সম্প্রদায়ের অর্থনৈতিক কর্মতৎপরতা

ড. বিশ্বজিৎ দাস

সারসংক্ষেপ

উত্তরবঙ্গের প্রবেশদ্বার হিসেবে পরিচিত মালদা জেলা। শুধু তাই নয়, মধ্যযুগীয় হুসেনশাহী ও ইলিয়াসশাহী আমলের গৌড়-পান্ডুয়ার জন্যও এ জেলার বিশেষ খ্যাতি। আবার প্রাক ঔপনিবেশিক কাল থেকে ব্যবসা-বাণিজ্যের জন্যও এ জেলার সুনাম ছিল। ফলে অর্থনৈতিক কর্মকাণ্ডের অন্যতম কেন্দ্রে পরিণত হয়েছিল এই জেলা। সামাজিক, সাংস্কৃতিক ক্ষেত্রের মতো অর্থনৈতিক ক্ষেত্রেও হিন্দু-মুসলমান সকল সম্প্রদায়ের অংশ গ্রহণের মধ্যে দিয়ে এই জেলা তার আপন গতিতে এগিয়ে চলেছিল। মুসলমানদের মধ্যে শেরশাবাদিয়া একটি বিশেষ সম্প্রদায়। সামগ্রিকভাবে ঔপনিবেশিক কালে বাংলার মুসলমানদের আর্থিক অগ্রগতির ক্ষেত্রে যে নিরাশার চিত্র ছিল বলে জানা যায়, এই নিবন্ধের মাধ্যমে সমকালীন মালদার মুসলমানদের এই সম্প্রদায়ের অর্থনৈতিক কর্মকান্ডের আলোচনার মধ্য দিয়ে সেই বহুল প্রচলিত ধারনার একটি ব্যতিক্রমী চিত্র যেমন প্রাপ্ত তথ্যের ভিত্তিতে তুলে ধরার প্রয়াস করা হবে তেমনি তার পাশাপাশি তাদের তৎসংক্রান্ত বৈশিষ্ট্যাবলীর ওপরও আলোকপাত করা হবে।

সূচকশব্দ : মুসলমান, মালদা, শেরবাদিয়া, এম.ও.কার্টার,হরিদাস পালিত, নোয়াখালী-হিতৈষী, সম্প্রদায়

প্রতিপাদ্য বিষয় :

ঔপনিবেশিক কালে ইংরেজরা যখন ভারতে পাশ্চাত্য জ্ঞান-বিজ্ঞান কেন্দ্রিক শিক্ষা তথা ইংরাজি শিক্ষার প্রবর্তন করে, সে সময় হিন্দুরা সাদরে এই শিক্ষা গ্রহণ করলেও মুসলমানরা বিশেষ কিছু কারণে এই নতুন শিক্ষা গ্রহণ থেকে বেশ কিছু কাল নিজেদেরকে বিরত রাখে। ফলস্বরূপ, জীবনে চলার পথে হিন্দুরা এগিয়ে গেলেও বাংলার মুসলমারা, হিন্দুদের তুলনায় 'পিছিয়ে পড়া' সম্প্রদায় হিসেবে পরিগণিত হতে থাকে এবং এর প্রভাব তাদের জীবনের সব ক্ষেত্রেই কম-বেশি দেখা গিয়েছিল, এমন কথা বহুল প্রচলিত হয়। অর্থনৈতিক ক্ষেত্রটিও ছিল এমনই একটি ক্ষেত্র যেখানে তথাকথিত 'পিছিয়ে পড়ার' চিত্রটিতেও তাদের নিকটতম প্রতিবেশি হিন্দুদের তুলনায় আনন্দদায়ক তেমন কিছু ছিল না বলেই জানা যায়। তৎকালীন বিভিন্ন গ্রন্থ, পত্র-পত্রিকার মধ্য দিয়ে দিয়ে বিশেষত মুসলমান বুদ্ধিজীবী সমাজ ও বিষয়ের ওপর আলোকপাত করেছিলেন। তারা তাদের লেখনির মধ্য দিয়ে এই পিছিয়ে পড়ার কারণ অনুসন্ধান-ব্যাখ্যা করেছিলেন এবং নিজ সমাজের সবঙ্গীন উন্নতির জন্য সকলকে উপস্থাপিত করার প্রয়াস করেছিলেন। এক্ষেত্রে ১৯৩৬

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Conflict between some higher-order curvature invariant terms

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Abstract

A viable quantum theory does not allow curvature invariant terms of different higher orders to be accommodated in the gravitational action. We show that there is indeed a conflict between the curvature squared and Gauss-Bonnet squared terms from the point of view of hermiticity. This means one should choose either, in addition to the Einstein-Hilbert term, but never the two together. We explore early cosmic evolution with Gauss-Bonnet squared term.

1. Introduction

The problem associated with bare cosmological constant and the absence of a scalar field in the late universe, motivated cosmologists to propose several curvature induced gravity models, for solving the cosmic puzzle encountered at the late-stage of cosmological evolution. In this context, $F(R, \mathcal{G})$ theory (R and $\mathcal{G}$ are the Ricci scalar and the Gauss-Bonnet term respectively), has been studied largely in recent years, and therefore is one of the prevalent models. It is well-known that the Gauss-Bonnet term is topologically invariant in 4-dimension. Thus, contribution from such a term in the field equations requires dilatonic coupling. A dilaton-like scalar field

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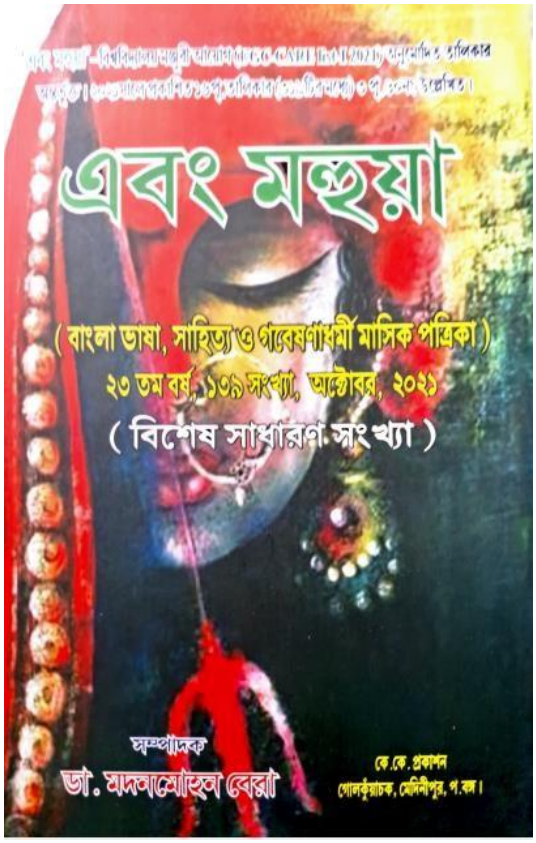

কেশবচন্দ্র ঘোষ

ভূমিকা :

গান্ধী যুগে ভারতে মহিলারা রাজনীতিতে যোগদান করেন এটা ঐতিহাসিক সত্য কিন্তু কংগ্রেসের সঙ্গে মহিলাদের সংস্পর্শ এর কোন সুস্পষ্ট মতবাদ আমরা পাই শ্রেণীর ঐতিহাসিকদের মতে মহিলাদের কংগ্রেস এই রাজনীতিতে টেনে আনেন স্বার্থে আর আন্দোলন শেষ হলে তাদের প্রয়োজন ফুরিয়ে যায়। আর একদল ঐতিহাসিক বলেছেন যে কংগ্রেস নেতাদের বা গান্ধীজীর ডাকে মহিলারা দলে দলে স্বাধীনতা সংগ্রামে যোগ দেন। এটা গান্ধীজীর জন্য সম্ভব হয়েছিল। গান্ধী নেতা হিসাবে এক অসাধারণ ছিলেন তার অসাধারণ ক্ষমতা ছিল। এতকাল ভারতবর্ষে যে মহিলারা গৃহবন্দি ছিল, তাদের ডাকে এই প্রথম রাজনীতিতে যোগ দেয়। গান্ধীজী ভারতীয় রাজনীতিতে একটি নতুন কৌশল ব্যবহার করেন। আর তিনিই প্রথম বলেন যে ভারতবর্ষের স্বাধীনতা সংগ্রামে শ্রেণীর সব মানুষের যোগ দেওয়ার অধিকার আছে। তিনি মেয়েদেরকে বলেন যে পুরোনো ত্যাগ করে রাজনীতিতে প্রবেশ করতে।

গান্ধীজীর ধারণা :

গান্ধীজী প্রথম মেয়েদের Help mate বা কর্ম সহযোগী বলে আখ্যা দেন। তিনি রাজনীতিতে প্রবেশের বহু আগে দক্ষিণ আফ্রিকাতে ১৮৯৮ সালে তিনি মেয়েদের সংগ্রামে সমান অধিকার বলে করেন। ভারতীয় রাজনীতিতে নারীদের ভূমিকা সম্পর্কে সুনিশ্চিত বক্তব্য আমরা শুনতে পায় মহারাষ্ট্রের ভগিনী সমাজের একটি অধিবেশনে এই বক্তৃতায় তিনি বলেন ভারতের মেয়েদের শতকরা ৮৫ ভাগ দরিদ্র এবং ভগিনী প্রথম কর্তব্য হবে এই মহিলাদের নিজেদের অধিকার সম্পর্কে সচেতন করা। তাদের স্বাধীন হবার জন্য আকাঙ্খার সৃষ্টি করা এবং পুরুষের সমকক্ষ স্থানে নিজেদের প্রতিষ্ঠা স্বাধীনত বলতে তিনি কুসংস্কার থেকে স্বাধীনতা, সমাজের দাসত্ব থেকে স্বাধীনতার কথা বড়লাট। সত্যাগ্রহের পর তিনি (১৯১৯) বার বার মেয়েদের সত্যাগ্রহে অংশগ্রহণ বলেছেন এবং জালিয়ানওয়ালাবাগ বহু নিরীহ নারী হত্যার পর তিনি সমস্ত মহিলা সমাজ অসহযোগ আন্দোলনে যোগ দিয়ে সত্যাগ্রহী হবার জন্য আহ্বান জানান। তিনি মহিলাদের রাজনীতি যোগ দেবার জন্য তিনটি সুচিন্তিত ধারা প্রবর্তন করেন-

ঊনিশ শতকের নারী শিক্ষা ও প্রগতিতে কাদম্বিনী গাঙ্গুলি

কেশবচন্দ্র ঘোষ

ভূমিকা :

নারী শিক্ষা ও প্রগতিতে ঊনবিংশ শতাব্দী ছিল খুব গুরুত্বপূর্ণ। এই শতকের প্রারম্ভে মেয়েদের প্রাতিষ্ঠানিক শিক্ষা ব্যবস্থার প্রক্রিয়া শুরু হয়েছিল। এই ব্যাপারে সরকারি ও দেশীয় সংস্থরক উভয়পক্ষই ক্রমশ আগ্রহ প্রকাশ করতে থাকে। মিশনারিদের চলাগ বাড়তে থাকলে তা বঙ্গ সমাজে সমাদরে গ্রহণ করে নি। তবু বাংলাদেশে মিশনারিরা নারী শিক্ষা প্রসারে ভূমিকা পালন করে ছিল। এদের মধ্যে অন্যতম ছিলেন ড্রিঙ্ক ওয়াটার বেথুন সাহেব। তিনি কাউন্সিল অফ এডুকেশন এর সভাপতি ছিলেন। এ দিকে বলা যায় যে নারি শিক্ষার ধারণা ও প্রসার ছিল একটি বহমান প্রক্রিয়া। কোন আরোপিত সংস্কারের বিষয় নই। তাই বিদেশি রাষ্ট্র শক্তির তুলনাই জন মনে নারী শিক্ষার প্রয়োজনীয়তা অনুভব করা ও তাকে স্বীকৃতি দেওয়ার মধ্যেই এই প্রচেষ্টার সাফল্য নিহিত ছিল, আমার এই গবেষণাপত্রে সেই দিক তা তুলে ধরার চেষ্টা করা হয়েছে।[১]

বেথুন স্কুল ও কলেজ নারী শিক্ষা বিস্তারে অগ্রণী ভূমিকা নিলেও ১৮৭০-এর শকে মহিলারা যে সব বিষয় নিয়ে পড়াশুনা করত তা মোটেই বিজ্ঞান ভিত্তিক ছিল ন, তাই তারা সংস্কৃত এর মত বিষয় অধ্যায়ন করত। পুরুষতান্ত্রিক সমাজ মনে করত য বিজ্ঞান এর মত জটিল বিষয় মেয়েদের বোধোগম্য হবে না তাই তারা নারীদের দুর্বল করত। মেয়েরা যে বিজ্ঞান এর মত বিষয় রপ্ত করতে পারে, সেটি বাস্তবের মাটিতে নিয়ে আসেন সেই সময়কার সাহসী মহিলা কাদম্বিনী বসু।[২]

ঊনিশ শতকের বাংলায় নারী শিক্ষা প্রসারের ক্ষেত্রে ঈশরচন্দ্র বিদ্যাসাগারের ভূমিকা পৃথক আলোচনার দাবি রাখে। তিনি বেথুন স্কুল প্রতিষ্ঠাই থেকে যুক্ত ছিলেন। তিনি মেয়েদের অন্তপুরের অন্ধকার থেকে আলোতে নিয়ে আসেন। বিদ্যাসাগর বুঝতে পেরেছিলেন যে, কোনও সমাজ সংস্কার কার্যকারি হবে না যদি, না মহিলাদের শিক্ষার আলোতে না নিয়ে আসা হয়। বেথুন স্কুলে যুক্ত থাকার সঙ্গে তিনি বাংলার অন্যান্য জায়গায় নারী শিক্ষা বিস্তারে উদ্যোগ নেন। এই ছাড়া নারী শিক্ষা বিস্তারে অন্যতম গুরুত্বপূর্ণ ভূমিকা নিয়েছিলেন কেশব চন্দ্র সেন ও ব্রাহ্ম সমাজের তরুণ নেতারা।[৩]

ভারতের বিড়ি শিল্পে মহিলা শ্রমিকের অবস্থা

কৃষ্ণেন্দু পালচৌধুরী

সংক্ষিপ্তসার :

বিশ্বের উন্নত ও উন্নয়নশীল দেশগুলির মতো ভারতেও ক্ষুদ্র ব্যবসা, গৃহভিত্তিক অসংগঠিত ক্ষেত্রে মহিলা শ্রমিকের অংশগ্রহণের বিষয়টি নারী উন্নয়ন বা নারীর ক্ষমতায়নের প্রক্রিয়ার পক্ষে একটি চিন্তার বিষয়। দক্ষ শ্রমিক হিসাবে কর্মক্ষেত্রে মহিলা শ্রমিকদে অংশগ্রহণের সুযোগ ক্রমশ হ্রাস পেতে থাকায় কম মজুরির অসংগঠিত ক্ষেত্রে তাদের অংশগ্রহণ ক্রমশই বেড়ে চলেছে। সেখানে তাদের কর্মদক্ষতা বৃদ্ধি করার সুযোগ খুবই কম এবং সেখানে তাদের প্রতি-পদক্ষেপে বিবিধরকম শোষণের স্বীকার হতে হয়। বিড়ি শিল্প একটি বজনসম্পদ নির্ভর, গৃহভিত্তিক, শ্রম নিবিড় শিল্প। এই শিল্পে লিঙ্গবৈষম্যের চিত্রটি খুবই প্রকট। বিড়ি শিল্পে নিযুক্ত মোট শ্রমিকের দুই তৃতীয়াংশই মহিলা। মূলত অর্থনৈতিকভাবে পিছিয়ে থাকা অঞ্চলের নিম্ন-আয় ও প্রান্তিক ধর্মীয় বা বর্ণ গোষ্ঠীর মহিলারাই বিড়ি শিল্পে যোগদান করে। এই কাজে তাদের কর্মদক্ষতা বাড়ানোর সুযোগ খুব কম থাকায় তাদের সর্বোচ্চ আয়ও কম হয়। তাছাড়া তামাকের সংস্পর্শে থেকে দীর্ঘক্ষণ কাজ করার ফলে তাদের নানাবিধ বিপজ্জনক শারীরিক সমস্যার সম্মুখীন হতে হয়। বেশিরভাগ ক্ষেত্রেই মহিলা শ্রমিকরা তাদের গৃহস্থালির অন্যান্য কাজের ফাঁকেই বিড়ি বাঁধার কাজ করে থাকেন। তাই, অনেক সময়েই, শ্রমিক হিসাবে তাদের এই শ্রম গ্রাহ্য করা হয় না। মহিলা শ্রমিকরা তাদের অশিক্ষা, অর্থনৈতিক পশ্চাদপদতা, বিকল্প কাজে সুযোগ না থাকা ইত্যাদি বিবিধ কারণে চিরদারিদ্র্যের অন্ধকারে ডুবে থাকে। অপরদিকে বিড়ি কারখানার মালিকরা বিভিন্ন আইনি বিধিনিষেধ ও কর ফাঁকি দেওয়ার উদ্দেশ্যে বিড়ি বাঁধার কাজে ঠিকাদারের মাধ্যমে শ্রমিক নিয়োগ করে। ফলে শ্রমিকেরা তাদের প্রাপ্য সবরকম সুযোগ সুবিধা থেকেও বঞ্চিত হয়। এই লেখায় ভারতে বিড়ি শিল্পের বিবর্তনের বিভিন্ন পর্যায়ে বিড়ি বাঁধার কাজে নিযুক্ত মহিলা শ্রমিকদের অবস্থার একটি বিশ্লেষণাত্মক আলোচনা তুলে ধরার চেষ্টা করা হয়েছে।

বিষয়সূচক মূল শব্দ : বিড়ি শিল্প, বিড়ি শ্রমিক, শোষণ, লিঙ্গবৈষম্য, অসংগঠিত ক্ষেত্র, সামাজিক নিরাপত্তা

প্রতিপাদ্য বিষয় ;

ভূমিকা :

বিড়ি শিল্প ভারতের একটি প্রাচীন ঐতিহ্যবাহী মূলত গৃহভিত্তিক শিল্প। বিড়িকে

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SOME CURVES ON THREE-DIMENSIONAL $N(k)$-PARACONTACT METRIC MANIFOLDS

ASHIS MONDAL

Abstract. The object of the present paper is to study some class of curves on three-dimensional $N(k)$-paracontact metric manifolds. We also study biharmonic Legendre curves and locally ϕ-symmetric Legendre curves on three-dimensional $N(k)$-paracontact metric manifolds. An example of three-dimensional $N(k)$-paracontact metric manifolds is given.

1. INTRODUCTION

The study of nullity distribution on paracontact geometry is an interesting topic in modern contact geometry. Kaneyuki and Williams [12] inatiated the study of paracontact geometry. Several authors [1, 7] have been studied on paracontact geometry. Recently Cappelletti-Montano *et al.* [8] introduced (k, μ)-paracontact geometry, where k and μ are some real constants. Martin-Molina [13, 14] obtained some classification theorem on paracontact metric (k, μ)-space.

A unit speed curve γ in an almost contact metric 3-manifold (M, ϕ, ξ, η, g) is said to be slant if its tangent vector field makes constant contact angle θ with ξ, i.e., $\eta(\gamma') = \cos\theta$ is constant along γ. Slant curves have been studied in the papers [2, 5]. Legendre curves on contact manifolds have been studied by C. Baikousis and D.E. Blair [3]. The present author has been studied curves on almost contact manifolds in the papers [16–18].

In this paper we are interested to study some curves on three-dimensional $N(k)$-paracontact metric manifolds. The present paper is organized as follows:

After the introduction in Section 1, we give preliminaries in Section 2. Section 3 contains some basic definition of Frenet curves on three-dimensional $N(k)$-paracontact metric manifolds. Section 4 we find curvature and torsion of Legendre curve with respect to Levi-Civita connection. In Section 5 we characterize biharmonic Legendre curves on three-dimensional $N(k)$-paracontact metric manifolds. Next section we study locally ϕ-symmetric Legendre curve on three-dimensional $N(k)$-paracontact metric manifolds. In the last section we construct an example which verifies Theorem 6.1.

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Some curves on three-dimensional trans-Sasakian manifolds

Ashis Mondal

Abstract. In the present paper we study biharmonic magnetic curves in three-dimensional trans-Sasakian manifolds with respect to Levi-Civita connection. It is shown that for biharmonic magnetic curves in a three-dimensional trans-Saakian manifold the structure function β is zero. We study locally ϕ-symmetric Legendre curves in a three-dimensional trans-Sasakian manifold. Also we characterized non-geodesic Legendre curves in a three-dimensional trans-Sasakian manifold for the Reeb vector field parallel to principal normal and binormal vector.

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Key words: magnetic curve; biharmonic curve; Legendre curve; trans-Sasakian manifold; locally ϕ-symmetric.

1 Introduction

Let (M, g) and (N, h) be two Riemannian manifolds and $\Psi : (M, g) \to (N, h)$ a smooth map. The energy functional of Ψ is defined by $E(\Psi) = \frac{1}{2}\int_M |d\Psi|^2 v_g$. Critical points of the energy functional are called harmonic maps and the Euler-Lagrange equation for the energy is $\tau(\Psi) = trace\nabla d\Psi = 0$, where ∇ denotes Levi-Civita connection on M. Biharmonic maps which can considered a natural generalization of harmonic maps are defined as critical points of the bienergy functional given by $E(\Psi) = \frac{1}{2}\int_M |\tau(|\Psi)|^2 v_g$. The first variation formula for the bienergy was derived by G. Y. Jiang [15] and it was proved that the Euler-Lagrange equation for bienergy is

$$\tau_2(\Psi) = -J(\tau(\Psi)) = -\nabla\tau(\Psi) - traceR^N(d\Psi, \tau(\Psi))d\Psi = 0,$$

where J is the Jacobi operator, $\nabla = -trace(\nabla^\Psi\nabla^\Psi - \nabla^\Psi_\nabla)$ is the rough Laplacian on the sections of pull bundle $\Psi^{-1}TN$, ∇^Ψ is the pull-back connection [10] and R^N is the curvature operation on N. One can easily see that harmonic maps are always biharmonic. But the converse is not true. Nonharmonic biharmonic maps are said to be proper. It is well known that proper biharmonic maps into R, that is, biharmonic function play an important role in elasticity and hydrodynamics. For the study of biharmonic maps we may refer to ([1], [2], [11]). Also biharmonic curves have been studied in the papers ([12], [14], [20]).

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ON f-KENMOTSU MANIFOLDS ADMITTING SCHOUTEN-VAN KAMPEN CONNECTION

Ashis Mondal

Abstract. In the present paper, we study three-dimensional f-Kenmotsu manifolds admitting the Schouten-Van Kampen connection. We study the concircular curvature tensor of a three-dimensional f-Kenmotsu manifold with respect to the Schouten-Van Kampen connection. Finally, we have cited an example of a three-dimensional f-Kenmotsu manifold admitting Schouten-Van Kampen connection which verify our results.

1. Introduction

In 1978, Solov'ev investigated hyperdistributions in Riemannian manifolds using the Schouten-Van Kampen connection [15]. In 2006, Bejancu studied Schouten-Van Kampen connection on Foliated manifolds [2]. In 2014, Olszak studied the Schouten-van Kampen connection to adapt it to an almost contact metric structure [13]. He characterized some classes of an almost contact metric manifolds with the Schouten-Van Kampen connection. Recently, G. Ghosh [4], Yildiz [19], Nagaraj [10] and D. L. Kiran Kumar [7] have studied the Schouten-Van Kampen connection in Sasakian manifolds, f-Kenmotsu manifolds and Kenmotsu manifolds respectively. Also Y. S. Perktas and A. Yildiz [14] have studied on f-Kenmotsu 3-manifolds with respect to the Schouten-van Kampen connection.

A transformation of an n-dimensional differential manifold M, which transforms every geodesic circle of M into a geodesic circle, is called a concircular transformation [6], [16]. A concircular transformation is always a conformal transformation [6]. Here geodesic circle means a curve in M whose first curvature is constant and whose second curvature is identically zero. Thus the geometry of concircular transformations, i.e., the concircular geometry, is a generalization of inversive geometry in the sense that the change of metric is more general than that induced by a circle preserving diffeomorphism. An interesting inverient of a concircular transformation is the concircular curvature tensor $\mathbb{W}$ with respect to Levi-Civita connection. It is defined by [16], [17]

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Original Scientific Paper

ON THREE-DIMENSIONAL TRANS-SASAKIAN MANIFOLDS ADMITTING SCHOUTEN-VAN KAMPEN CONNECTION

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Abstract. In the present paper, we study three-dimensional trans-Sasakian manifolds admitting the Schouten-van Kampen connection. Also, we have proved some results on ϕ-projectively flat, ξ-projectively flat and ξ-concircularly flat three-dimensional trans-Sasakian manifolds with respect to the Schouten-van Kampen connection. Locally ϕ-symmetric trans-Sasakian manifolds of dimension three have been studied with respect to Schouten-van Kampen connection. Finally, we construct an example of a three-dimensional trans-Sasakian manifold admitting Schouten-van Kampen connection which verifies Theorem 4.1. and Theorem 5.2.
Key words: General geometric structures on manifolds, Schouten-van Kampen connection, Special Riemannian manifolds

1. Introduction

The Schouten-van Kampen connection is one of the most natural connections adapted to a pair of complementary distributions on a differentiable manifold endowed with an affine connection. Solov'ev investigated hyperdistributions in Riemannian manifolds using the Schouten-van Kampen connection ([18], [19], [20], [21]). In 2014, Olszak studied the Schouten-van Kampen connection to adapt it to an almost contact metric structure [17]. He characterized some classes of almost contact metric manifolds with the Schouten-van Kampen connection. Recently, G. Ghosh [10], Yildiz [26], Nagaraja [15] and D. L. Kiran Kumar [12] have studied the

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THREE-DIMENSIONAL PARA-KENMOTSU MANIFOLDS ADMITTING η-RICCI SOLITONS

ASHIS MONDAL[1]

Abstract. In the present paper we study η-Ricci solitons on three-dimensional para-Kenmotsu manifolds with the curvature condition $R.Q = 0$. Also we study conformally flat, projectively flat and concircularly flat η-Ricci soliton on three-dimensional para-Kenmotsu manifolds. Finally, we have cited an example of a three-dimensional para-Kenmotsu manifold which admits η-Ricci solitons.

1. Introduction

In 1982, Hamilton [13] introduced the notion of the Ricci flow to find a canonical metric on a smooth manifold. The Ricci flow is an evolution equation for metrics on a Riemannian manifold

$$\frac{\partial}{\partial t}g_{ij}(t) = -2R_{ij}.$$

A Ricci soliton is a natural generalization of Einstein metric and defined on a Riemannian manifold (M, g). A Ricci soliton is a triple (g, V, λ) with g a Riemannian metric, V a vector field and λ a real scalar such that

$$\pounds_V g + 2S + 2\lambda g = 0,$$

where S is a Ricci tensor of M and $\pounds_V$ denotes the Lie derivative operator along the vector field V. The Ricci soliton is said to be shrinking, steady and expanding according as $\lambda < 0, \lambda = 0$, or $\lambda > 0$, respectively [8]. Ricci solitons have been studied by many authors, such as [1, 6, 9, 10, 14, 16] and several authors.

As a generalization of Ricci solitons, the notion of an η-Ricci solitons was introduced by Cho and Kimura [7]. This notion has been studied in [5], for Hopf hypersurfaces in complex space form. An Ricci soliton is a tuple (g, V, λ, μ), where V is a vector field on M, λ and μ are real constants, and g is a Riemannian (or pseudo-Riemannian) metric satisfying the equation

$$\pounds_V g + 2S + 2\lambda g + 2\mu\eta \otimes \eta = 0. \tag{1.1}$$

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η-RICCI SOLITONS ON PARA-KENMOTSU MANIFOLDS WITH SOME CURVATURE CONDITIONS

Ashis Mondal

Abstract. In the present paper, we study η-Ricci solitons on para-Kenmotsu manifolds with Codazzi type of the Ricci tensor. We study η-Ricci solitons on para-Kenmotsu manifolds with cyclic parallel Ricci tensor. We also study η-Ricci solitons on φ-conformally semi-symmetric, φ-Ricci symmetric and conformally Ricci semi-symmetric para-Kenmotsu manifolds. Finally, we construct an example of a three-dimensional para-Kenmotsu manifold which admits η-Ricci solitons.

1. Introduction

In 1982, Hamilton [12] introduced the notion of the Ricci flow to find a canonical metric on a smooth manifold. The Ricci flow is an evolution equation for metrics on a Riemannian manifold

$$\frac{\partial}{\partial t}g_{ij}(t) = -2R_{ij}.$$

A Ricci soliton is a natural generalization of Einstein metric and defined on a Riemannian manifold (M, g). A Ricci soliton is a triple (g, V, λ) with g a Riemannian metric, V a vector field and λ a real scalar such that

$$L_V g + 2S + 2\lambda g = 0,$$

where S is a Ricci tensor of M and L_V denotes the Lie derivative operator along the vector field V. The Ricci soliton is said to be shrinking, steady and expanding according as $\lambda < 0, \lambda = 0$, or $\lambda > 0$, respectively [7]. Ricci solitons have been studied by many authors, such as [9, 10, 13] and several authors.

As a generalization of Ricci solitons, the notion of η-Ricci solitons was introduced by Cho and Kimura [6]. This notion has been studied in [4], for Hopf hypersurfaces in complex space form. A Ricci soliton is a tuple (g, V, λ, μ), where V is a vector field on M, λ and μ are real constants, and g is a Riemannian (or pseudo-Riemannian) metric satisfying the equation

$$L_V g + 2S + 2\lambda g + 2\mu\eta \otimes \eta = 0.$$

η-Ricci solitons on para-Kenmotsu manifolds were studied by A. M. Blaga [1] and η-Ricci solitons on Lorentzian Para-Sasakian manifolds were also studied by A. M.

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THE SCHOUTEN-VAN KAMPEN CONNECTION ON QUASI-SASAKIAN MANIFOLDS

Ashis MONDAL[1]

Abstract

In the present paper, we study three-dimensional quasi-Sasakian manifolds admitting the Schouten-van Kampen connection. We characterize quasi-Sasakian manifolds and find certain curvature properties with respect to the Schouten-van Kampen connection. Finally, we construct an example of a three-dimensional quasi-Sasakian manifold admitting the Schouten-van Kampen connection which verifies the results discussed in the present paper.

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Key words: Quasi-Sasakian manifolds, Locally ϕ-symmetric, Schouten-van Kampen connection, ϕ-projectively flat.

1 Introduction

In [3], the notion of quasi-Sasakian manifold was introduced by D. E. Blair to unify Sasakian and cosymplectic structure. S. Tanno [15] also added some remarks on quasi-Sasakian structures. Also, the properties of quasi-Sasakian manifolds have been studied by several authors in papers [7, 8, 9]. The Schouten-van Kampen connection have been introduced for non-holomorphic manifolds in papers [13, 17]. The Schouten-van Kampen connection on foliated manifolds have been studied by A. Bejancu [1]. Recently, Z. Olszak studied the Schouten-van Kampen connection on almost contact metric structure [11]. A. Yildiz studied three-dimensional f-Kenmotsu manifolds with respect to the Schouten-van Kampen connection [18]. Also, G. Ghosh studied Sasakian manifolds with respect to the Schouten-van Kampen connection [6].

The projective curvature tensor is an important tensor from the differential geometric point of view. Let M be an n-dimensional Riemannian manifold. If there exist a one-to-one correspondence between each coordinate neighborhood of M and a domain in Euclidean space such that any geodesic of Riemannian

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Recent Advances in the Synthesis and Applications of α-Ketothioesters

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Abstract: α-Ketothioesters have only recently received widespread attention as synthetic intermediates and an impressive growth has been realized for their utilization in synthetic and medicinal chemistry. Several elegant approaches such as oxidative thioesterification and radical coupling allow for their convenient synthesis from easily available starting materials, e.g., methyl ketones, alkenes, alkynes, and α-hydroxyketones. Due to their multifaceted and diverse reactivities, several important reactions such as C(O)–S bond cleavage and S-migration with various *C*-, *N*-, and *O*-based nucleophiles, Ni-catalyzed mono- and double-decarbonylations, enantioselective carbonyl-ene reaction, diastereoselective hetero Diels-Alder reactions with olefins, and different types of cyclization reactions have been observed. They have also proven to be a valuable tool for the synthesis of heterocycles, pharmaceutically relevant anticancer drug, and natural product. However, in comparison to other 1,2-dicarbonyl derivatives such as α-ketooxoesters, α-ketoamides, and α-ketoaldehydes, they are much less appreciated as synthetic intermediates. This review summarizes the recent advancements achieved in the synthesis of α-ketothioesters as well as their applications in the development of new reactions for the formation of C–C, C–N, and C–O bonds, including multiple bond-forming processes.

Keywords: α-Ketothioester or α-oxothioester; C–S bond formation; cyclization reaction; heterocycles; thiols

1. Introduction

α-Ketothioesters constitute a class of organic compounds characterized by the presence of an α-keto group adjacent to a thioester moiety. They have received widespread applications as synthetic intermediates and important progress has been made in this area. These are ubiquitous in biochemical process such as in polyketide biosynthesis.[1–2] Besides synthetic chemistry, they have also proven themselves as promising candidates in medicinal chemistry.[3–9] For example, they have been frequently used in the field of antibiotics for accessing cephalosporin derivatives.[4] *S*-ethyl 2-oxopropanethioate (EOP), a thioester derivative of pyruvic acid, has been recently shown to be a promising therapeutic agent for treating inflammation

ONLINE EDUCATION IN A SUB-URBAN COLLEGE IN WEST BENGAL: PANDEMIC PARANOIA AND STRANDED EDUCATION HIGHER-UP---A CASE STUDY

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Abstract: Since the pandemic struck us in March 2020 and following lockdown measures, the educational institutions are closed and entire community of students and teachers have shifted to virtual or online mode of education in the teaching-learning process. However, the question that arises is whether e-learning can be the miracle cure, the panacea for ills faced by education sector. This chapter tries to analyze the prospects and challenges of online learning keeping the experience of students in perspective. Undergraduate students of remote areas are doubly challenged than their counterparts in cities where amenities are visibly greater and accessible. The former face an environment which is hardly conducive to online learning and moreover this pandemic paranoia spells disaster for them. Their attention in online classes gets snapped with poor connectivity and engagement with teachers is short-lived due to lack of privacy in homes where interaction is difficult and unsustainable for a longer period.

KEYWORDS: education, digital, technology, connectivity, disparity, colleges.

THE PATRIARCHAL PANDEMIC: COVID-19 AND DOMESTIC VIOLENCE ON WOMEN IN INDIA- A SOCIAL ANATHEMA *

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ক্ষমতায়নের নিরিখে ভারতীয় নারীদের অবস্থা

কৃষ্ণেন্দু পালচৌধুরী

সংক্ষিপ্তসার:

কোনো দেশের অর্থনৈতিক উন্নয়ন তার মানবসম্পদ উন্নয়নের সঙ্গে ওতপ্রোতভাবে জড়িয়ে থাকে। ভারতের অর্থনৈতিক উন্নয়নের বিভিন্ন ধাপে মানবসম্পদ উন্নয়নের বিষয়টিকে যথেষ্ট গুরুত্ব দেওয়া হয়েছে। কিন্তু পিতৃতান্ত্রিক সমাজ ব্যবস্থার অনিবার্যতায় আমাদের দেশে লিঙ্গবৈষম্য প্রকট। ভারতীয় সমাজে নারীদের কখনই পুরুষের সমান মর্যাদা দেওয়া হয়নি – এটা ঐতিহাসিক ভাবে সত্য। যদিও ভারতের সংবিধান এই লিঙ্গবৈষম্য দূর করার লক্ষ্যে নারী-পুরুষের সমানাধিকারের কথা বলেছে। অর্থনৈতিক উন্নয়নের গতিপথ নির্ধারণকারীরা নারীকল্যাণ তথা নারীর ক্ষমতায়নের বিষয়টি বেশ গুরুত্ব সহকারে সামনে রেখেই বিভিন্ন পরিকল্পনার খসড়া তৈরি করেছেন। এই লেখায় নারীর ক্ষমতায়নের প্রেক্ষিতে বর্তমান সমাজে নারীর অবস্থান তুলে ধরার প্রচেষ্টা করা হয়েছে। খাতায়-কলমে নারীর ক্ষমতায়ন ও বাস্তবে ক্ষমতায়িত নারীর অবস্থার আলোচনায় মানবসম্পদ উন্নয়নের কিছু সূচকের সাপেক্ষে এই আলোচনা এগিয়েছে।

বিষয়সূচক মূল শব্দ :

নারীকল্যাণ, নারীর ক্ষমতায়ন, লিঙ্গবৈষম্য, মানবসম্পদ উন্নয়ন সূচক

প্রতিপাদ্য বিষয় :

ভূমিকা :

'ক্ষমতায়ন' একটি প্রক্রিয়া যা মানুষকে তাদের জীবনযাত্রার মানোন্নয়নকারী বিষয়গুলির উপর নিয়ন্ত্রণ কায়েম করতে সাহায্য করে। 'ক্ষমতায়ন' হল মানুষকে রাজনৈতিকভাবে সক্রিয়, অর্থনৈতিকভাবে উৎপাদনশীল ও স্বাধীনচেতা করে গড়ে তোলার এক সচেতন পদক্ষেপ। মানব উন্নয়নের আলোচনায় ক্ষমতায়ন বলতে ক্ষমতাবান ও ক্ষমতাহীন শ্রেণির মধ্যে ক্ষমতার ভারসাম্য রক্ষাকে বোঝায়। একজন ক্ষমতায়িত ব্যক্তি তার মানসিক দৃঢ়তা, আত্মবিশ্বাস ও বিচক্ষণতা দিয়ে তার জীবনযাত্রার মানকে সুচারুভাবে নিয়ন্ত্রণ করতে পারে। উন্নয়নের অর্থনীতিবিদদের মতে, মানবসম্পদের উন্নয়নের মাধ্যমেই অর্থনৈতিক প্রবৃদ্ধির পথ প্রসারিত হবে। এভাবেই উন্নয়ন অর্থনীতির আলোচনায় মানবসম্পদ উন্নয়নের ধারণাটি সংযোজিত হয়েছে।

কবি কাজী নজরুল ইসলাম তাঁর কবিতায় বলেছেন "বিশ্বে যা কিছু মহান

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Full Length Research Article

Regulatory Role of Nanoporous Silica on Dicot *Cicer arietinum* and Monocot *Sorghum bicolor*

Sutanuka Mitra*[1], Nabanita Mukherjee[2], Sambit Das[3], Anurag Sau[4], Shinja Chakraborty[5], Shibani Dwivedy[6], Serene Adak[7], Sanchaita Gayen[8] and Arunava Goswami[9]

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ABSTRACT

In the present era of rising population and pollution, the demand of commercialized nano formulations in agricultural fields is increasing. Nanoporous silica has emerged as a novel tool for drug delivery and diagnosis. However, very few studies have been conducted to elucidate its effects on plants and animals. It is essential to study the effects of nanoporous silica on consumable plants because they are being absorbed by these primary producers and successively passed along the food chain. Also, food and immunity are two sides of a coin. Gut flora assists in immunity. This age belongs to a diet that has the ability to enhance immunity. Therefore, fertilizers that eventually enter the intestine should be beneficial to the bacteria residing in it. This experiment aims at studying the morphological characters of nanoporous silica, investigating its effects on various biochemical pathways of model crop plants like dicotyledonous *Cicer arietinum* and monocotyledonous *Sorghum bicolor* and on the growth and viability of dominant gut flora *Bacillus coagulans*. The results of this study establish that it can positively regulate certain biochemical pathways in a size dependent and dose dependent manner in plants. It has been found to increase growth of *B. coagulans* over specific time scale.

Key words: Nanoporous silica, Gut flora, Mesoporous, Osmotic stress, Oxidative stress

In the growing era of nanoscience and nanotechnology, advancement in the search for novel nanoparticles has led to synthesis or isolation of nanoparticles with unique chemical structure and properties. These nanoparticles either exist in Nature or are manufactured in industries. In the past few years, one such particle, with nanoporous structure, namely mesoporous silica nanoparticles (MSNs) or nanoporous silica has gained importance owing to its eccentric properties such as solid framework, large surface area, porous structure, active surface with honeycomb-like structure high loading capacity, low toxicity, higher biocompatibility, and more stability [1]. Silica is the second most abundant element on Earth's crust due to the age-old weathering of rocks, sedimentation and biosilicification process in both terrestrial and aquatic organisms. Nanoporous silica also exists in Nature the synthesis of which depends on the biosilicification in organisms such as diatoms, sponges, etc. [1]. The coastal areas have huge deposition of nanoporous silica as sea water recedes leaving behind the diatom skeletons as diatomaceous earth. Besides the structural novelty of MSNs, they have surface charge at both outer and inner surfaces [2]. It has been found that drug loading in mesoporous nanoparticles and liquid transport rates through mesoporous membranes are directly related with internal surface charges [3]. It has also been seen that with a decrease in salt concentration or a decrease in pore size, the bulk electric potential became different than zero [2]. Moreover, the permeability of solvents through an artificially synthesized MSN, namely MCM 48, reduces from water to propanol indicating that the various types of interactions of the solvent molecules with surface of MCM 48 such as hydrophobic–hydrophilic interactions between the pore walls and the solvents, and/or to alkoxylation of surface ≡Si–OH groups by ethanol and 1-propanol affect the flow of solvents through the pores [3]. Thus, how a mesoporous silica behaves in a solution is an interesting topic in nanotechnology.

Presently, nanoporous silica is being extensively used as effective delivery vehicles for a variety of biocides to fight against various diseases including bone/tendon tissue engineering [4-7], diabetes [8-9],, inflammation [10], AIDS [11] and cancer [12]. It has also found application in optics, photonics, sensing, biosensing, filtration, microfabrications, protein separation, catalyses, drug delivery, etc. [1]. With the

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Partial purification and characterization of a thermophilic and alkali-stable laccase of *Phoma herbarum* isolate KU4 with dye-decolorization efficiency

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ABSTRACT

Production of an extracellular thermophilic and alkali stable laccase from *Phoma herbarum* isolate KU4 was reported for the first time, both in submerged fermentation (SmF, highest 1590 U/mL) and solid state fermentation (SSF, highest 2014.21 U/mL) using agro-industrial residues. The laccase was partially purified to 7.93 fold with the apparent molecular weight of 298 kDa. The enzyme had pH optimum at 5.0 and temperature optimum at 50 °C, with maximum stability at pH 8.0. It showed activity towards various phenolic and non-phenolic compounds. The kinetic parameters, K_m, V_{max} and K_{cat} of the laccase for DMP were 0.216 mM, 270.27 U/mg and 506.69 s^{-1}, respectively. Laccase activity was inhibited by various metal ions and conventional inhibitors, however, it was slightly increased by Zn^{2+}. The laccase showed good decolorization efficiency towards four industrial dyes, namely, methyl violet (75.66%), methyl green (65%), indigo carmine (58%) and neutral red (42%) within 24 h. FTIR analysis of the decolorized products confirmed the degradation of the dyes. The decolorization efficiency of the enzyme suggests that the partially purified laccase could be used to decolorize synthetic dyes present in industrial effluents and for waste water treatments. The thermophilic and alkali stable laccase may also have wider potential industrial applications.

KEYWORDS

Agro-industrial residues; alkali-stable; laccase; protease; *Phoma herbarum* isolate KU4; thermophilic

Introduction

Laccase (benzenediol: oxygen oxidoreductases, EC 1.10.3.2) is a multicopper oxidase (MCO), which catalyzes the oxidation of a wide range of its substrates using molecular oxygen as an electron acceptor, with the concomitant reduction of oxygen to water. Yoshida[1] first described laccase in a Japanese lacquer tree, *Rhus vernicifera*. It is widely distributed among bacteria, fungi and plants.[2] The enzyme is mostly produced by white-rot and litter-decomposing fungi.[3] Laccase is synthesized during the early or late growth phase of fungi.[4,5] However, most fungi produce the enzyme extracellularly, but in some fungi intracellular laccase production is also observed.[6,7] Laccase has a broad range of substrates, including lignins, phenols, diamines and aromatic amines.[8–10] Due to the wide substrate range, laccase is used in various industrial applications, like, fruit juice and wine clarification, textile, paper and pulp bleaching, bioremediation of xenobiotic compounds, biosensors and decolorization of synthetic dyes.[11–15]

Submerged fermentation (SmF), which involves the cultivation of microorganisms in liquid media has many advantages, such as effectiveness in controlling different parameters and in the scaling up of processes.[16] During the fermentation process, the inoculated fungal cells grow in the nutrient medium and release the enzymes extracellularly into the culture filtrate. Cultivation of fungi in liquid media allow easy mycelial distribution in the flasks, ease in the manipulation of the process parameters and enhanced production of biomass under a limited time.[17] Lignin-containing agro-industrial residues are widely used for economical production of various ligninolytic enzymes. Lignin content of the agro-industrial residues provides a suitable habitat for the secretion of larger amount of these enzymes.[18,19] Reuse of these wastes, reduces the environmental problems arising from their various modes of disposal.[20] Reports indicate that due to low production costs and higher productivity, the use of agro-industrial wastes in solid state fermentation (SSF) for the production of enzymes has gained much attention.[21–24]

All over the world, approximately 10,000 different types of dyes and pigments are used for industrial purpose. It is estimated that 800,000 tons of colorants are produced per year, in which at least 15% of the dyestuff during processing are discharged in industrial effluents.[25] These synthetic dyes not only have adverse effects on environment, but they are also genotoxic and carcinogenic.[26] Use of microbial or enzymatic systems for dye decolorization and degradation is cost-effective and eco-friendly process, which could be an alternative to chemical decomposition process.[27,28] Use

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Impact of antibiotics as anthropogenic stressor for influencing bacterial evolutionary process – A review

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Abstract. A large number of human induced stressors are affecting natural evolutionary process through altering ecosystems and biodiversity. Antibiotics are one of the most commonly excreted pollutants released in environment since last eight decades. Antibiotics can alter genetic orientation of bacterial population and can exert selection pressure for emerging new taxon. In environments like soil and water, antibiotics directly or indirectly may affect many aspects of natural systems like biogeochemical cycles, nitrifications and decomposition process. All these may bring new selection pressure for bacteria not only in community or population level but also in species level.

Key words: antibiotics, bacteria, evolution, population, community.

1. Introduction

Since industrial revolution human activities has had a great impact on ecosystem and biodiversity of this planet. Directly or indirectly human is acting as one of the most potential driving force that can modify ecosystems as well as biodiversity resulting in vast evolutionary changes in different species around us (Palumbi, 2001). As a hyper-keystone species human dominates over a large number of other keystone species and this hyper-dominance also creates different types of selection pressure on the other component species of the existing biodiversity (Worm & Paine, 2016). Human activities are causing permanent changes in ecosystems and creating new ecosystems called Anthropogenic Biomes or Anthromes (Ellis, 2011). Rapid evolution has been observed in microbes to vertebrates (Dlugosch & Parker, 2008) due to anthropogenic causes. Antibiotics (Baquero & Blazquez, 1997), pesticides (Tabashnik, 1994) and climate change (Parmesan, 2006) are the major anthropogenic stressors that have potential responses to direct evolutionary changes in various ways in different forms of life. In this review I will try to draw a scenario how anthropogenic activities in the form of antibiotics exert evolutionary pressure on microbial communities of different ecosystems and force them to adapt in various selection pressure. Antibiotics act as a potential ecological stressor in the environment that have the potentiality to alter the structure and composition of microbial communities through resistance expansion and ecological function disturbances in the micro-habitat (Ding & He, 2010).

Antibiotics are used to manage various infectious diseases caused by bacteria in humans, animals, livestock, and aquacultures all over the world (Cycoń et al., 2019). Alexander Fleming (in 1929) discovered penicillin that have inhibitory effect on bacterial cell wall biosynthesis and thus able to stop infectious pathogens like *Staphylococcus aureus*. Antibiotics are used in large scale since last 80 years to treat a variety of infectious diseases of human and animals. Antibiotics are also used in non-medical purposes like Animal Husbandry and Aquaculture, Bee-keeping, Horticulture, Food preservation, Alcohol production and Boat and hull paint (Meek et al., 2015).

Environmental Pollution
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Molybdenum and hydrogen sulfide synergistically mitigate arsenic toxicity by modulating defense system, nitrogen and cysteine assimilation in faba bean (*Vicia faba* L.) seedlings ☆

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Highlights

- Molybdenum (Mo) and hydrogen sulfide (H_2S) synergistically mitigated arsenic stress.
- Mo and H_2S efficiently reduced overproduction of reactive oxygen species.
- Exogenous Mo and H_2S concomitantly regulated antioxidative defense system.
- Mo and H_2S modulated nitrogen and proline metabolism under arsenic toxicity.
- Mo and H_2S triggered cysteine and H_2S biosynthesis in seedlings under arsenic stress.

Exogenous Melatonin Modulates Endogenous H_2S Homeostasis and L-Cysteine Desulfhydrase Activity in Salt-Stressed Tomato (*Solanum lycopersicum* L. var. cherry) Seedling Cotyledons

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Soumya Mukherjee & Satish C. Bhatla

Abstract

Although melatonin has been reported to function as a stress signaling molecule, not much information is available on the biochemical and molecular events associated with probable melatonin-hydrogen sulfide crosstalk in plants. Present work provides evidence on the role of melatonin in the modulation of H_2S homoeostasis during NaCl stress in dark-grown tomato (*Solanum lycopersicum* L. var. cherry) seedlings. NaCl stress (120 mM) inhibits hypocotyl elongation, promotes primary root growth and enhances electrolytic leakage from tomato seedlings. Treatment with H_2S donor (100 µM; NaHS) tends to reverse these effects, all the more so (additive effect) in the presence of melatonin. NaCl stress and exogenous melatonin (30 µM) treatments modulate endogenous H_2S accumulation and positively upregulate the activity of L-cysteine desulfhydrase (L-DES; EC 4.4.1.15; cytosolic). Melatonin has been observed to temporally modulate the activity of specific isoforms of H_2S biosynthesizing enzyme, L-DES in seedling cotyledons. Zymographic analysis of L-DES isoforms in tomato seedling cotyledons has provided novel findings in plant system. Melatonin treatment decreases H_2S accumulation in NaCl-stressed seedling cotyledons which is accompanied by a contrasting increase in L-DES activity. Melatonin, therefore, regulates endogenous H_2S concentration in seedling cotyledons (NaCl treated), thus indicating the role of H_2S catabolism pathways in H_2S homoeostasis. Present findings thus reveal that exogenous melatonin modulates early H_2S signaling in cotyledons of tomato seedlings subjected to NaCl stress. Furthermore, exogenous melatonin and H_2S in combination (additive effect) ameliorate NaCl stress-induced growth changes in tomato seedlings.

দলিত আন্দোলন ও ড: বি.আর.আম্বেদকর

সুশেন্দু বিশ্বাস

সংক্ষিপ্তসার :

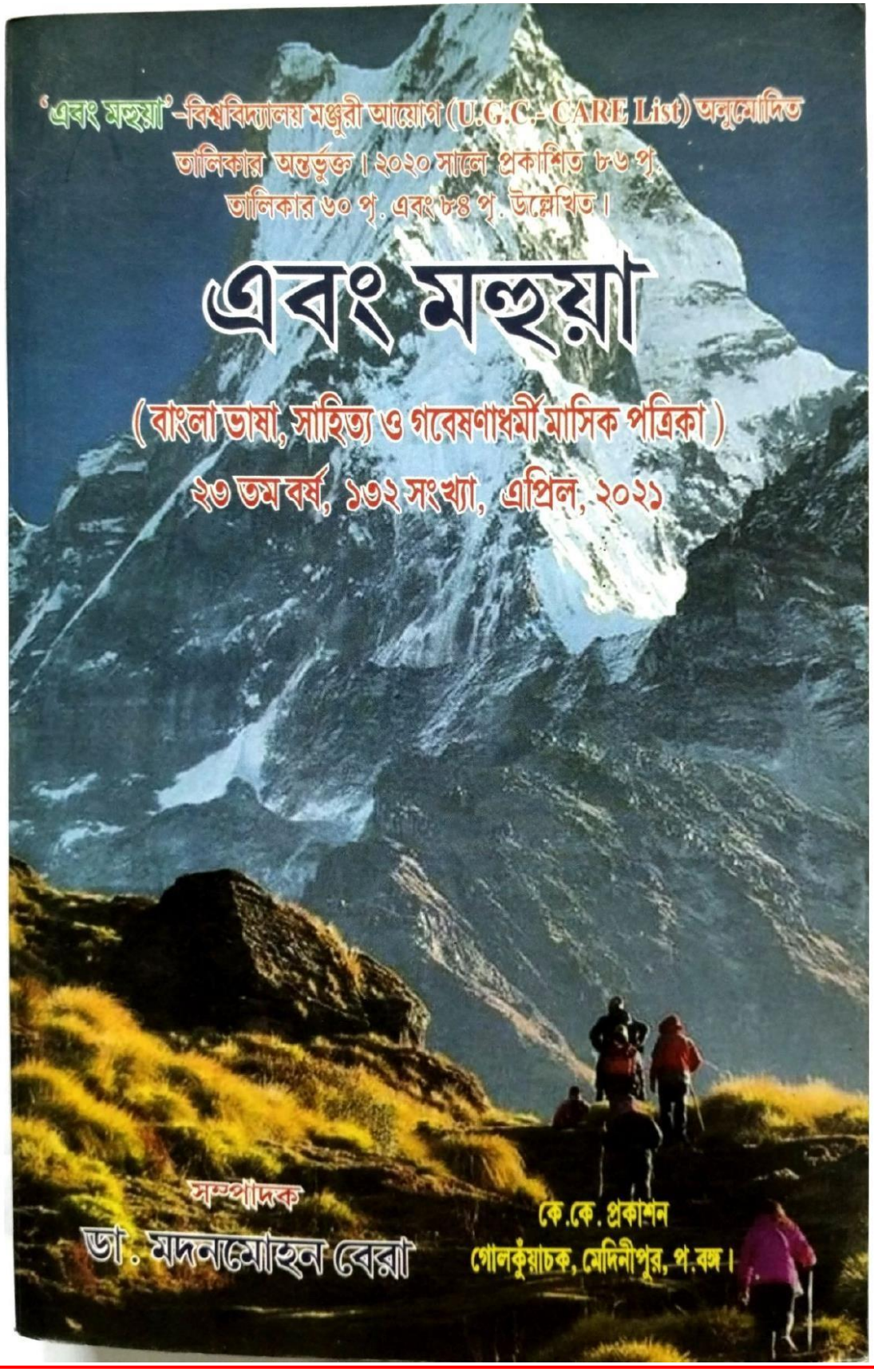
ভারতবর্ষে জাতপাত প্রথা ও তাদের নিয়ে চর্চা একটি অতি গুরুত্বপূর্ণ ঐতিহাসিক বিষয়। পেশার বিচারে যাঁরা সুইপার, চা-শ্রমিক, মুচি, ধোপা, ডোম, মেথর ইত্যাদি নীচু কাজ করেন তাঁরা হলেন 'দলিত' বা 'অস্পৃশ্য'। এই তথাকথিত দলিত বা অস্পৃশ্য মানুষগুলি হলেন 'অশুচী' বা 'অপবিত্র'। এই অপবিত্র মানুষগুলি মানুষিকভাবে, সামাজিকভাবে, আর্থিকভাবে, রাজনৈতিকভাবে নির্যাতিত চয়ে আসছেন প্রাচীনকাল থেকে একথা অমান্য করবার কোন জায়গা আছে বলে মনে হয় না। এই অবহেলিত মানুষগুলির সামাজিক, আর্থিক, আত্মিক প্রগতির কথা ভেবেছেন অনেকেই, তাদের মধ্যে ড. বি. আর. আম্বেদকর যে সর্বাগ্রে থাকবেন তা বলাই বাহুল্য। ড. বি. আর. আম্বেদকর দলিতদের উন্নয়নে অনেকগুলি প্রতিষ্ঠান স্থাপন করেছিলেন তারমধ্যে অন্যতম হল-১৯২৪ সনের ২০ই জুলাই অস্পৃশ্যদের শিক্ষা বিস্তারে হোষ্টেল গড়ে তোলা, লাইব্রেরী প্রতিষ্ঠা, সাংস্কৃতিক বিকাশে শিক্ষা কেন্দ্র স্থাপন তথা জোটবদ্ধভাবে কাজ করার জন্য 'বহিস্কৃত হিতকরণী সভা', নামে একটি সংগঠন প্রতিষ্ঠা করেন। ১৯২৮ সনে 'ডিপ্রেসড ক্লাসেস এডুকেশন সোসাইটি', প্রতিষ্ঠা করেন। দলিত-দরিদ্রের মুক্তির জন্য গড়ে তোলেন 'ইন্ডিপেন্ডেন্ট লেবার পার্টি', বা 'স্বাধীন শ্রমিক দল' (১৯৩৬)। তিনি শ্রমিকস্বার্থে ভারতের কমিউনিষ্ট পার্টির সাথে ধর্মঘটের ডাক দেন যৌথভাবে ১৯৩৮ সালে। তিনি দলিতদের স্বার্থে গড়ে তোলেন 'তফসিলী ফেডারেশন', ইত্যাদি এইপ্রকার বিভিন্ন সংস্থা বা প্রতিষ্ঠান তৈরী করে দলিতদের উন্নয়নমূলক কাজ করে তিনি ভারতের পশ্চাদপদ শ্রেণির অন্তরে এক বিশেষ জায়গা করে নিয়েছেন। তাঁর উদ্যেগে কীভাবে অবহেলিত শ্রেণির মানবাধিকার প্রতিষ্ঠিত হল এবং কতটা হল তা তুলে ধরাই আমার এই প্রবন্ধের প্রধান উদ্দেশ্য।

সূচক শব্দ :

ড. বি. আর. আম্বেদকর, দলিত, অস্পৃশ্য, বহিস্কৃত হিতকরণী সভা, ডিপ্রেসড ক্লাসেস এডুকেশন সোসাইটি, ইন্ডিপেন্ডেন্ট লেবার পার্টি, মানবাধিকার।

মূল প্রবন্ধ :

রোমানদের ছিল ক্রীতদাস, স্পা র্টানদের ছিল সেবাদাস, ইংরেজদের ছিল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এবং মহুয়া
(বাংলা ভাষা, সাহিত্য ও গবেষণাধর্মী মাসিক পত্রিকা)
২৩ তম বর্ষ, ১৩২ সংখ্যা, এপ্রিল, ২০২১
সম্পাদক
ডা. মদনমোহন বেরা
কে.কে. প্রকাশন
গোলকুঁয়াচক, মেদিনীপুর, প.বঙ্গ।

নদীয়া জেলার ঐতিহাসিক পটভূমি

সুশেন্দু বিশ্বাস

সারসংক্ষেপ :

পশ্চিমবঙ্গের একটি গুরুত্বপূর্ণ জেলা হল নদীয়া জেলা। ১৯৪৭ সালে দেশভাগের সঙ্গে সঙ্গে নদীয়া জেলা দ্বিখণ্ডিত হয়ে এর একাংশ নিয়ে কুষ্ঠিয়া জেলা গঠিত হয়। কুষ্ঠিয়া বর্তমানে বাংলাদেশের অন্তর্ভুক্ত। অবশিষ্ট নদীয়া জেলা পশ্চিমবঙ্গের দক্ষিণাংশে কলকাতা থেকে প্রায় ৫০ কিলোমিটার উত্তরে অবস্থিত। এই জেলার নামকরণ ও ঐতিহাসিক প্রেক্ষাপটের একটি সুদীর্ঘ ইতিহাস ও বিতর্ক রয়েছে। একদা নদীয়া ও নবদ্বীপ নামটি সমার্থক ছিল। পরবর্তীকালে নদীয়া নামটির প্রচলন ঘটে। তবে এই নামকরণের বিভিন্ন ব্যাখ্যা পাওয়া যায় যা বর্তমান প্রবন্ধটিতে আলোচিত হবে। তাছাড়া নদীয়া জেলার একটি সুদীর্ঘ ইতিহাস রয়েছে। প্রাচীনযুগের ঐতিহাসিক তথ্যের অভাব থাকলেও মধ্যযুগের ইতিহাস সম্পর্কে বিভিন্ন গুরুত্বপূর্ণ তথ্যাদি পাওয়া যায়। প্রাপ্ত তথ্যের ভিত্তিতে নদীয়া জেলার একটি ঐতিহাসিক প্রেক্ষাপট এই প্রবন্ধে তুলে ধরা হবে।

সূচক শব্দ :

বৃন্দাবনদাস, চৈতন্যভাগবত, নবদ্বীপ, বিষ্ণুপুরাণ, মার্কণ্ডেয়পুরাণ, মহাবংশ, তবাকৎ-ই-নাসিরি, নগ্নদিবো, গঙ্গারিডি, পাটলিপুত্র, দীয়া, শশাঙ্ক, গৌড়, লক্ষ্মণসেন, চৈতন্যমঙ্গল, বারভুঁইয়া।

প্রতিপাদ্য বিষয় :

প্রাচীন কাল থেকে বাংলার ইতিহাসে নদীয়া জেলা একটি গুরুত্বপূর্ণ স্থান ছিল। গাঙ্গেয় ব-দ্বীপ অঞ্চলে এবং ভাগীরথী নদীর তীরে অবস্থিত নদীয়ার অতীত গৌরবও অসীম। বাংলার বিভিন্ন রাজনৈতিক উত্থান-পতন, ধর্মীয় গতি-প্রকৃতি, সামাজিক পরিবর্তন প্রভৃতির বহু গুরুত্বপূর্ণ ঘটনার সাক্ষী অতীতের নদীয়া জেলা। অতীতে 'নবদ্বীপ' ও 'নদীয়া' নাম দুটি সমার্থক ছিল। নদীয়ার অপর নামই ছিল নবদ্বীপ। নবদ্বীপ অতীতকালে একসময় জ্ঞান-গরিমার প্রাণকেন্দ্র ছিল। তাই কেউ কেউ নদীয়াকে 'প্রাচ্যের অক্সফোর্ড' বলেও অভিহিত করতেন। শ্রীচৈতন্য ও তাঁর পরবর্তী সময়ের বৈষ্ণব কবি ও গ্রন্থকারগণ বিভিন্নভাবে নবদ্বীপের উচ্ছ্বসিত প্রশংসা করেছেন। কবি বৃন্দাবন দাস তাঁর 'চৈতন্য ভাগবত' কাব্যে লিখেছেন—


'এবং মহুয়া'-বিশ্ববিদ্যালয় মঞ্জুরী আয়োগ (U.G.C.- CARE List) অনুমোদিত
তালিকার অন্তর্ভুক্ত। ২০২০ সালে প্রকাশিত ৮৬ পৃ.
তালিকার ৬০ পৃ. এবং ৮৪ পৃ. উল্লেখিত।
এবং মহুয়া
(বাংলা ভাষা, সাহিত্য ও গবেষণাধর্মী মাসিক পত্রিকা)
২৩ তম বর্ষ, ১৩৩ সংখ্যা, মে, ২০২১
সম্পাদক
ডা. মদনমোহন বেরা
কে.কে. প্রকাশন
গোলকুঁয়াচক, মেদিনীপুর, প.বঙ্গ।

পরিবেশ ভাবনায় কার্ল মার্কস

সুশেন্দু বিশ্বাস

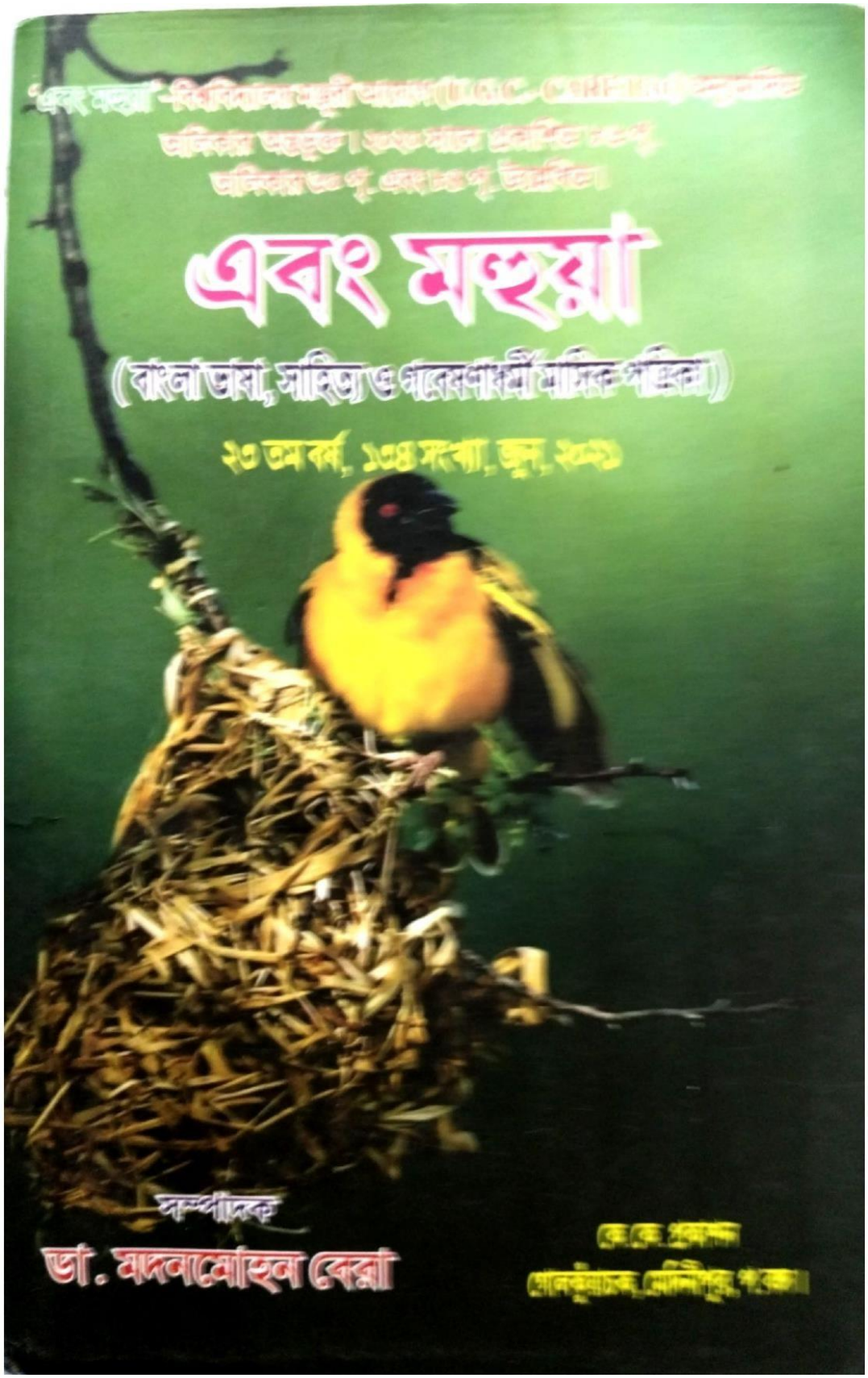
সারসংক্ষেপ :

আমরা স্বাধীন ভারতের নাগরিক। রাজনীতি আমাদের অস্থি-মজ্জায়। রাজনীতি ছাড়া দেশও চলবে না। তাই রাজনীতিকে উপেক্ষা করা কাম্য নয়। স্বাধীন দেশ নাগরিকের সর্বাঙ্গিন মঙ্গলে সদা সচেষ্ট থাকবেন এটাই দস্তুর। কিন্তু স্বাধীনতার ৭২ বছর পরেও আমাদের মনে অনেক গ্লানি যে রয়েছে তা বলার অপেক্ষা রাখে না। অনেক বিষয়েই উপেক্ষার নিদর্শন আছে। কিন্তু আজ আমরা যদি 'পরিবেশ' নিয়ে রাষ্ট্রের ভূমিকার দিকে তাকাই তাহলে অনেক অসন্তোষ জমবে আমাদের মনে। তাই 'রাজনীতি' শব্দটির অর্থ বর্তমান সময়ে সাধারণ মানুষের কাছে বেশ ঘোলাটে ধরনের। স্বাধীনোত্তর ভারতবর্ষে রাজনীতি মানে সাধারণভাবে মিছিল-মিটিং-সভা-সমাবেশ, আর তার সঙ্গে বিভিন্ন রংয়ের পতাকাবাহী মানুষের দাপাদাপি। সবটাই গণতন্ত্র রক্ষার প্রয়াস মাত্র। আর 'গণতন্ত্র' ও 'ভোটাধিকার' তো এখন পরস্পরের প্রতিশব্দ হয়ে দাঁড়িয়েছে। জনগণের ভোট আদায়ের জন্য কখনো সাম্প্রদায়িক উস্কানি, আবার কখনো জাত পাতের মধ্যে বিভাজন তৈরি করতে রাজনৈতিক দলগুলি পিছুপা হয়না। মানুষ অনেকাংশেই বিভ্রান্ত। তাদের পক্ষে বোঝা মুশকিল যে, শুধুই ক্ষমতার লালসা নাকি রাজনৈতিক দলগুলির চিন্তার পরিসর (নীতি প্রণয়ন ও প্রয়োগ) সমাজ ও পরিবেশের বিভিন্ন ক্ষেত্রেও বিরাজ করছে। কারণ সমাজ ও পরিবেশকে রক্ষা করাও দেশ গঠনের অন্যতম কাজ। স্বাভাবিকভাবেই প্রশ্ন ওঠে— দেশের কোন স্বীকৃত ও রাজনৈতিক দল এই বিষয় নিয়ে চিন্তিত? অন্তত তাদের কর্মসূচির নিরিখে। তথ্য সংগ্রহের কারণেই দেশের সব রাজনৈতিক দলের পরিবেশ বিষয়ক কর্মসূচির (প্রস্তাবের) তুলনামূলক আলোচনা বর্তমান নিবন্ধে করা সম্ভব নয়। কিন্তু দেশের অন্যতম জাতীয় রাজনৈতিক দল, ভারতের কমিউনিস্ট পার্টি (মার্ক্সবাদী)-র (যা সাধারণ মানুষের কাছে নামেই অধিক পরিচিত) পরিবেশ ও পরিবেশ সম্পর্কিত বিষয়ের রাজনৈতিক দৃষ্টিভঙ্গি বর্তমান সময়ে প্রাসঙ্গিক হওয়ার যথেষ্ট কারণ আছে। এই প্রবন্ধে পরিবেশ নিয়ে মার্কসের কালজয়ী ভাবনাকে তুলে ধরা হবে।

শব্দ সূচক: পরিবেশ, মার্কসবাদ, রাজনীতি, গণতন্ত্র, ভোটাধিকার, গ্লোবাল ওয়ার্মি, কমিউনিস্ট পার্টি।

প্রতিপাদ্য বিষয় :

আমরা স্বাধীন ভারতের নাগরিক। রাজনীতি আমাদের অস্থি-মজ্জায়। রাজনীতি


এবং মহুয়া
(বাংলা ভাষা, সাহিত্য ও গবেষণাধর্মী ত্রৈমাসিক পত্রিকা)
সম্পাদক
ডা. মদনমোহন বেরা

নারী শিক্ষা আন্দোলনে 'হিতকরী সভা'র ভূমিকা

সুশেন্দু বিশ্বাস

সারসংক্ষেপ :

ঊনবিংশ শতকে বাংলাদেশে শিক্ষা, সংস্কৃতি, জ্ঞান-বিজ্ঞান, জাতীয়তাবাদী রাজনীতি, নারীশিক্ষার বিস্তার ও অন্ধবিশ্বাস, কুসংস্কার, গোঁড়ামীর বিরুদ্ধে সংঘবদ্ধ প্রতিবাদ প্রভৃতি সমাজ উন্নয়নের সকল প্রকার আন্দোলনই সংঘটিত হতে দেখা যায়। এই কাজে এগিয়ে এসেছিলেন কয়েকজন বিখ্যাত মহাপুরুষ ও কিছু প্রগতিশীল সংস্থা। এর মধ্যে অন্যতম সংস্থা হল 'উত্তরপাড়া হিতকরী' সভা। এই সভা প্রতিষ্ঠিত হয়েছিল ১৮৬৩ খ্রিস্টাব্দের ৫ই এপ্রিল। এই সভার প্রধাণ লক্ষ্য ছিল— বঙ্গের গৃহবন্দী নারীকে মুক্তি দেওয়া। আর তাদের ঐকান্তিক প্রচেষ্টার দরুণ ঊনবিংশ শতাব্দীর শেষার্ধেই ঘটেছিল অজ্ঞানতার তিমিরে অবগুণ্ঠিতা বন্দিনী নারীর মুক্তি। তারপর শুরু হয়েছিল তার অপ্রতিহত জয়যাত্রা।

'হিতকরী সভা' প্রতিষ্ঠা ও উত্তরপাড়ার উন্নতিকল্পে এগিয়ে এসেছিলেন উত্তরপাড়ার মহারাজা জয়কৃষ্ণ মুখোপাধ্যায়, তিনি বিভিন্নপ্রকার সমাজ উন্নয়নমূলক কাজ শুরু করেছিলেন। তাঁর মহান কর্মকান্ডকে মহত্তর করে তুলতে এগিয়ে এসেছিলেন উত্তরপাড়ার কিছু মহানুভব শিক্ষিত যুবক। তাদের মধ্যে অন্যতম হলেন— হরিহর চট্টপাধ্যায়, বিজয়কৃষ্ণ মুখোপাধ্যায় (জয়কৃষ্ণের বৈমাত্রেয় ভ্রাতা), রাজকৃষ্ণ মুখোপাধ্যায়ের (জয়কৃষ্ণের সহোদর ভ্রাতা)।

সমাজ উন্নয়নে এই সভা যে সব কাজ করেছিলেন সেগুলি হল : নারী শিক্ষা প্রসারের ব্যবস্থা করা, শিক্ষা প্রসারে সেমিনার আয়োজন করা, গ্রামে শিক্ষার প্রয়োজন কতটা ? তা সাধারণ মানুষের মধ্যে প্রচার করা, 'জেনানা' শিক্ষা চালু করা, 'অন্তঃপুর পরীক্ষা' ব্যবস্থা চালু করা, 'বৃত্তি পরীক্ষা' পরিচালনা করা, মদ্যপান বিরোধী প্রচার করা, সর্পদংশন হলে কি করনীয় ? তা প্রচার করা, ইত্যাদি বিভিন্ন প্রকার সচেতনতামূলক প্রচার করাই ছিল 'হিতকরী সভা'র প্রধান কর্মসূচি।

সূচক শব্দ :

হিতকরী সভা, জয়কৃষ্ণ মুখোপাধ্যায়, বিজয়কৃষ্ণ মুখোপাধ্যায়, 'জেনানা এডুকেশন', 'অন্তঃপুর পরীক্ষা', উত্তরপাড়া জয়কৃষ্ণ পাবলিক লাইব্রেরী, বিদ্যাসাগর, মেরী কার্পেন্টার, ডবলিউ. ডবলিউ. হান্টার।

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CERTAIN RESULTS ON $N(\kappa)$-CONTACT METRIC MANIFOLDS WITH CONFORMAL RICCI SOLITONS

TARAK MANDAL

Abstract. In the present paper, we have studied conformal Ricci solitons on $N(\kappa)$-contact metric manifolds. Also we have studied second order parallel tensor, conformal gradient Ricci solitons in $N(\kappa)$-contact metric manifolds. We have also proved that, there does not exist conformal Ricci soliton in an $N(\kappa)$-contact metric manifold. Finally, we give an example.

1. INTRODUCTION

In 1988, the notion of κ-nullity distribution of a Riemannian manifold was introduced by S. Tanno in the paper [21]. In κ-nullity distribution the characteristic vector field ξ of the manifold belongs to the distribution. The κ-nullity distribution of a Riemannian manifold M of dimension $(2n+1)$ is given by

$$N(\kappa): p \to N_p(\kappa) = \{Z \in T_pM : R(X,Y)Z = \kappa\{g(Y,Z)X - g(X,Z)Y\}, \quad \forall X, Y \in T_pM,$$

where κ is a real number and T_pM is the Lie algebra of all vector fields at p. Since the characteristic vector field ξ belongs to the κ-nullity distribution, thus

$$R(X,Y)\xi = \kappa\{\eta(Y)X - \eta(X)Y\}. \tag{1.1}$$

A contact metric manifold of dimension $(2n+1)$ satisfying (1.1) is said to be an $N(\kappa)$-contact metric manifold. If $\kappa = 1$, then the manifold is reduced to Sasakian manifold and for $\kappa = 0$, the manifold is locally isometric to the product of a flat $(n+1)$-dimensional manifold and an n-dimensional manifold with scalar curvature 4 when $n > 1$ and flat when $n = 1$ [1]. Contact metric manifolds and $N(\kappa)$-contact metric manifolds have been studied by several authors such as Blair [1,2], Blair, Koufogiorgos and Papantoniou [3], De, Yildiz and Ghosh [9], Kar, Majhi and De [15], Sarkar and Biswas [18] and many more.

In 1926, Levy introduced the notion of second order parallel tensors. Later many authors such as R. Sharma [19, 20], Chandra, Hui and Shaikh [6], Mondal and De [17] have studied second order parallel tensors on several manifolds.

The notion of Ricci soliton was introduced by Hamilton [14] which is the generalization of the Einstein metrics and is defined by

$$(\mathcal{L}_V g)(Y,Z) + 2S(Y,Z) + 2\lambda g(Y,Z) = 0,$$

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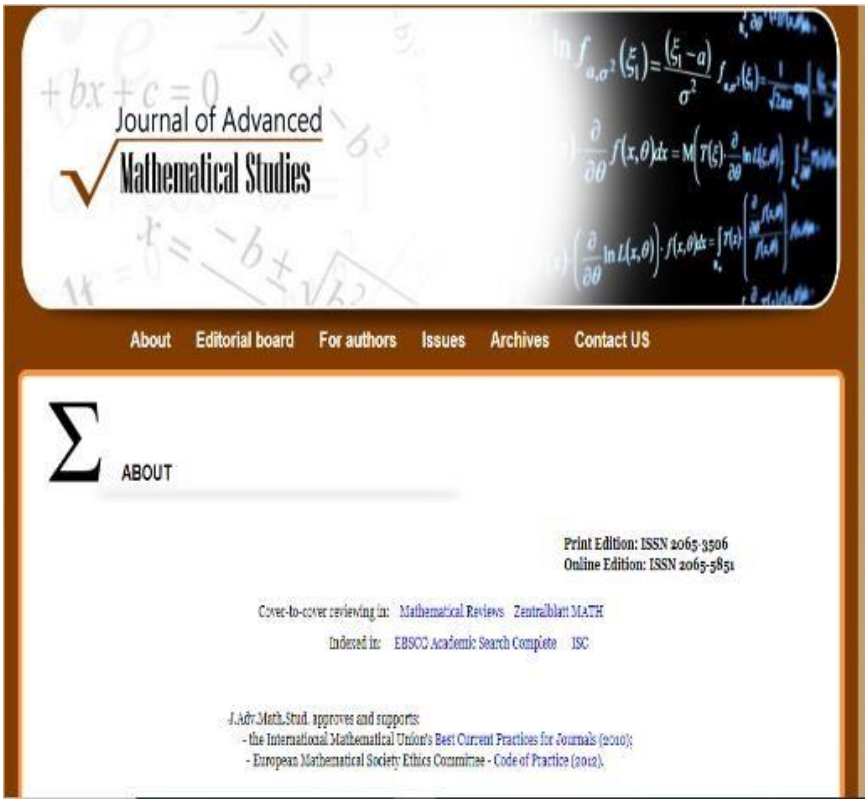
Key words and phrases: $N(\kappa)$-contact metric manifold, conformal Ricci soliton, second order parallel tensor, conformal gradient Ricci soliton.



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https://doi.org/10.31926/but.mif.2021.1.63.2.7

ON D-HOMOTHETICALLY DEFORMED $N(\kappa)$-CONTACT METRIC MANIFOLDS

Tarak MANDAL[1]

Abstract

In the present paper, we have studied generalized weakly symmetric and generalized weakly Ricci symmetric D-homothetically deformed $N(\kappa)$-contact metric manifolds. Also we have studied Ricci solitons on deformed $N(\kappa)$-contact metric manifold and obtained several results if the manifold has generalized weakly symmetric and generalized weakly Ricci symmetric restrictions. We have also proved that there does not exist a Ricci soliton in a D-homothetically deformed $N(\kappa)$-contact metric manifold. Finally, we give an example.

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SOME RESULTS ON GENERALIZED (κ, μ)-SPACE FORMS WITH RESPECT TO THE SEMI-SYMMETRIC METRIC CONNECTION

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Abstract. In the present paper, we have studied curvature tensor of generalized (κ, μ)-space forms with respect to the semi-symmetric metric connection. We have established a relation between conformal curvature tensors of a generalized (κ, μ)-space form with respect to the Levi-Civita connection and semi-symmetric metric connection and construct the condition for which a generalized (κ, μ)-space form with respect to semi-symmetric metric connection to be ξ-conformally flat. We have also derived the expression of Weyl projective curvature tensor of a generalized (κ, μ)-space form on the same metric connection. Also we give an example.

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Development of a 'SSQuEE' method for recovery and preconcentration of pesticide from environmental samples

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Abstract— **A simple sensitive quick and easy and efficient (SSQuEE) analytical techniue based on cloud point extraction (CPE) has been developed for the determination of different class of pesticides in soil and water with High Performance Liquid Chromatography separation and ultraviolet detection. The environmentally friendliness surfactant like Triton X -100, compared to Tween series of nonionic surfactant can effectively extract imidacloprid (insecticide), flusilazole (fungicide) and atrazine (herbicide) at cloud point temperature at 67°C, 82°C and 62°C respectively. To reach the optimum extraction efficiency, different experimental parameter like surfactant concentration, salt type and its concentration, equilibrium time & temperature, pH were observed. At the optimum conditions linear regression coefficient of the standard curves was grater than 0.9924. The limit of detection of imidacloprid, flusilazole and atrazineare are 0.10, 0.24, 0.15μgL^{-1}and recovery percent are 99.71%, 88.1% and 89.74% respectively.**

Index Terms— **Pesticides, Environmental samples, Surfactants, CPE, HPLC-UV-VIS.**

I. INTRODUCTION

Humans are exposed to pesticides as a consequence of their applications in farming as well as their persistence in different environmental components viz air, water, soil and plant system. The interaction of pesticide with environmental factors may result in alteration of their physicochemical properties. Trace amount of pesticides in water and soil compartment together with residue analysis sometimes become challenging in terms of compatibility with the determination tool. To increase the production of vegetable the application of agro chemicals for agriculture as well as for plant protection and animal health has converted the problem of environmental pollution into national and international issues [1]. Sorption is one of the most important factors that affects the fate of pesticides in the soil and determines their distribution in the soil/water environment, which is widely used to describe the process of a pesticide partitioning between water solution and soil [2]. Imidacloprid [1-(6-chloro-3-pyridylmethyl) -Nnitroimidazolidin-2-ylideneamine], flusilazole [1-((bis(4-fluorophenyl)methylsilyl)methyl)-1H-1,2,4-triazole], atrazine [1-Chloro-3- ethylamino-5- isopropylamino-2,4,6-triazine] are systemic insecticide, fungicide and herbicide respectively which were used with different mode of action. These pesticides were used as seed-dressing, soil treatment and foliar treatment in different crops and extensively used in agricultural areas. It is necessary to drawn attention to the pesticides [3]. The transport; retention, mode of action and transformation are more and more of a public concern. This pesticide residue is highly persistent and can survive many years in soils, waters, and organisms [4]. Migration of the pesticides into groundwater via soil layers has therefore become one of the primary approaches leading to the widespread contamination to ecosystems [5]. The massive accumulation of pesticides in ecosystems not only affects the quality of crops which are directly exposed to the pesticides, but also serves as a food chain to pose a threat to human health [6] .Thus far, the extraction and analysis of pesticide residues have been established using liquid to liquid [7], solid-phase [8,9], single-drop micro extraction [10,11], and hollow fiber-based liquid-phase micro extraction [12], Dispersive liquid- liquid micro extraction [13] etc.

It is therefore of great importance to develop sensitive and efficient analytical methods to detect pesticides from multi-media. Several analytical methods have been reported including gas chromatography [14], high performance liquid chromatography [15] and capillary electrophoresis [16]. Now, Cloud point extraction (CPE) [17-18] is simple, sensitive, quick, easy, efficient, environmental friendly route using different surfactants which has hydrophobic in nature [19]. In cloud point extraction is a process where at an optimum temperature two distinct phases is separated like surfactant-rice and an aqueous. [20]. Proper Surfactants can form micelles and become turbid when heated to the particular temperature. The organic solutes enclosed in the micelles of surfactants and separate from the bulk, water solvent. The cloud point extraction method is applied for the determination of different organic and inorganic molecule or ions [21, 22], polycyclic aromatic hydrocarbons (PAHs) [23], vitamins [24, 25], and estrogens [26] and proteins [27]. With the use of nonionic surfactant cloud point extraction procedure can be improved the enrichment of pesticides residue in environmental sample like soil, water and vegetable with the use of HPLC combined with ultraviolet-visible spectrophotometer. There are many several factors affecting on the CPE, like types and concentration of surfactant, temperature, time of incubation, ionic strength and pH of the solution.

II. EXPERIMENTAL

Reagent and materials

Imidacloprid (CAS no 138261-41-3), flusilazole (CAS no 85509-19-9) and atrazine (CAS no 1912-24-9) obtained from sigma Aldrich (St Louis, MO, USA). Tween 20 (Cas no 9005-64-5, Merck Mumbai.), Tween 80 (Cas no 9005-65-6, Merck Mumbai.) and Triton X-100 (batch no 005A-2602-13,

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'এবং মহুয়া' - বিশ্ববিদ্যালয় মঞ্জুরী আয়োগ (UGC-CARE list-I 2021) অনুমোদিত তালিকার অন্তর্ভুক্ত। ২০২১সালে প্রকাশিত ১৬পৃ.তালিকার (৩১৯টির মধ্যে) ৩ পৃ.৬০নং উল্লেখিত।

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মহাবিদ্যালয় গ্রন্থাগারে পাঠক সংখ্যা হ্রাসের কারণ ও তার প্রতিকার

হেদায়েত হোসেন

সার সংক্ষেপ :

বর্তমানে বৈদ্যুতিন মাধ্যমের পাঠসামগ্রী অতি সহজলভ্য হওয়ায় পৃথিবীর প্রায় সমস্ত দেশেই গ্রন্থাগারে পাঠক সংখ্যা কমে এসেছে। মহাবিদ্যালয় গ্রন্থাগারও তার ব্যতিক্রম নয়। তার উপর মহামারির প্রকোপ মহাবিদ্যলয়ের গ্রন্থাগারের পাঠক সংখ্যাকে প্রায় শূন্যে নামিয়ে দিয়েছে। এমত অবস্থায় গ্রন্থাগারের পাঠককে গ্রন্থাগারমুখী করা মহাবিদ্যালয়ের গ্রন্থাগারিকদের পক্ষে একটা কঠিন কাজ। সমাজের সমস্ত শ্রেণীর মানুষকে এগিয়ে এসে এই দুরুহ কাজকে সম্পূর্ণ করতে হবে। আলোচ্য প্রবন্ধে মহাবিদ্যালয় গ্রন্থাগারের পাঠকবর্গের গ্রন্থাগার বিমুখতা ও তার কারণ, কি ভাবে এই সমস্যা থেকে মুক্তি পাওয়া সম্ভব তা বিস্তারিত ভাবে আলোচিত হয়েছে। গ্রন্থাগার হলো জ্ঞানের ঘর এই জ্ঞানের ঘরকে অন্ধকার হতে দিলে চলবে না। তাই আমাদের বর্তমান পাঠকদের আরও বেশি পরিমানে বই পড়তে উৎসাহ প্রদান করতে হবে, যা দিতে পারবে একটা সুন্দর ভবিষ্যৎ।

শব্দ সূচক :

বৈদ্যুতিন গ্রন্থাগার, COVID-19, ই-বুক, ই-জার্নাল, ই-মাগ্যাজিন, 'বদ্ধ মঞ্চ', সূচীকরণ, লিটারেচার সার্চ, স্টাফ প্যাটার্ন, 'মুক্ত মঞ্চ', পাঠস্পৃহা, ওরিয়েন্টেশন প্রোগ্রাম।

প্রতিপাদ্য বিষয় :

ভূমিকা :

আমাদের জীবনধারা গঙ্গা-যমুনার মতোই দুই ধারায় প্রবাহিত। এক ধারার নাম আত্মরক্ষা বা স্বার্থপ্রতা, আরেক ধারার নাম আত্মপ্রকাশ বা পরমার্থ বৃদ্ধি। একদিকে যুদ্ধবিগ্রহ, মামলা-ফ্যাসাদ প্রভৃতি কদর্য দিক; অপরদিকে সাহিত্য, শিল্প, ধর্ম প্রভৃতি কল্যাণপ্রদ দিক। একদিকে শুধু কাজের জন্য কাজ। অপরদিকে আনন্দের জন্য কাজ। একদিকে সংগ্রহ, আরেক দিকে সৃষ্টি। যে জাতি দ্বিতীয় দিকটির প্রতি উদাসীন থাকে শুধু প্রথম দিকটির সাধনা করে, সে জাতি কখনও উঁচু জীবনের অধিকারী হতে পারে না। দ্বিতীয় কাজটি বেঁচে আছে বইয়ের মধ্যে। বই পড়াকে বাঁচিয়ে রাখে বই সম্ভার

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সূচিপত্র

গ্রন্থাগার বিজ্ঞানে প্রভাতকুমার মুখোপাধ্যায়ের অবদান ও আধুনিক গ্রন্থাগারে তার উপযোগিতা

হেদায়েত হোসেন

সারসংক্ষেপ :

বিশ্বভারতী বিশ্ববিদ্যালয়ের কেন্দ্রীয় গ্রন্থাগারের অন্যতম রূপকার তথা প্রথম জীবনীকার ও তথ্যবিজ্ঞানী হিসাবে প্রভাতকুমার মুখোপাধ্যায়ের নাম 'গ্রন্থাগার বিজ্ঞানে' বিশেষভাবে পরিচিত। তিনি ছিলেন বিশ্বভারতী বিশ্ববিদ্যালয়ের কেন্দ্রীয় গ্রন্থাগার প্রতিষ্ঠার পুরোধা। বিশ্বভারতীর জন্মলগ্ন থেকেই তিনি গ্রন্থাগারটিকে সুচারু পরিচালনা ছিলেন। এই উদ্দেশ্যে তিনি একটি নূতন বর্গীকরণ পদ্ধতি প্রচলন করেন এবং 'বাংলা গ্রন্থ বর্গীকরণ' নামে একটি গ্রন্থ প্রকাশ করেন। Melvil Dewey এর Decimal Classification (DDC) প্রকাশিত হওয়ার পর তিনি দেখলেন, DDC তে পাশ্চাত্য ভাষা বিষয়ে খুব বেশি দৃষ্টি আকর্ষণ করা হয়নি। তার ফলে পাশ্চাত্য ভাষার বই রাখার তেমন কোনো নির্দিষ্ট জায়গা পাওয়া যায় না। এই অসুবিধা দূর করার জন্য তিনি অক্লান্ত পরিশ্রম করে গ্রন্থাগারের বর্গতালিকায় প্রথম পরিবর্তন এনেছিলেন সেখানে দর্শন, ধর্ম, ভাষা, শিল্পকলা ও ইতিহাসের মধ্যে 'ভারতীয়তা'কে নিয়ে আসেন অর্থাৎ বাংলা গ্রন্থ বর্গীকরণে ভারতীয় বিষয়ের যোগ্য স্থান করে দেন। সেই জন্য তিনি হলেন গ্রন্থাগার বিজ্ঞানে 'বাংলা বর্গীকরণের' স্রষ্টা। আধুনিক কালের গ্রন্থাগারে তাঁর প্রচলিত বাংলা বর্গীকরণ পদ্ধতি এখনও অনেক গ্রন্থাগারে দেখা যায়।

শব্দ সূচক :

ডাক সংখ্যা, Dewey Decimal Classification (DDC), 'মুক্ত মঞ্চ' গ্রন্থাগার, গ্রন্থমঞ্চ, শঙ্কুনির্মাণ, Scheme of Classification (বর্গীকরণ পদ্ধতি), Call No, Recall Value.

প্রতিপাদ্য বিষয় :

ভূমিকা :

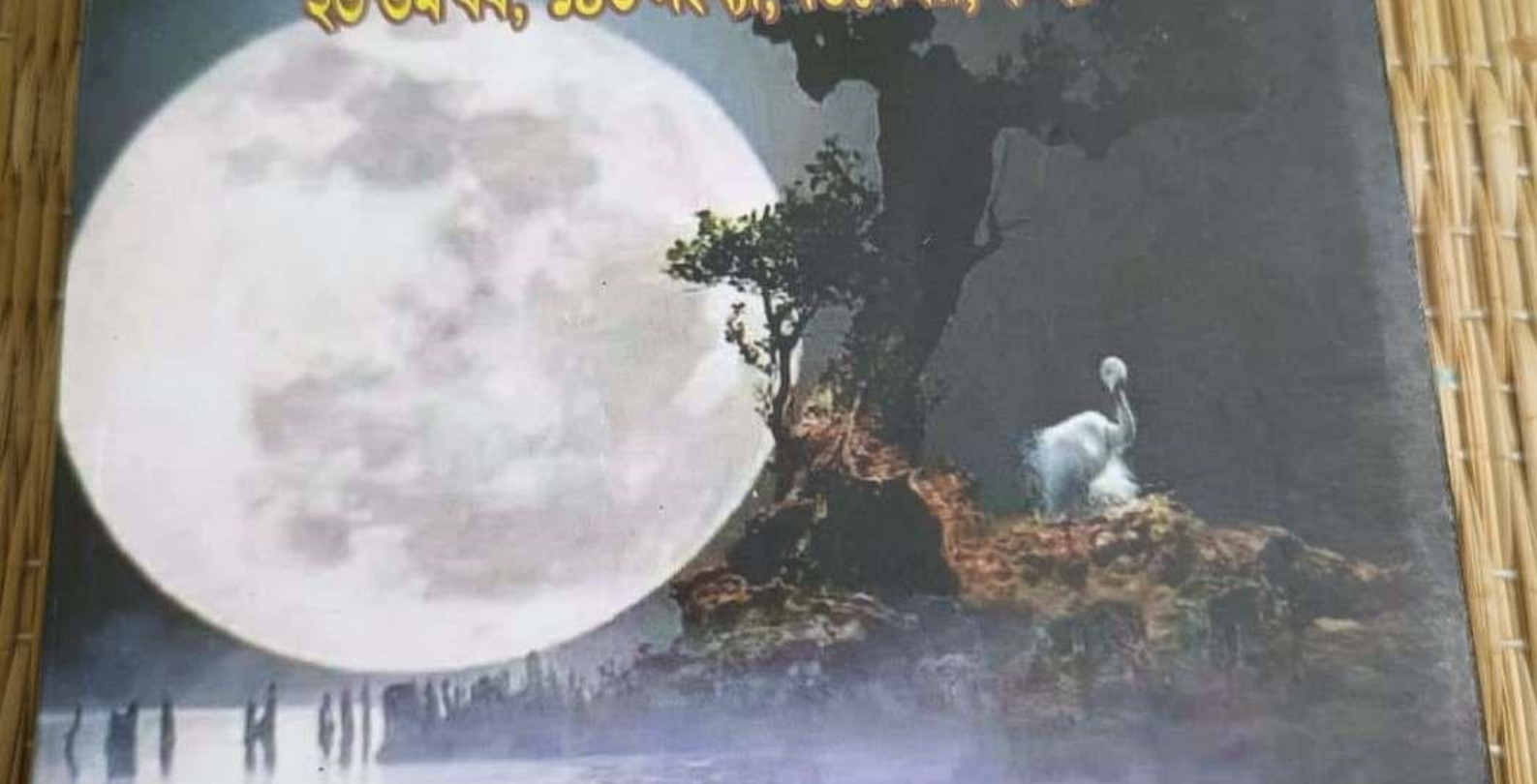
১৯০১ সালে রবীন্দ্রনাথ ঠাকুর শান্তিনিকেতনে ব্রহ্মচর্যাশ্রমের যে বীজ বপন

'এবং মহুয়া' - বিশ্ববিদ্যালয় মঞ্জুরী আয়োগ (UGC-CARE list-I 2021) অনুমোদিত তালিকা অন্তর্ভুক্ত। ২০২১সালে প্রকাশিত ১৩পৃ. তালিকার (৩১৯টির মধ্যে) ৩ পৃ.৬০নং উল্লেখিত।

এবং মহুয়া

(বাংলা ভাষা, সাহিত্য ও গবেষণাধর্মী মাসিক পত্রিকা)

২৩ তম বর্ষ, ১৪৩ সংখ্যা, ডিসেম্বর, ২০২১



সম্পাদক

ডা. মদনমোহন বেরা

কে.কে. প্রকাশন
গোলকুঁয়াচক, মেদিনীপুর, প.বঙ্গ।

'এবং মহুয়া'-বিশ্ববিদ্যালয় মঞ্জুরী আয়োগ(UGC-CARE list-I 2021)
অনুমোদিত তালিকার অন্তর্ভুক্ত।
২০২১সালে প্রকাশিত ১৬পৃ.তালিকার(৩১৯টির মধ্যে) ৩ পৃ.৬০নং উল্লেখিত।

এবং মহুয়া

(বাংলা ভাষা, সাহিত্য ও গবেষণাধর্মী মাসিক পত্রিকা)

২৩তম বর্ষ, ১৪৩ সংখ্যা
ডিসেম্বর,২০২১

সম্পাদক
ড. মদনমোহন বেরা

সহসম্পাদক
পায়েল দাস বেরা
মৌমিতা দত্ত বেরা

যোগাযোগ :
ড. মদনমোহন বেরা, সম্পাদক।
গোলকুঁয়াচক, পোষ্ট-মেদিনীপুর,৭২১১০১,জেলা-প.মেদিনীপুর, প.বঙ্গ।
মো.-৯১৫৩১৭৭৬৫৩

কে.কে. প্রকাশন
গোলকুঁয়াচক, মেদিনীপুর, পশ্চিমবঙ্গ।

(বিনিময় ৫৫০টাকা)

রবীন্দ্রনাথ ঠাকুরের গ্রন্থাগার ভাবনা ও গ্রন্থাগার জনক রঙ্গনাথনের 'গ্রন্থাগার পঞ্চনীতি': একটি পর্যালোচনা

হেদায়েত হোসেন

সারসংক্ষেপ :

বিশ্ব জ্ঞানভাণ্ডারে বরেণ্য ব্যক্তিগণ বিভিন্ন বিষয়ে তাঁদের প্রতিভার ছাপ রেখে গেছেন, রবীন্দ্রনাথ ঠাকুর হলেন এমনই একজন ব্যক্তিত্ব। গ্রন্থাগার বিষয়ে তাঁর মৌলিক ভাবনাচিন্তা ও অবদান তুলনাহীন। আধুনিককালে গ্রন্থাগারিকগণ তা প্রতি পদক্ষেপে অনুভব করেন। গ্রন্থাগার জনক ডঃ শিয়ালি রামামৃত রঙ্গনাথনের বহু পূর্বেই গ্রন্থগারের পরিচালনার নীতি, রীতি, ধ্যান-ধারণা কেমন হবে তার সমূহ বিবরণ দিয়ে গেছেন। সেই সঙ্গে গ্রন্থাগারিকের ভুমিকা কেমন হবে তার একটি রূপরেখা দিয়ে গেছেন। তাঁর কিছু কিছু রচনার মধ্যে গ্রন্থ ও গ্রন্থাগার ভাবনা যেভাবে দেখতে পাই, তাতে নিঃসন্দেহে বলা যায় রবীন্দ্রনাথ ছিলেন ভারতবর্ষের প্রথম গ্রন্থাগার আন্দোলনের প্রবর্তক এবং পথপ্রদর্শক।

শব্দ সূচক :

গ্রন্থবিজ্ঞান, লাইব্রেরি, গ্রন্থগার পঞ্চনীতি, গ্রন্থাগারিক, পাঠক মণ্ডলী, দিল্লি লাইব্রেরি অ্যাসোসিয়েশন।

প্রতিপাদ্য বিষয় :

ভূমিকা :

কবি সাহিত্যিকসহ বহু মনীষী গ্রন্থাগার বিষয়ে প্রভূত অবদান রেখে গেছেন। বিশ্বের যে সমস্ত মনীষী প্রাণবন্ত বক্তব্য রেখে গেছেন রবীন্দ্রনাথ ঠাকুর এবং ভারতের গ্রন্থাগারবিজ্ঞানের জনক ডঃ শিয়ালি রামামৃত রঙ্গনাথন তাঁদের মধ্যে অন্যতম। তাঁদের অবদান গ্রন্থগার বিজ্ঞানে আজও সমানভাবে প্রাসঙ্গিক এবং তাঁদের অবদান আধুনিককালের সমস্ত গ্রন্থ ও গ্রন্থাগারপ্রেমীদের সবিশেষ প্রভাবিত করে।

সাহিত্য-সংস্কৃতি, চিন্তা-ভাবনা, শিল্প-সঙ্গীত, দেশ ও কালের সকল দিকেই সর্বদর্শী রবীন্দ্রনাথ ঠাকুর তাঁর প্রতিভার ছাপ রেখে গেছেন। অতএব তাঁর সচেতন মনে যে গ্রন্থ ও গ্রন্থাগার বিষয়ে কিছু মূল্যবান ভাবনার উদয় হবে সেটা খুবই স্বাভাবিক। তাঁর রচিত দুটি কবিতা 'কীটের বিচার' (কণিকা, ১৩০৬; পৃষ্ঠা ১৭) ও 'যথাস্থান' (ক্ষণিকা, ১৩৫৯; পৃষ্ঠা ২৩) এবং আরও দুটি সম্পূর্ণ রচনা— 'লাইব্রেরি' ও 'লাইব্রেরির মুখ্য কর্তব্য' থেকে

plant biology

RESEARCH PAPER

Exogenous melatonin-mediated regulation of K^+/Na^+ transport, H^+-ATPase activity and enzymatic antioxidative defence operate through endogenous hydrogen sulphide signalling in NaCl-stressed tomato seedling roots

M. H. Siddiqui, M. N. Khan, S. Mukherjee, R. A. Basahi, S. Alamri, A. A. Al-Amri, Q. D. Alsubaie, H. M. Ali, B. M. A. Al-Munqedhi, I. A. A. Almohisen

First published: 15 July 2021 | https://doi.org/10.1111/plb.13296 | Citations: 25

Abstract

- Melatonin (Mel) and hydrogen sulphide (H_2S) have emerged as potential regulators of plant metabolism during abiotic stress. Presence of excess NaCl in the soil is one of the main causes of reduced crop productivity worldwide. The present investigation examines the role of exogenous Mel and endogenous H_2S in tomato seedlings grown

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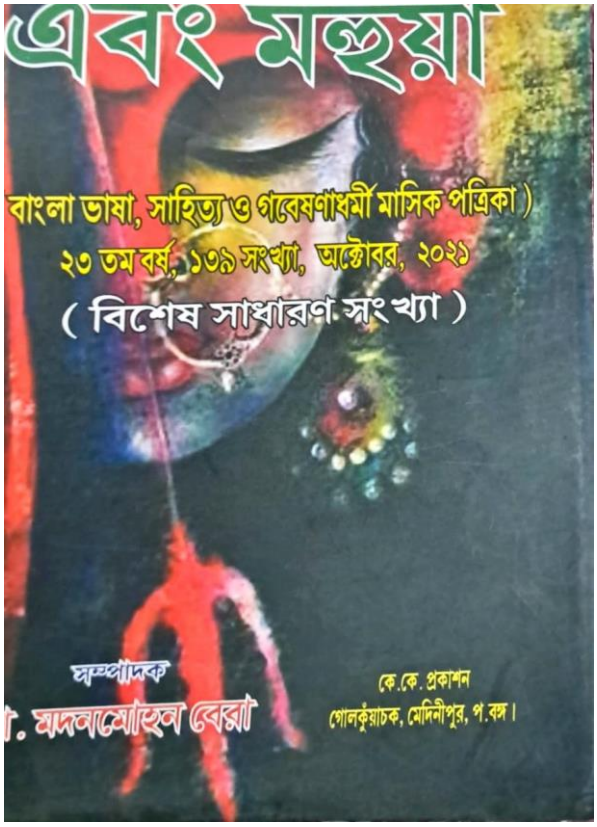

U.G.C.- CARE List-I 2021 approved journal, Indian Language-Arts and Humanities Group, out of 16 pages placed in Page 3 & No.60 out of 319

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ঔপনিবেশিক মালদার শিকার : একটি পর্যালোচনা

ড. বিশ্বজিৎ দাস

প্রারম্ভিক্ষেপ :

বর্তমান ইতিহাস চর্চার অন্যতম একটি জনপ্রিয় ধারা হল স্থানীয় ইতিহাস চর্চা। ফলে এই চর্চার ক্ষেত্রে জেলা মালদার ইতিহাস অন্বেষণ গুরুত্বপূর্ণ। অন্যান্য জেলার মতো এ জেলারও ইতিহাস আলোচনার দিক অনেক যা উৎসাহী, দক্ষ গবেষক-লেখকদের দ্বারা চর্চিত হচ্ছে। যদিও এই চর্চায় সামাজিক, অর্থনৈতিক, রাজনৈতিক ও সংস্কৃতির বিভিন্ন দিক স্থান পেলেও পৃথকভাবে এ জেলার শিকারের ইতিহাস নিয়ে আলোচনা বিশেষ নজরে আসেনি। সে কারণে এই বিষয়ের অবতারণা। বর্তমান প্রবন্ধে প্রাপ্ত তথ্যের ওপর নির্ভর করে স্বাধীনতা পূর্বকালে অবিভক্ত মালদা জেলার শিকারের বিভিন্ন দিক নিয়ে আলোচনা করা হলেও শিকারিরা কি পদ্ধতিতে শিকার করতেন-তার পুঙ্খানুপুঙ্খ বিবরণ তুলে ধরা এর বিষয়বস্তু নয় বরং শিকার নামক এই খেলায় দেশীয় উচ্চবর্গের শিকারিদের স্থান তাদের ঔপনিবেশিক প্রভুদের অপেক্ষা কী ছিল তা যেমন জানার প্রয়াস করা হয়েছে তেমনি উচ্চবর্গ, নিম্নবর্গ, বিদেশি ও বহিরাগত- সকল শিকারিদের দ্বারা বিভিন্ন বন্য পশু-পাখি ও সরীসৃপ শিকারের কারণ এবং প্রভাব জেলায় কী ছিল সেগুলোও অন্বেষণ করার প্রয়াস করা হয়েছে।

সূচকশব্দ :

খেলা, ঔপনিবেশিক, শিকার, শিকারি, মালদা, জমিদার, জে. জে. পেস্টারটন, এম. ও. কার্টার, গৌড়দূত, পশু, দেশীয়।

প্রতিপাদ্য বিষয় :

শিকার বহু প্রাচীন কাল থেকে ভারতে প্রচলিত ছিল। দেশীয় রাজন্যবর্গ তাদের রাজত্বের বিভিন্ন সময়ে শিকারে মত্ত হতো চিত্ত বিনোদনের উদ্দেশ্যে। সেই দিক দিয়ে এটি ভারতীয় উচ্চবর্গের কাছে একটি ঐতিহ্যে পরিণত হয়েছিল এবং এই চিরাচরিত ঐতিহ্য প্রবহমান ছিল ঔপনিবেশিক কালেও নিজেদের অস্তিত্ব রক্ষাকারি কিছু দেশীয় রাজন্যবর্গের মধ্যে। তবে শুধু দেশীয় রাজন্যবর্গ বললে ভুল হবে কারণ তাদের পাশাপাশি ছিল ধনী জমিদার শ্রেণির মানুষেরা। উল্লেখ করা প্রয়োজন এই পর্বে শিকার কেবলমাত্র ভারতীয় ঐতিহ্য নয়, ছিল একটি ঔপনিবেশিক খেলা যার একটি নির্দিষ্ট নিয়ম ছিল, ছিল পোষাকও। ঔপনিবেশিক শাসকেরা নিজ দেশে এটিকে খেলা হিসেবে

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D_a-HOMOTHETIC DEFORMATION AND RICCI SOLITIONS IN THREE DIMENSIONAL QUASI-SASAKIAN MANIFOLDS

Tarak Mandal

DOI Number
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First page
547
Last page
555

Abstract

In the present paper, we have studied curvature tensors of a quasi-Sasakian manifold with respect to the D_a-homothetic deformation. We have deduced the Ricci solition in quasi-Sasakian manifold with respect to the D_a-homothetic deformation. We have also proved that the quasi-Sasakian manifold is not $\bar{\xi}$-projectively flat under D_a-homothetic deformation. Also we give an example to prove the existance of quasi-Sasakian manifold.

Keywords

Quasi-Sasakian manifold, D_a-homothetic deformation, Ricci soliton, Weyl projective curvature tensor.

Full Text:

PDF

References

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Details of Publication in Journals for the year 2020

Some curves on three-dimensional α-para-Kenmotsu manifolds

Ashis Mondal

Abstract. In the present paper, we study magnetic biharmonic and biminimal curves on a three-dimensional α-para-Kenmotsu manifold. We obtain necessary and sufficient conditions for biharmonicity and biminimality of a non-null magnetic curve. Also we study the mean curvature vector of a Legendre curve satisfying some recurrent conditions on a three-dimensional α-para-Kenmotsu manifold.

M.S.C. 2010: 53C15, 53C25, 53C50.
Key words: Slant curves; Legendre curves; magnetic curves; biharmonic magnetic curves; α-para-Kenmotsu manifold.

1 Introduction

The trajectories of charged particles moving on a Riemannian manifold (M, g) under the action of a magnetic field F is known as magnetic curves. In three dimensional oriented Riemannian manifold (M^3, g), a divergence free vector field defined as a magnetic field. A closed 2-form F on M is called the magnetic field. The Lorentz force of a magnetic field F on (M, g) is a (1,1) tensor field Φ is defined by

$$g(\Phi(X), Y) = F(X, Y), \tag{1.1}$$

for any X, Y in $\chi(M)$.
A regular curve γ will be magnetic curve with F, if it satisfies the Lorentz equation (also known as Newton's equation)

$$\nabla_{\dot\gamma}\dot\gamma = \Phi(\dot\gamma), \tag{1.2}$$

where ∇ is the Levi-Civita connection on g. When Lorentz forces vanishes, we have $\nabla_{\dot\gamma}\dot\gamma = 0$. If $\nabla F = 0$, then a ma magnetic field is known as uniform. The magnetic curves are of constant speed. Specially, unit speed curves are called normal magnetic curves [10].
Let (M, g) and (N, h) be two (pseudo-)Riemannian manifolds and $\Psi : (M, g) \to (N, h)$ a smooth map. The energy functional of Ψ is defined by $E(\Psi) = \frac{1}{2}\int_M |d\Psi|^2 v_g$. Critical points of the energy functional are called harmonic maps and the Euler-Lagrange

Differential Geometry - Dynamical Systems, Vol.22, 2020, pp. 171-182.

Current Botany 2020, 11: 159-170
doi: 10.25081/cb.2020.v11.6382
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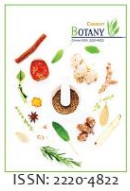
Research Article



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Comparison of phytoplankton community structure in two tropical estuaries of East Coast of India

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ABSTRACT

Dissolved nutrients concentrations in estuarine waters play important role in shaping phytoplankton community of two Indian river estuaries. The first study site was Saptamukhi river estuary which is a part of Hooghly-Matla estuarine system is located in the Indian Sundarban and second study site was Mahanadi estuary located in Orissa coast (adjacent to industrial and coastal fishing zone). The Saptamukhi estuary received less anthropogenic waste compared to Mahanadi estuary and the main source of nutrient is autochthonous due to huge litter from surrounding mangrove forest. Mahanadi estuarine water received nutrients from industrial effluent and fishing waste. The Saptamukhi estuarine water had less dissolved inorganic phosphorus concentration but huge dissolved inorganic nitrogen concentration. High dissolved silicate concentration might encourage the diatom growth over other phytoplankton group here. In Mahanadi estuarine water, high amount of dissolved inorganic phosphate coming from the phosphate industries supported the growth of Cyanophyceae, Chlorophyceae and Dinophyceae. Chlorophycean genus *Pediastrum* bloom observed in the post-monsoon during this study. In Saptamukhi Estuarine water, in spite of high phytoplankton population in post-monsoon season no individual species reached bloom condition during the study period. In both the estuarine water Gross Primary Productivity was high but the community respiration was higher. Monsoonal runoff from land considerably changed the community in both estuarine water. Dissolve inorganic nitrogen and dissolved inorganic phosphate ratio played major role for the community change of phytoplankton in two estuarine waters.

KEYWORDS: Phytoplankton; diatom; estuary; nutrients

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INTRODUCTION

Phytoplankton, can be categorized as prokaryotic cyanobacteria and eukaroytic algal groups, is responsible for primary production, supporting food webs and play a central role in essential elements, nutrient, and oxygen cycling in estuaries. They respond to changes in different environmental conditions [1,2]. Eutrophication or change in transparency of water column [3,4] alter the structural characteristics of phytoplankton communities (i.e., diversity, richness, and dominant species groups) in estuaries and coastal waters. Changes in essential nutrients concentrations like nitrogen, phosphorus, silicate etc and the ratio of these nutrients have great impacts on controlling phytoplankton species diversity [5, 6]. In tropical estuaries like Mandovi-Zuari, [7] and Cochin estuary [8] nitrogen limits primary productivity. High anthropogenic Phosphorus inputs may also shift ecosystem to N limited [9]. Study of phytoplankton community and controlling factors responsible for changes in community can give the researchers a clue about larger-scale, long-term changes in ecosystem function, including shifts in nutrient cycles, food webs, and fisheries [10]. Apart from elementary Carbon, Nitrogen and Phosphorus are two very important elements for algal growth. Phytoplankton growth flourishes when ratio of nutrients in the ambient water is C: N: P = 166:20:1 [11]. According to the modified Redfield ratio, the optimum dissolved nitrogen and dissolved phosphorus ratio is 20 for phytoplankton but alteration is quite common in this ratio throughout the world oceans and other aquatic bodies due to changes in atmospheric deposition, fertilizer use, waste waters discharge and reduced or increased rate of biologically controlled addition or removal of the nutrients [9]. In-spite of altered redfield ratio many of the phytoplankton species are adapted to that water and form a compact community [12]. But the species composition of community can shift greatly from place to place or time to time in a same place in response to that change [13, 14, 15, 16, 17, 18]. So dissolved inorganic nitrogen and dissolved inorganic phosphate ratio in the water is expected to play a crucial role in phytoplankton growth and community composition. Change in dissolved inorganic nitrogen concentration led to shift of phytoplankton community from one chain forming diatom species to another in the Harima-Nada,

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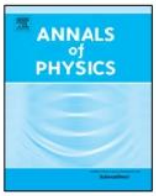

Probing early universe with a generalized action

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ABSTRACT

Possibly, the most general action in the background of isotropic and homogeneous space–time has been considered to study the quantum evolution of the early universe, apart from a cosmological constant. The hermiticity of the effective Hamiltonian operator in the presence of curvature squared terms suggests unitary time evolution of the quantum states, assuring conservation of probability. The oscillatory behaviour of the semi-classical wavefunction around a de-Sitter solution signals that the theory is classically allowed, and the universe enters an inflationary regime just after Planck's era. In view of a hierarchy of Hubble flow parameters, and using a redefined effective potential, the complicated classical field equations in the presence of several coupling parameters, reduce to standard general-relativistic equations with a single scalar field. As a result, inflation has been studied without considering any additional flow parameters. Inflationary parameters lie very much within the presently available Planck's data, and the model admits graceful exit from inflation.

1. Introduction

In quantum mechanics, 'unitarity' is a restriction on the allowed evolution of quantum systems that ensures the sum of probabilities of all possible outcomes of an event is always normalized

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Early Universe in view of a modified theory of gravity

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Abstract

We study the quantum evolution of the early Universe, its semi-classical analogue together with inflationary regime, in view of a generalized modified theory of gravity. The action is built by supplementing the non-minimally coupled scalar–tensor theory of gravity with scalar curvature squared term and a Gauss–Bonnet-dilatonic coupled term. It is generalized, since all the parameters are treated as arbitrary functions of the scalar field. It is interesting to explore the fact that instead of considering additional flow parameters, an effective potential serves the purpose of finding inflationary parameters. The dilaton stabilization issue appears here as a problem with reheating. Addition of a cosmological constant term alleviates the problem, and inflation is effectively driven by the vacuum energy density. Thus Gauss–Bonnet term might play a significant role in describing late-time cosmic evolution.

Keywords: generalized action, early Universe, canonical quantization, inflation

(Some figures may appear in colour only in the online journal)

1. Introduction

It is well known fact that the 'standard model of cosmology' based on general theory of relativity (GTR) explains a long evolution history of the Universe, right from the structure formation, and the formation of CMBR (at a redshift $z \approx 3200$) up to the recent decelerated matter dominated era (at a redshift $z \approx 1$), once the seed of perturbations is assumed to exist. Nevertheless, it has already been established that gauge-invariant divergences make GTR non-renormalizable, and also that it can not quite accommodate observations in connection Sn1a

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COVID-19 AND DIGITAL RIGHTS: VIOLATIONS IN TIMES OF TRIAL

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ABSTRACT

The famous Italian Philosopher Giorgio Agamben had spoken about the state of exception. The Covid-19 pandemic is such an extraordinary event, a health pandemic of exponential proportion that has weakened democracies across the world and governments in many countries have faced allegations of massive human rights violations. This paper focuses on digital rights violations and how governments and media giants are clamping down dissent in the virtual world in the name of containing the virus. Free exchange of information has become a luxury as governments across the nations throttle digital freedom of its citizens. They are not deterred even in the face of widespread protests as they face legitimacy deficit. The paper defines digital rights in the Information Age when digital space and cyber-security are common parlance. Cases of arbitrary arrests, surveillance, phone tapping, privacy breaches and other digital rights violations are rampant as governments impose emergency legislation and internet shutdowns to curb political dissent. What does it say about the ubiquity of territorial sovereignty of nation-states in post-pandemic world order? Can the violations of digital rights jeopardize democracies in the long run? Will such societal shocks provoke positive ways to reconsider common good and human rights? Is there any reason to remain

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ORIGINAL ARTICLE

Evaluation of the growth response of spore forming lactic acid *Bacillus–Bacillus coagulans* in presence of oxide nanoparticles

Nabanita Mukherjee[1] · Sutanuka Mitra[1] · Serene Adak[1] · Shinja Chakraborty[1] · Anurag Sau[1] · Arunava Goswami[1]

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Abstract
It is important to develop fundamental understanding on the utilization of inorganic nanoparticles (NPs) in health and environment as their use in the agricultural food sector, medical applications, cosmetics, paints are growing rapidly. Agricultural food sector is one of the major fields where these particles of less than 100 nm diameter are applied. This sector uses this revolutionary technology for increased growth of crop; thus, its effect on human body not only need to be studied, but also its effect on human beneficial gut flora that are in symbiosis relationship with human kind needs attention. Here, experiments were conducted on one of the dominant beneficial human gut bacteria (spore-forming lactic acid *Bacillus*, *Bacillus coagulans*) in presence of both titanium dioxide (TiO_2) anatase nanoparticles (as this nanomaterial used mostly in plants among metal-based nanomaterials) and zinc oxide (ZnO) NPs (as this nanomaterial used mostly in drugs as antimicrobial agent to destroy harmful bacteria, nowadays also used as antiviral agent). ZnO NPs show toxicity at and above 1 mg/L, whereas bacteria show more growth than control in presence of TiO_2 anatase NP at 1 mg/L in absence of light. TEM and SEM images and results of enzyme assay revealed that NPs do not aggregate, they act on bacteria, but bacterial cell wall integrity behave differently in presence of different NPs with high level of control on regulation of energy; hence, nanoparticle interaction mechanism with bacteria is studied thoroughly.

Keywords *Bacillus coagulans* · Gut bacteria · Nanoparticles · Surface interaction · Cell wall integrity · Kinase activity · ATP production

Introduction

With the advent of technology, engineered nanomaterials with diameters < 100 nm found in different areas like medical imaging, disease diagnoses, drug delivery, gene therapy, agri-food sector and others. Along with rapid emergence of nanotechnology and increasing use of nanoparticles, our society now demands detailed information on potential health and environmental effects of most new technologies. The stability and safety of various nanoparticles are (Chen and Schluesener 2008) tested on live cells before use in cosmetics, treatment and medical therapy (Mah et al. 2000; Pantarotto et al. 2003; Weissleder et al. 1990; Souto and Müller 2008). This work intends to study the effect of nanoparticles (particularly those which are used in agri-food sector) on probiotic organism that is in symbiosis with human kind.

Human gut is the natural habitat of huge number of microbial species. Only intestine of an individual is the habitats of 300–500 different species of bacteria among which 10^{11} or 10^{12} bacterial cells/g of intestinal luminal contents form a complex and dynamic ecosystem in large intestine (Simon and Gorbach 1984; Borriello 1986). Besides digestion and absorption, it produces huge numbers of antibody than any other parts of the body (Helgeland and Brandtzaeg 2000) and its inhabitable microbial activity has major impact upon development and functioning of intestinal immune system. Thus, a balanced microbial ecosystem has a key role for correct development of individuals' immune system. Various diseases are associated with disturbances in the intestinal ecosystem (Bjorksten et al. 1999; Kalliomäki et al. 2001;

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Soumya Mukherjee

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Silicon-induced postponement of leaf senescence is accompanied by modulation of antioxidative defense and ion homeostasis in mustard (*Brassica juncea*) seedlings exposed to salinity and drought stress

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Premature leaf senescence
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ABSTRACT

Soil salinity and drought stress (DS) are the massive problem for worldwide agriculture. Both stresses together become more toxic to the plant growth and development. Silicon (Si) being the second most abundant element in the earth's crust, exerts beneficial effects on plants under both stress and non-stress conditions. However, limited information is available to substantiate the beneficial role of Si in delaying the premature leaf senescence and imparting tolerance of mustard (*Brassica juncea* L.) plants to salinity and DS. Therefore, the present study aimed to explore the role of Si (source K_2SiO_3) in chlorophyll (Chl) biosynthesis, nutrients uptake, relative water content (RWC), proline (Pro) metabolism, antioxidant system and delaying of premature leaf senescence in mustard plants under sodium chloride (NaCl) and DS conditions. Results of this study show that exogenous Si (1.7 mM) significantly delayed the salt plus DS-induced premature leaf senescence. This was further accompanied by the enhanced nutrients accumulation and activity of chlorophyll metabolizing enzymes [δ-amino-levulinic acid (δ-ALA) dehydratase and porphobilinogen deaminase] and levels of δ-ALA, and Chls *a* and *b* and also by decreased the Chl degradation and Chl degrading enzymes (Chlorophyllase, Chl-degrading peroxidase, pheophytinase) activity. Exogenous Si treatment induced redox homoeostasis in *B. juncea* L. plants, which is evident by a reduced generation of reactive oxygen species (ROS) resulting due to suppressed activity of their generating enzymes (glycolate oxidase and NADPH oxidase) and enhanced defence system. Furthermore, application of Si inhibited the activity of protease and triggered the activity of antioxidant enzymes (superoxide dismutase, catalase, ascorbate peroxidase and glutathione reductase) and plasma membrane H^+-ATPase activity. In conclusion, all these results reveal that Si could help in the modulation of Chl metabolism, redox hemostasis, and the regulation of nutrients (nitrogen, phosphorus, Si and potassium) uptake in the mustard plants that lead to the postponement of premature leaf senescence under salinity plus DS.

1. Introduction

Worldwide, both soil salinity and drought stress (DS) are enormous 50% of all irrigated area, which delivers about 33% of the world's food (Rengasamy, 2010; Coskun et al., 2016). Globally, also DS causes more than 50% loss of an average yield of agricultural crops (Zlatev and F.C.

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Research article

Crosstalk among hydrogen sulfide (H_2S), nitric oxide (NO) and carbon monoxide (CO) in root-system development and its rhizosphere interactions: A gaseous interactome

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Abiotic stress
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ABSTRACT

Root development in higher plants is achieved by a precise intercellular communication which determines cell fate in the primary embryonic meristem where the gasotransmitters H_2S, NO and CO participate dynamically. Furthermore, the rhizosphere interaction of these molecules with microbial and soil metabolism also affects root development. NO regulates root growth and architecture in association with several other biomolecules like auxin indole-3-acetic acid (IAA), ethylene, jasmonic acid (JA), strigolactones, alkamides and melatonin. The CO-mediated signal transduction pathway in roots is closely linked to the NO-mediated signal cascades. Interestingly, H_2S acts also as an upstream component in IAA and NO-mediated crosstalk during root development. Heme oxygenase (HO) 1 generates CO and functions as a downstream component in H_2S-mediated adventitious rooting and H_2S–CO crosstalk. Likewise, reactive oxygen species (ROS), H_2S and NO crosstalk are important components in the regulation of root architecture. Deciphering these interactions will be a potential biotechnological tool which could provide benefits in crop management in soils, especially under adverse environmental conditions. This review aims to provide a comprehensive update of the complex networks of these gasotransmitters during the development of roots.

1. Overview of the root development

The development of the root system is essential for the proper plant growth since allowing the uptake of water and the mineral nutrients (Villordon et al., 2014). Root development in higher plants is achieved by a precise intercellular communication which determines cell fate in the primary embryonic meristem. The innermost layer of root meristem differentiates to produce endodermis and the surrounding layers divide subsequently to produce cortex and epidermis. The quiescent center present at the basal part of ground meristem is a hub of potential stem cells which later differentiate into different root layers (Motte et al., 2019).

Plasmodesmata connections reveal that differentiating root cells are mostly connected to their own tissue layer. The molecular signaling events help in exerting asymmetric cell division thus resulting in zonal differentiation of roots. SHORTROOT (SHR) and SCARECROW (SCR) effectively function in the differentiation of cortex and endodermis respectively (Benfey et al., 1993; Scheres et al., 1995). Arabidopsis mutants with defects in the BYPASS1 (*BPS1*) gene reveal important regulation of root development mediated by auxin (Van Norman et al., 2004) but independent of ABA and strigolactone signals (Van Norman and Sieburth, 2007). Ethylene has been suggested to play an important role in the differentiation of epidermal cells. Local and systemic signaling mechanisms support the adaptive root development in response to nutrient starvation and other abiotic stresses (Rouached et al., 2010; Williams and Miller, 2001; Yang and Finnegan, 2010; García et al., 2018; Oldroyd and Leyser, 2020).

In the mechanism of local and systemic response, the ARABIDOPSIS NITRATE REGULATED 1 (ANR 1) functions as an important MADS box transcription factor which coordinates, with auxin and soil nitrate levels, the lateral root development (Gutierrez et al., 2009; Williams and Miller, 2001; Asim et al., 2020). In a similar mechanism, phosphate starvation regulates the expression of PHOSPHATE DEFICIENCY RESPONSE 2 (*PDR2*) which in turn regulates auxin-mediated signaling

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Calcium-hydrogen sulfide crosstalk during K^+-deficient NaCl stress operates through regulation of Na^+/H^+ antiport and antioxidative defense system in mung bean roots

M. Nasir Khan [a], Manzer H. Siddiqui [b], Soumya Mukherjee [c], Saud Alamri [b], Abdullah A. Al-Amri [b], Qasi D. Alsubaie [b], Bander M.A. Al-Mungedhi [b], Hayssam M. Ali [b]

Show more

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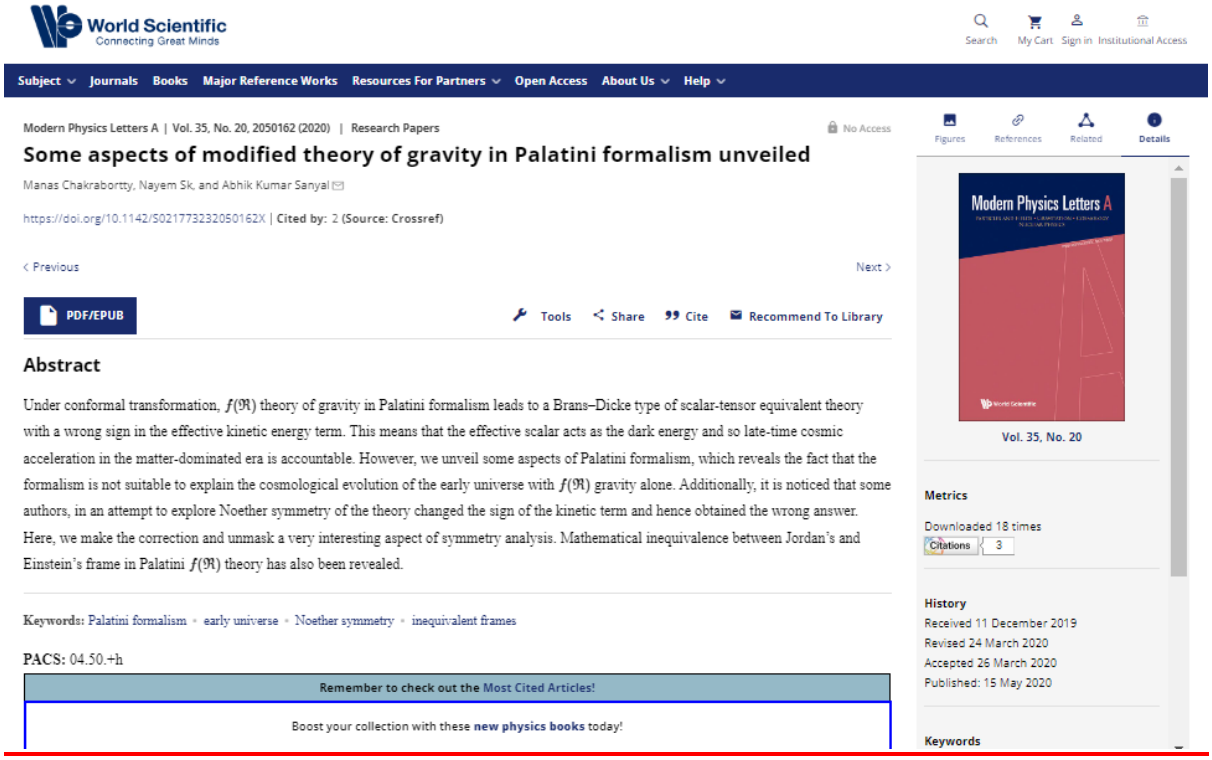
Highlights

- Short term NaCl-induced potassium (K^+) deficiency regulates NaCl-induced impairments.
- Under long term NaCl stress, further decline in K^+ content was deleterious.
- Calcium (Ca^{2+}) regulates Na^+/H^+ antiport and defense system under NaCl stress.
- Ca^{2+}-dependent regulation of plant response to NaCl stress is mediated by hydrogen sulfide (H_2S).
- H_2S functions downstream of Ca^{2+} during plant adaptive responses to NaCl stress.

Documentation of Faculty Publications

Year 2019-2020

Abhik Kumar Sanyal



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Some aspects of modified theory of gravity in Palatini formalism unveiled

Manas Chakrabortty, Nayem Sk, and Abhik Kumar Sanyal

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Abstract

Under conformal transformation, $f(\mathfrak{R})$ theory of gravity in Palatini formalism leads to a Brans–Dicke type of scalar-tensor equivalent theory with a wrong sign in the effective kinetic energy term. This means that the effective scalar acts as the dark energy and so late-time cosmic acceleration in the matter-dominated era is accountable. However, we unveil some aspects of Palatini formalism, which reveals the fact that the formalism is not suitable to explain the cosmological evolution of the early universe with $f(\mathfrak{R})$ gravity alone. Additionally, it is noticed that some authors, in an attempt to explore Noether symmetry of the theory changed the sign of the kinetic term and hence obtained the wrong answer. Here, we make the correction and unmask a very interesting aspect of symmetry analysis. Mathematical inequivalence between Jordan's and Einstein's frame in Palatini $f(\mathfrak{R})$ theory has also been revealed.

Keywords: Palatini formalism • early universe • Noether symmetry • inequivalent frames

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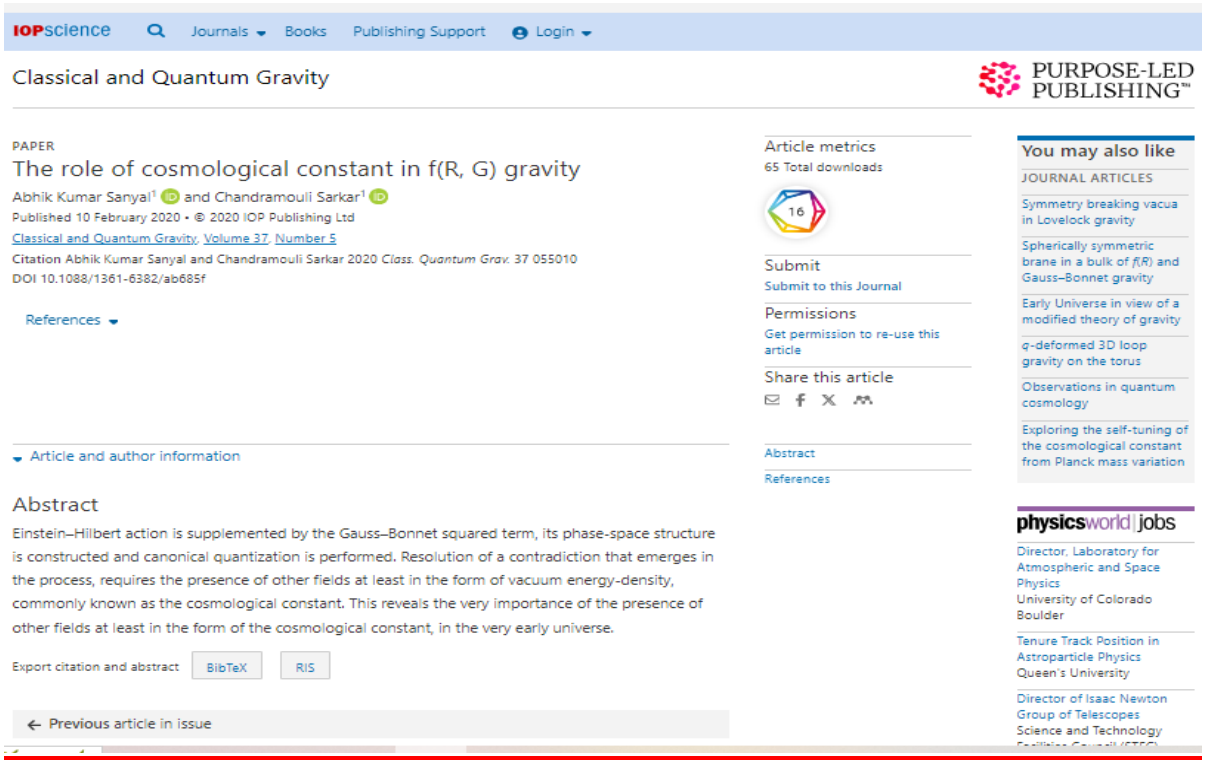

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Classical and Quantum Gravity

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PAPER

The role of cosmological constant in f(R, G) gravity

Abhik Kumar Sanyal[1] and Chandramouli Sarkar[1]

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Abstract

Einstein–Hilbert action is supplemented by the Gauss–Bonnet squared term, its phase-space structure is constructed and canonical quantization is performed. Resolution of a contradiction that emerges in the process, requires the presence of other fields at least in the form of vacuum energy-density, commonly known as the cosmological constant. This reveals the very importance of the presence of other fields at least in the form of the cosmological constant, in the very early universe.

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LEGENDRE CURVES ON 3-DIMENSIONAL f-KENMOTSU MANIFOLDS ADMITTING SCHOUTEN-VAN KAMPEN CONNECTION

Ashis Mondal

Abstract. In the present paper, biharmonic Legendre curves with respect to Schouten-Van Kampen connection have been studied on three-dimensional f-Kenmotsu manifolds. Locally ϕ-symmetric Legendre curves on three-dimensional f-Kenmotsu manifolds with respect to Schouten-Van Kampen Connection have been introduced. Also, slant curves have been studied on three-dimensional f-Kenmotsu manifolds with respect to Schouten-Van Kampen connection. Finally, we have constructed an example of a Legendre curve in a 3-dimensional f-Kenmotsu manifold.

Keywords: Legendre curves; f-Kenmotsu manifold; Locally ϕ-symmetric Legendre curves; Schouten-Van Kampen connection; Slant curve.

1. Introduction

In the study of contact manifolds, Legendre curves play an important role, e.g., a diffeomorphism of a contact manifold is a contact transformation if and only if it maps Legendre curves to Legendre curves. Legendre curves on contact manifolds have been studied by C. Baikoussis and D. E. Blair in the paper [2]. Originally, the notion of Legendre curve was defined for curves in a contact three-manifolds with the help of a contact form. This notion of Legendre curves can be also extended to almost contact manifolds [22]. Curves satisfying the properties of Legendre curves in almost contact metric manifolds are known as almost contact curves [5]. In [16], A. Sarkar, S. K. Hui and M. Sen have studied Legendre curves on three dimensional trans-Saskian manifold. J. Welyzcko [22], studied Legendre curves on a three-dimensional trans-Sasakian manifolds with respect to Levi-Civita connections. In [5], the authors have introduced a 1-parameter family of linear connections on three-dimensional almost contact metric manifolds to study biharmonic curves on almost contact manifolds. The author has studied some curves on three-dimensional

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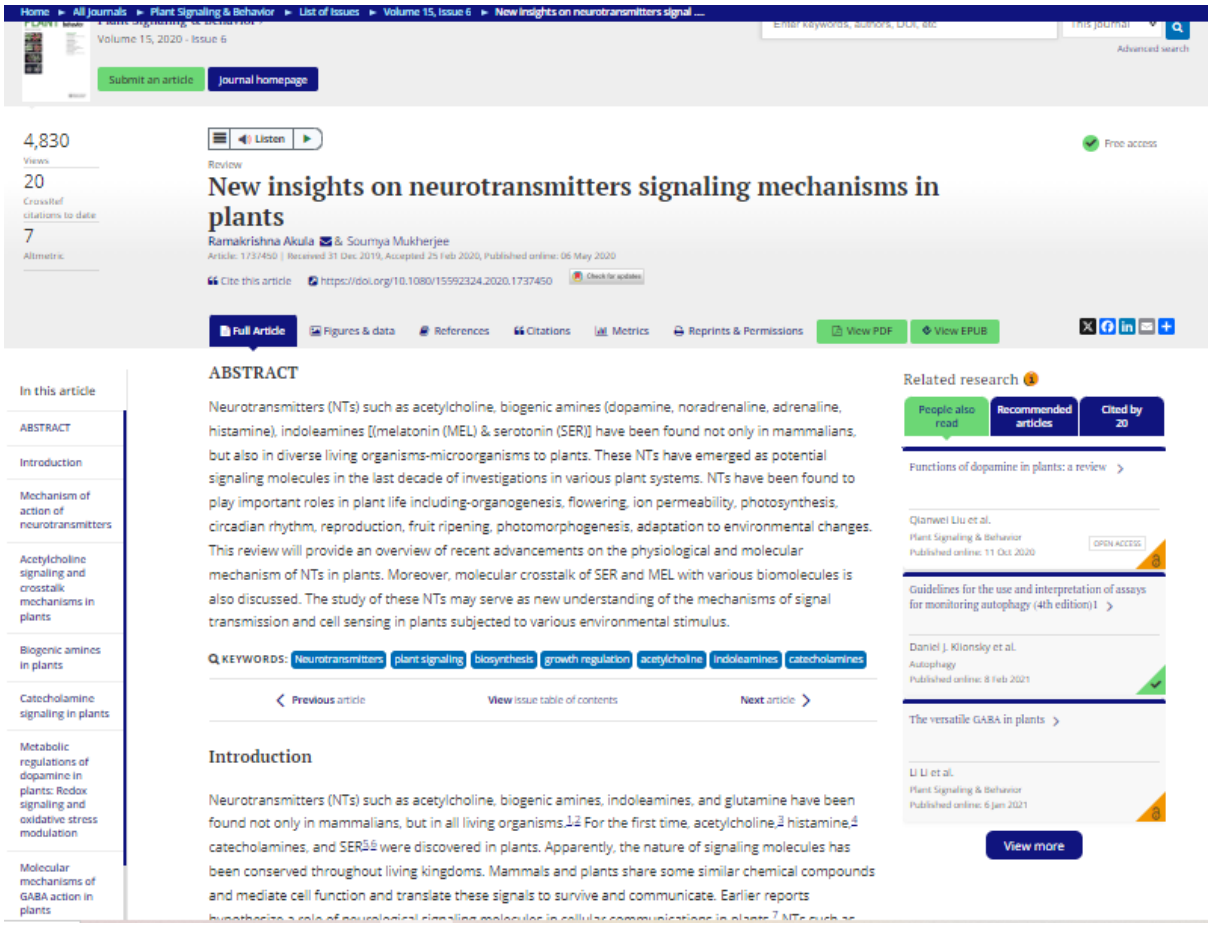

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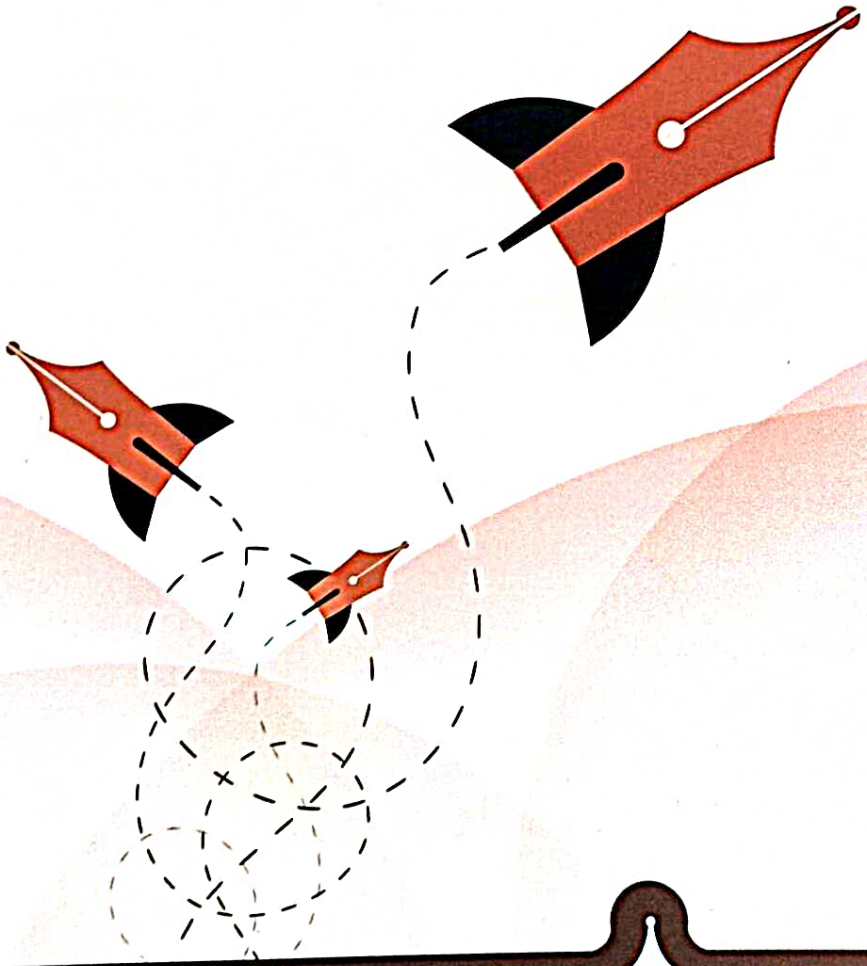

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SHATTERED HOMELANDS : DIASPORA, PARTITION, AND THE QUEST FOR BELONGING

Tarun Mandal*

ABSTRACT

The research and attention paid to diasporas has grown in recent years. Despite the diversity and breadth of diasporic communities' pursuits, "the diaspora" remains a focal point for academics, social movements, and national governments interested in transnational practices, especially as they pertain to the movement of global capital and cultural and political ideologies. How may the experiences of diasporas provide light on questions of national identity, citizenship, and community, as well as the nature of the nation-state? How can people whose conception of a "homeland" defies easy categorization by census or map affect our understanding of borders and boundaries? By analyzing and critiquing the concept of the "refugee diaspora," this article aims to investigate these concerns. First, I will look at how the term "diasporas" has evolved through time to encompass many types of migration, both voluntary and involuntary. In this article, I will examine the "refugee diasporic" experience through the lens of the conflicts that arise from issues of nationality, identity, and place. My investigation into these matters is based on a particular historical event—the 1947 British Partition of India—and the varied diasporas of East Bengali refugees that emerged during this time. This case study illustrates how gender, religion, class, caste, and ethnicity all play a role in shaping diasporic groups' stories and imaginations, rather than how easy it is to generalize about them as cohesive communities. Partition and East Bengali refugees' legacies, including the continuing contestation over "home," are discussed in the paper's last section, which examines these issues within India and beyond the worldwide Bengali diaspora.

Keywords : Diaspora, Home, Nation-State, Partition, Identity.

These nuances highlight the significance of avoiding equating the yearning for "home" and "place" among the exiles with an innate bond to the nation-state. The historical record unequivocally proves that diasporas, whether its "victim" or "refugee," predate the contemporary, post-Treaty of Westphalia concept of the nation-state. Moving across borders or losing one's nationality does not seem to be the source of a strong sense of belonging to a certain location. Forced relocation from one's home country is the natural starting point for the creation of refugees, especially in this day and age when many view nation states as the pinnacle of communal identity and where their continued existence seems assured. According to Benedict Anderson, the concept of the nation-state has been successful because it has allowed people to (1) channel their suppressed "nationalist" feelings into a coherent political framework and (2) use this framework to legitimize the use of force against other nations. This has allowed them to exert control over their history, demographics, and geography. According to Anderson, the "map, the census and the museum" have been very useful in a global system of nation-states for controlling population flows, cultural recollections, and geographical borders. This is not to downplay the significance of the country. A number of refugee diasporas, including those of the Sikh, Kurdish, and Sri Lankan Tamil communities, have expressed the desire for a homeland of their own, rather

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Dalia Saha

symmetry

MDPI

Article

Inflation with Scalar-Tensor Theory of Gravity

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Abstract: The latest released data from Planck in 2018 put up tighter constraints on inflationary parameters. In the present article, the in-built symmetry of the non-minimally coupled scalar-tensor theory of gravity is used to fix the coupling parameter, the functional Brans–Dicke parameter, and the potential of the theory. It is found that all the three different power-law potentials and one exponential pass these constraints comfortably, and also gracefully exit from inflation.

1. Introduction

The standard (FLRW) model of cosmology based on the basic assumption of homogeneity and isotropy, known as the 'cosmological principle', has successfully been able to explain several very important issues in connection with the evolution of the universe. First of all, it predicts the observed expansion of the universe being supported by the Hubble's law. It also postulates the existence of cosmic microwave background radiation (CMBR), formed since recombination when the electrons combined to form atoms, allowing photons to free stream, with extreme precession, being verified by Penzias and Wilson for the first time [1]. It further predicts with absolute precession the abundance of the light atomic nuclei ($\frac{^4\mathrm{He}}{\mathrm{H}} \sim 0.25$, $\frac{^2\mathrm{D}}{\mathrm{H}} \sim 10^{-3}$, $\frac{^3\mathrm{He}}{\mathrm{H}} \sim 10^{-4}$, $\frac{^7\mathrm{Li}}{\mathrm{H}} \sim 10^{-9}$, by mass and not by number) observed in the present universe [2–4]. Finally, assuming the presence of the seeds of perturbation in the early universe, it can explain the observed present structure of the universe. Despite such tremendous success, the model inevitably suffers from a plethora of pathologies. The problems at a glance are the following [5,6].

1. 'The singularity problem': Extrapolating the FLRW solutions back in time one encounters an unavoidable singularity, since all the physical parameters viz. the energy density (ρ), the thermodynamic pressure (p), the Ricci scalar (R), the Kretschmann scalar ($R_{\alpha\beta\gamma\delta}R^{\alpha\beta\gamma\delta}$) etc. diverge.

2a. 'The flatness problem': The model does not provide any explanation to the observed value of the density parameter $\Omega \approx 1$, which depicts that the universe is spatially flat.

2b. 'The horizon problem': It also can not provide any reason to the observed tremendous isotropy of the CMBR being split in 1.4×10^4 patches of the sky, that were never causally connected before emission of the CMBR.

2c. 'The structure formation problem': It does not also provide any clue to the seeds of perturbation responsible for the structure formation.

3. 'The dark energy problem': Finally, the standard FLRW model does not fit the redshift versus luminosity-distance curve plotted in view of the observed SN1a (Supernova type a) data.

In connection with the first problem, viz. the so called 'Big-Bang singularity', and also to understand the underlying physics of 'Black-Hole' being associated with Schwarzschild singularity, it has been realized long ago that 'General Theory of Relativity' (GTR) must have to be replaced by a quantum theory of gravity when and where gravity is strong enough. However, GTR is not renormalizable and a renormalized theory requires to include higher-order curvature invariant terms in the gravitational action [7]. Despite serious and intense research over several decades and formulation

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Details of Publication in Journals for the year 2019

Internal Child Migrants, Child Labour and Education: Concerns and Policy Perspective

Dr. Koyel Basu*

Abstract

Search for economic survival is one of the greatest challenges of contemporary capitalist societies. It entails people to move from one place to another thus creating the unavoidable problem of transient labour force. A key feature of human history is movement of people from one place to another. Migration has become a major area of social science enquiry in recent decades, recognized as associated with widespread societal transformation and economic development. Recent empirical work has presented a very different picture, making clear that, in practice, childhood is envisioned, structured and experienced in divergent ways across the globe. Child migration is especially common in rural areas with low or declining productivity and limited employment opportunities. Theorization of independent child migration is a life transition event.

In fact they migrate in search of improved livelihood and better employment apart from other reasons. However migration literature is either emphatic on optimism or pessimism when it comes to people on the move. But the narratives on migration should be analytical and much more layered while detecting its causality with various factors. Notwithstanding the negative and positive debates on migration, it cannot be denied that migration is a reality both within and across countries and is characterized by order and disorder, will and coercion, welcoming and rejection, in measures.

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* Dr. Koyel Basu, Assistant Professor, Department of Political Science, Jangipur College, Murshidabad-742213 for last twelve years. I completed my doctoral dissertation in Human Rights and State Politics in the year 2015 from Jadavpur University.

Transition Metal Chemistry
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Synthesis, X-ray crystal structure, DFT calculations, spectroscopic characterization and redox behaviour of a rhodium(III) complex of an anthracene–pyridylhydrazone ligand

Soumitra Dinda[1] · Sarat Chandra Patra[2] · Bikash Kumar Panda[3] · Sanjib Ganguly[1]

Received: 12 October 2018 / Accepted: 12 December 2018

Abstract
A pyridylhydrazone incorporating an anthracene moiety, designated as $\mathbf{HL^{Anc}}$, has been synthesized in order to examine its coordination behaviour towards rhodium(III). The complex $[RhL^{Anc}(PPh_3)_2Cl_2]$, incorporating a four-membered metallacycle, has been isolated and authenticated by a single-crystal X-ray diffraction study. The complex shows interesting redox and optoelectronic properties, and to better understand these, theoretical investigations have been performed using density functional theory (DFT) and time-dependent DFT. The visible excitation for the complex arises from primarily mixed singlet-manifold ^{1}ILCT and ^{1}LLCT transitions.

Introduction

Hydrazones are important building blocks in synthetic organic chemistry owing to their easy availability and versatile reactivity [1, 2]. They have been extensively applied for the synthesis of molecular switches, metallo-assemblies and sensors [3, 4], decoration of nanoparticles [5, 6], syntheses of alicycles and heterocycles [7], and derivatization of carbohydrates for mass spectrometric analysis [8]. Other aspects and applications of hydrazones that have previously been reviewed include their biological activities [9] and their utility as valuable synthetic intermediates [1, 10–12]. It has been recently reported that the hydrazone N–N bond operates as a key activating unit and plays a crucial role as a Lewis base that acts as a directing group (DG) towards rhodium-catalysed C–H activation reactions [13–15]. It has been further authenticated that during the course of such catalytic reactions, Rh(III) is chelated by the N-atoms of the hydrazone moiety [13].

In the present work, we have undertaken the synthesis of a pyridylhydrazone incorporating the polycyclic aromatic hydrocarbon (PAH), anthracene, $\mathbf{HL^{Anc}}$ (Scheme 1), starting from 2-hydrazinopyridine. The rhodium(III) complex of $\mathbf{HL^{Anc}}$ has been synthesized. We found that the ligand is luminescent, and so is its complex. The complex has been characterized by its X-ray crystal structure, which shows the formation of a typical four-membered metallacycle upon coordination. An interesting feature of this complex is that the ligand can behave as an electron donor and this has been substantiated from the nature of the redox orbitals.

Experimental

Materials and methods

2-Hydrazinopyridine was obtained from TCI Chemicals (India) and 9-anthranaldehyde was procured from Alfa Aesar. Triphenylphosphine was purchased from Sigma-Aldrich. Rhodium trichloride salt was purchased from Arora-Matthey. All solvents and other chemicals were utilized as received, without further purification. UV–Vis spectra were recorded on a PerkinElmer LAMBDA 25 spectrophotometer. ^{1}HNMR spectra were recorded on a Bruker FT instrument for complex **1** and a 600-MHz

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11243-018-00300-4) contains supplementary material, which is available to authorized users.

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Land Reforms and Groundwater Use- The Problem of Market Failure

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Received: 10 April **Revised:** 18 April **Accepted:** 26 April

Abstract

In terms of scientific nomenclature, water is considered as a renewable environmental resource. However, in economic perspective this may be viewed differently. Economists always think of the demand for and supply of a product- here it is water resource. Water does have regeneration and recycling process as like other natural resources. But, if we consider the case of ground water then the over-exploitation of it with the advent of technological break though after the green revolution period and with the rigorous implementation of land redistributive programmes in India, ground water because of its non-excludable property confronted with the 'free use' and 'free riding' problems leading to market failure. This is referred as 'Tragedy of Commons'. That is the reason for which ground water has been subsided and polluted considerably. Thus, to be thinking critically, ground water is a depletable resource and has to be carefully utilized to guarantee sustainable development for our future generations.

Keywords:Groundwater, Green Revolution, Land Reforms, Market failure, Steady-state.

I. Introduction:

Ground water is a valuable gift of mother-nature. The survival of entire flora and fauna is dependent on its existence. Hence, the issue of management of ground water is a matter of serious concern for the ecologists, social scientists, policy makers and of course for the common people. In agriculture, ground water management is an important issue. This is even more pertinent for developing country like India in which agriculture is still very much dependent on the vagaries of nature. Thus, in India- where agricultural produce is still vulnerable especially for the small and marginal farmers who has limited access to the water market- appropriate policy prescription for the efficient use of ground water resource is of extreme importance.

Resources could be classified into three categories: Depletable resources, Renewable resources and Expendable resources. They are differentiated in terms of time scale of adjustment processes. All resources are depletable; but it's the renewable resources which adjust more rapidly for self-renewing. Ground water is primarily a renewable resource, its stock is depleted in every moment and is also being renewed within course of time by rainwater and snow melting into ground water or unconfined

Quality of Schooling and Girls' Educational Attainment in West Bengal

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Abstract:

Quality of schooling is an essential input for girl's educational attainment in any parts of world. Quality of schooling is a holistic approach that incorporates a host of dimensions, namely- school infrastructure, availability of teachers in school and a good number of socio economic factors that often debar students particularly the girls to access institutional education. School infrastructure is also composed of many inputs, like- whether the school has *pacca* building, whether it has adequate class rooms and also class rooms in good condition, whether the school has boundary wall, whether the school has proper sanitation facility- issue that is particularly significant for the girl students. The socio economic conditions include the literacy status of the families for girls, economic status of families, migration or immigration status of father, proximity of school from the village and importantly, the household responsibilities for the girls. In the past few years or so, West Bengal was not in the front line to render good quality of schooling among states of India. However, presently, with the advent of pro gender policies in education by the centre and state, positive change of parental approach toward girl's education and most significantly, the enormous zeal of the girls to attain and accomplish the institutional education has proved to be a big push to the extent of educational attainment for girl's in West Bengal.

Keywords: Schooling, Girl's education, West Bengal.

I. Introduction:

Quality of schooling is an important endogenous variable in the literacy campaign for the girls in India. Attendance as well as dropout of students particularly girls in schools is largely determined by the quality of schooling. It has greater influence over the parental decision regarding their children's schooling. Quality of schooling depends on host of factors, like- school building, potable water availability, sanitation facilities- inputs that resemble with the school infrastructure and average number of students per teacher etc. By and large, it is true that all schools don't have equal quality of schooling. There may be inter-regional variation or variation within a certain locality. If the quality of a school is better than other schools then parents are convinced to send them in such schools even if it is located in relatively distant areas. This issue has greater significance for the girl's students. In order to guarantee the equitable quality education in conformity to the Sustainable Development Goals (SDG) 2030[1], it has become a compulsion for the policy makers, union and state governments in India to ensure sustainable quality of schooling. In the previous Millennium Development Goals (MDG) in UNDP the mandate was

[1] Sustainable Development Goals-
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all;
Goal 5: Achieve gender equality and empower all women and girls (Source: http://www.undp.org/).

Equity in Education: A Comparative Study

-Dr.Nandini Chakraborty, Asst. Professor, Department of Economics, Jangipur College, Jangipur, West Bengal.

Abstract: *Caste and gender always remain as key concerns of social sciences in India that continues to be relevant even today. In ancient times, the Vedic culture which represented Brahmanic hegemony reinforced subjugation of the ancient subalterns like sudras and women. In colonial India, the education system was de-Sanskritized but the access to education remained as a distant dream to these two groups. The concept of inclusivity is introduced only in nineties with DPEP programme (1994) and Sarva Shiksha Abhiyan (2000) that calls for universalization of primary education by increasing enrolment, retention and attendance. This paper tried to analyze how far these programmes improve the position of marginalized people in Indian education system. Simple cross sectional tables and diagrams with reference period of 2010-11 is taken for discussion. the study is mostly descriptive in nature.*

Key words: education, caste, gender, enrolment, dropout.

I. Introduction:

Education is an instrument of socialization and is considered as a powerful catalytic agent for social change and empowerment. The indian education system is among the largest in the world where nearly one fourth of its population is engaged in direct learning process. One of the primary flaw of this vast structure relates to the lack of inclusivity which means inequal accessibility of education among different segment of the community. One of the important barriars towards inclusivity is the caste affiliation of a person. Caste is one of the oldest concerns of india that continues to be relevent even today and determines educational attainment of a person in a negetive fashion. However, since 1950, affirmative action programmes were taken by Indian social policy makers to eradicate this inequality. Keeping the importance of education, article 15 of the Indian constitution enables the state to make special provision for the advancement of any socially and educationally backward class of citizen. In pursuance of these constitutional provisions, a series of measures have been taken both by the central government and the state government to spread education and literacy among the Scheduled Castes (SC) and Scheduled Tribes (ST) and other marginalized groups that include elaborate provisions of pre-metric and post-metric scholarships, abolition of user fees, reservation of seats in schools and colleges including technical and professional institutions, establishment of hostels and Ashram schools for the children of Scheduled Castes and Scheduled Tribes. Most of these programmes emphasized supply led investments whereas financial assistance is considered as a weapon to boost demand. Sarva Shiksha Abhiyan (SSA) is perhaps the most important of such measures. Even though the primary objective of it is to provide useful and quality education for all children in the elementary levels i.e., in the 6 to 14 years' age group by 2010. But its secondary aim is to make up the social, regional and gender disparities, with the active participation of the local community in the management of the programme. This paper tried to analyze to what extent this policy prescription affects education attainment of marginalized communities.

II. Objective of the study:

To examine extent of inequality in educational performance of schedule caste and schedule tribe population of India after the initiation of SSA.

III. Literature review:

Porter (1965) points out education as asocial capability in getting opportunities but there may exist some features that suppress the people through social categorization like caste, ethnicity and religions by dominant group. Pal (2016), in his study of anganwadi workers observed that the ***dalit*** children (lower caste children who were traditionally "untouchables.") are made to stand or sit separately with their plates from upper caste students. Hoff and Panday (2012) also found that publicly revealing caste identity that induced isolation impairs the ability to learn and may lead to drop out or low scoring educational performance. The caste stratification of education is more profound when women are considered. SC and ST girls are the worst off in terms of most educational outcome indicators (Pandey, 1990: Raju, 1991). According to MORD report (2007): 73% of SC women, 79% of ST women are illiterate. The dropout rate for the above mentioned social groups are 34.2% and 43.3% respectively. Discrimination could also exist within the schooling system e.g. in the form of hostile teacher's attitudes towards children belonging to

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REVIEW PAPER

Insights into nitric oxide–melatonin crosstalk and *N*-nitrosomelatonin functioning in plants

Soumya Mukherjee

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Received 25 June 2019; Editorial decision 5 August 2019; Accepted 6 August 2019

Editor: Peter Bozhkov, Swedish University of Agricultural Sciences, Sweden

Abstract

Similar to animal systems, plants have been suggested to possess both positive and antagonistic interactions between nitric oxide (NO) and melatonin. This review summarizes the current understanding of NO–melatonin crosstalk in plants with regard to redox homoeostasis, regulation of gene expression, and developmental changes. It also addresses the possible role of *N*-nitrosomelatonin (NOmela), which is likely to be associated with redox signaling and long-distance communication. Localization and quantification of NOmela are expected to add new insights into its precise role in plants. Methodological advances in imaging, isolation, and quantification of such a transient molecule require further attention. The quest for the biological role of NOmela in plants should lure physiologists to pursue investigations to obtain solid experimental evidence.

Keywords: Abiotic stress, melatonin, nitric oxide, *N*-nitrosomelatonin (NOmela), reactive nitrogen species, redox signaling.

Introduction

Recent investigations have deciphered the unique role of nitric oxide (NO)–melatonin crosstalk in regulating redox homoeostasis in cells (Turjanski *et al.*, 2000; Kirsch and de Groot, 2005; Berchner-Pfannschmidt *et al.*, 2008; Singh *et al.*, 2016). The redox roles of NO and melatonin have long been investigated in animal systems (Beckman *et al.*, 1990; Kirsch and de Groot, 2005; Kopczak *et al.*, 2007), and recent investigations have provided new insights into their interaction in plant systems (Kaur and Bhatla, 2016; Arora and Bhatla, 2017; Mukherjee, 2018). What appears interesting to physiologists is the ability of species of NO to nitrosate melatonin (a tryptophan derivative) at the nitrogen atom of the indole moiety (Kirsch and de Groot, 2002; Williams, 2004). The nitrosated form of phytomelatonin, *N*-nitrosomelatonin (NOmela), is a unique signaling molecule likely to function in redox homeostasis in plants (Singh *et al.*, 2016). NO is able to function as a unique signaling molecule as it possesses properties such as high diffusibility across cell walls and plasma membrane, a short half-life (<15 s), and a variable *in vivo* concentration (Moncada *et al.*, 1991; Delledonne *et al.*, 1998). According to Rubbo *et al.* (1996), NO has both pro-oxidant and antioxidant roles in its function as a free radical species. These dual roles are primarily regulated by its concentration and that of various other free radical species formed during oxidative stress. NO has been established as a gaseous free radical in plants with various effects on plant growth, flowering, morphogenesis, and oxidative stress management (Siddiqui *et al.*, 2011; Manai *et al.*, 2014; Mostofa *et al.*, 2015). Nitrate reductase (NR; EC 1.7.99.4) appears to be the primary enzyme associated with NO production in plant cells (Dean and Harper, 1988; Rockel *et al.*, 2002), but investigations in the past decade have reported the presence in plants of putative nitric oxide synthase (NOS; EC 1.14.13.39) activity (Barroso *et al.*, 1999; del Río *et al.*, 2004).

Abbreviations: NO: nitric oxide; NOmela: *N*-nitrosomelatonin; RNS: reactive nitrogen species; ROS: reactive oxygen species.

Nitric Oxide
Volume 82, 1 January 2019, Pages 25-34

Recent advancements in the mechanism of nitric oxide signaling associated with hydrogen sulfide and melatonin crosstalk during ethylene-induced fruit ripening in plants

Soumya Mukherjee

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Highlights

- Nitric oxide mediated modulation of fruit ripening.
- Hydrogen sulphide and nitric oxide crosstalk associated with inhibition of ethylene biosynthesis.
- Melatonin induced amelioration of fruit senescence and elevated antioxidative defense.
- Melatonin – nitric oxide interaction and probable formation of nitrosomelatonin during fruit ripening.
- Applications of exogenous nitric oxide, hydrogen sulfide and melatonin in post-harvest management of fruits.

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"You are lying on your pyre, child, burning for life" The Existentialist Dramaturgies of Badal Sircar, Girish Karnad, Mohan Rakesh and Mahesh Elkunchwar

Basudeb Chakrabarti

Abstract ■ Indian theatre, particularly in the 1960s, witnessed dramatic idioms derived from the Western influence and reinterpretations of indigenous traditions known as the "roots movement" (Mee11) as theatre strove to arrive at a "creative alliance" which would "enrich the pan-Indian modern theatre" (Banerjee, "Towards a Multi-cultural Indian Theatre?" 8). And since, in the Indian cultural forms, the issue of modernity remains "inseparable" from the transformations brought about by Western influences, "subject position" in the "cultural systems" of the nation displays an "ambidexterity" of neither belonging exclusively to "a subaltern" nor to "a dominant culture" yet partaking to both "with equal effectiveness" (Dharwadker, "The Critique of Western Modernity in Post-Independent India" 56). Badal Sircar, Girish Kanrad, Mohan Rakesh and Mahesh Elkunchwar emerged into the domain of Indian theatre in the 1960s encountering a nation beset with external aggressions, economic downslide, food scarcity, industrial recession, retrenchment and political nepotism. Responding to the swamping disillusionment in all spheres of life, these dramatists, at least in the earliest part of their careers, exteriorized man's "inner sense of dissonance and dislocation" on the stage drawing impetus from the philosophy of existentialism vis-à-vis the writings of Heidegger, Sartre and Camus and the absurdist plays of Beckett, Ionesco, Adamov and Genet (Marker and Innes x). This present paper attempts to re-read Sircar's *Evam Indrajit* (1965), Kanrad's *Yayati* (1960), Rakesh's *Halfway House* (1968) to illustrate how the tenets and tangents of existentialism suffused these dramatists in their bid to negotiate the *angst* that loomed large over the nation and also how, even after fifty-four years of Independence, such an ideological orientation has remained validated in Elkunchwar's *Sonata* (2002).

Keywords: existentialism, alienation, responsibility, choice

In India, as Sumanta Banerjee observes, in "the 1950-60 period" there was considerable excitement over the "theories of Existentialism of Sartre and Camus" as "the Theatre of the Absurd ... arrived and the plays of Beckett, Ionesco, Adamov and Genet ... reached the bookstalls" (qtd. in Katyal 30). Indian response to the European precept of subjectivizing reality as in Beckett, Ionesco and others emerged in Girish Karnad's *Yayati* (1961), Badal Sircar's *Evam Indrajit* (1963), Mohit Chattopadhyay's

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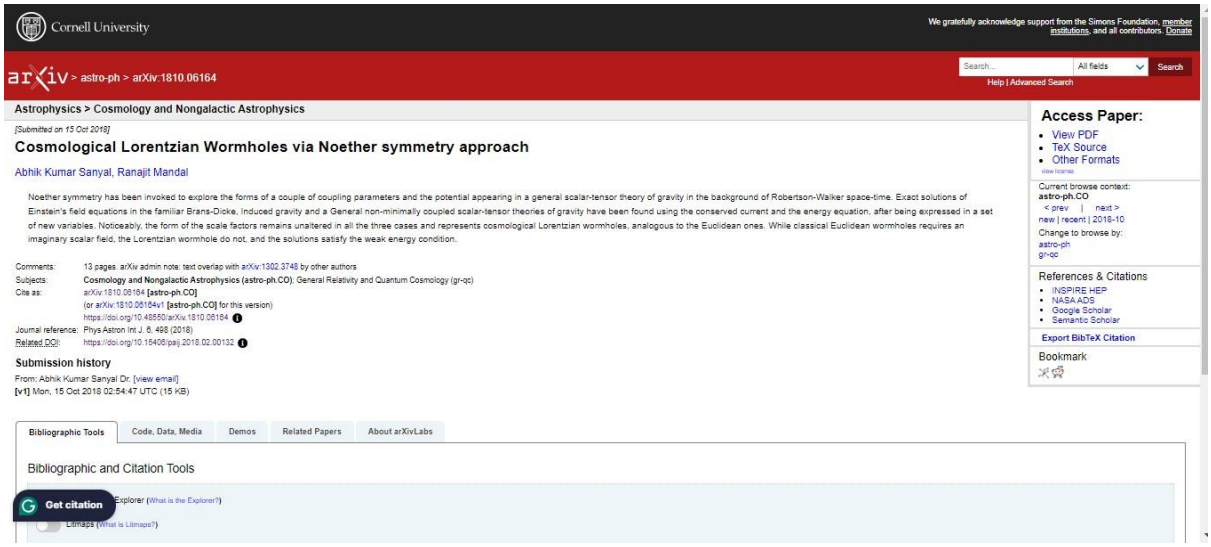
Details of Publication in Journals for the year 2018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[Submitted on 15 Oct 2018]
Cosmological Lorentzian Wormholes via Noether symmetry approach
Abhik Kumar Sanyal, Ranajit Mandal
Noether symmetry has been invoked to explore the forms of a couple of coupling parameters and the potential appearing in a general scalar-tensor theory of gravity in the background of Robertson-Walker space-time. Exact solutions of Einstein's field equations in the familiar Brans-Dicke, Induced gravity and a General non-minimally coupled scalar-tensor theories of gravity have been found using the conserved current and the energy equation, after being expressed in a set of new variables. Noticeably, the form of the scale factors remains unaltered in all the three cases and represents cosmological Lorentzian wormholes, analogous to the Euclidean ones. While classical Euclidean wormholes requires an imaginary scalar field, the Lorentzian wormhole do not, and the solutions satisfy the weak energy condition.
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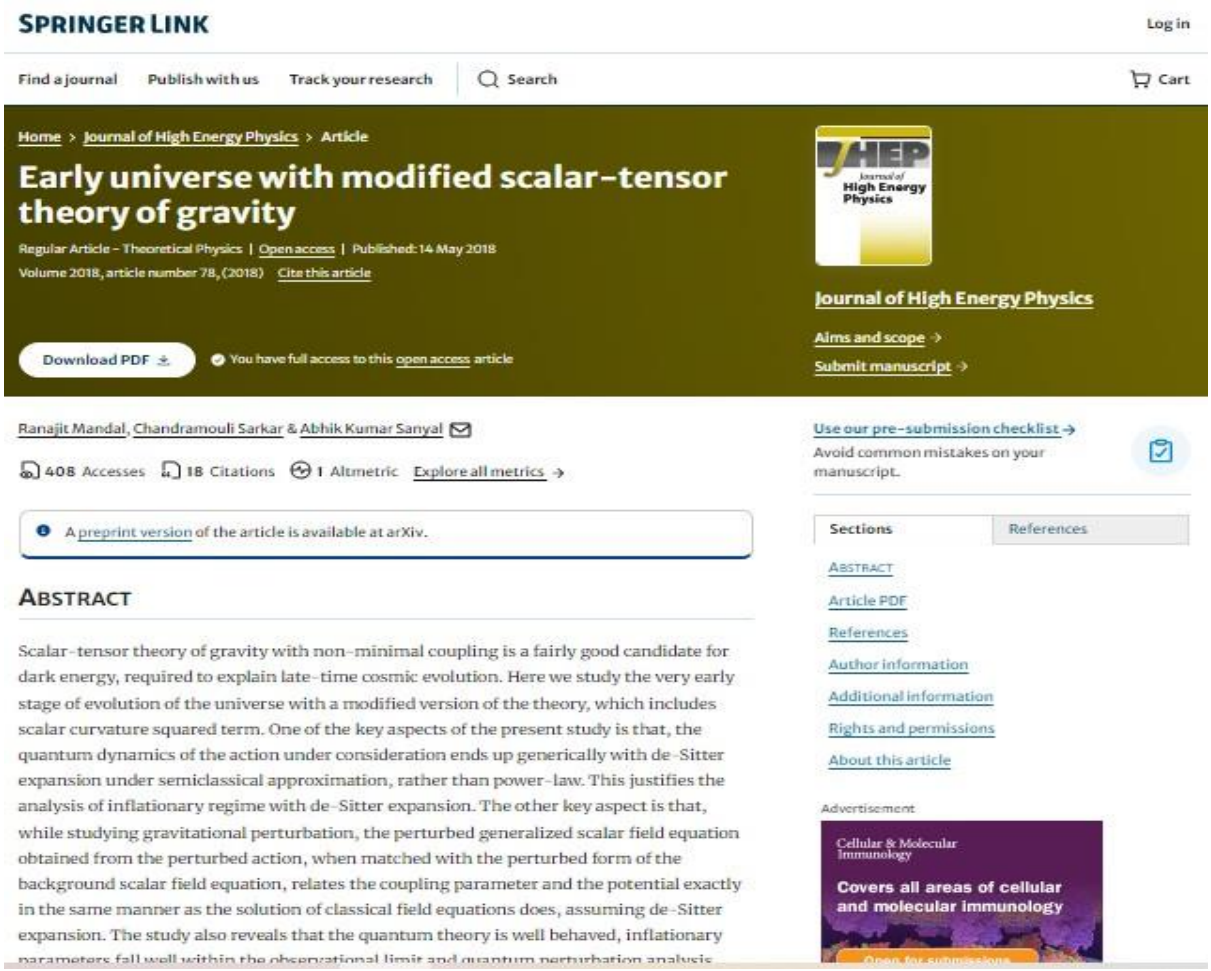
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Ranajit Mandal, Chandramouli Sarkar & Abhik Kumar Sanyal
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ABSTRACT
Scalar–tensor theory of gravity with non–minimal coupling is a fairly good candidate for dark energy, required to explain late–time cosmic evolution. Here we study the very early stage of evolution of the universe with a modified version of the theory, which includes scalar curvature squared term. One of the key aspects of the present study is that, the quantum dynamics of the action under consideration ends up generically with de–Sitter expansion under semiclassical approximation, rather than power–law. This justifies the analysis of inflationary regime with de–Sitter expansion. The other key aspect is that, while studying gravitational perturbation, the perturbed generalized scalar field equation obtained from the perturbed action, when matched with the perturbed form of the background scalar field equation, relates the coupling parameter and the potential exactly in the same manner as the solution of classical field equations does, assuming de–Sitter expansion. The study also reveals that the quantum theory is well behaved, inflationary parameters fall well within the observational limit and quantum perturbation analysis
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On the equivalence between different canonical forms of $F(R)$ theory of gravity

Nayem Sk and Abhik Kumar Sanyal

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Abstract

Classical equivalence between Jordan's and Einstein's frame counterparts of $F(R)$ theory of gravity has recently been questioned, since the two produce different Noether symmetries, which could not be translated back and forth using transformation relations. Here we add the Hamiltonian constraint equation, which is essentially the time–time component of Einstein's equation, through a Lagrange multiplier to the existence condition for Noether symmetry and show that all the three different canonical structures of $F(R)$ theory of gravity, including the one which follows from Lagrange multiplier technique, admit each and every available symmetry independently. This establishes classical equivalence.

Keywords: $F(R)$ theory · Lagrangian multiplier technique · Jordan's frame, Einstein's frame · equivalence

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PHYSICAL REVIEW D
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Equivalent and inequivalent canonical structures of higher order theories of gravity

Ranajit Mandal and Abhik Kumar Sanyal

Phys. Rev. D **96**, 084025 – Published 12 October 2017; Erratum Phys. Rev. D **98**, 069901 (2018)

ABSTRACT

The canonical formulation of higher-order theories of gravity can only be accomplished by introducing additional degrees of freedom, namely, the extrinsic curvature tensor K_{ij}. Consequently, to match Cauchy data with the boundary data, terms in addition to the three-space metric h_{ij} must also be fixed at the boundary. While in the Ostrogradsky, Dirac, and Horowitz formalisms the extrinsic curvature tensor is kept fixed at the boundary, a modified Horowitz formalism fixes the Ricci scalar R instead. It has been taken for granted that the Hamiltonian structures corresponding to all of the formalisms with different end-point data are either the same or are canonically equivalent. In the present study, we show that this indeed is true, but only for a class of higher-order theories. However, for more general higher-order theories—e.g., dilatonic coupled Gauss-Bonnet gravity in the presence of a curvature-squared term—the Hamiltonian obtained following the modified Horowitz formalism is found to be different from the others, and is not related under canonical transformation. Further, it has also been demonstrated that only the modified Horowitz' formalism can produce a viable quantum description of the theory, since it only admits a classical analogue under an appropriate semiclassical approximation. Thus, fixing the Ricci scalar R at the boundary appears to be a fundamental issue for a canonical formulation of higher-order theories of gravity.

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Erratum: Equivalent and inequivalent canonical structures of higher order theories of gravity [Phys. Rev. D **96**, 084025 (2017)]

Ranajit Mandal and Abhik Kumar Sanyal
Phys. Rev. D **98**, 069901 – Published 13 September 2018

ABSTRACT

In the manuscript, we concluded that Horowitz's as well as Dirac's and Ostrogradski's formalisms fail to produce a viable quantum description of the modified Einstein-Gauss-Bonnet-dilatonic (MEGBD) action. However, later we note that such conclusion stems from an error in the solution to the classical field equations. Here, we rectify the error, along with all the expressions associated with it. In the process, we find that both Horowitz's formalism (as well as Dirac's and Ostrogradski's formalisms) and modified Horowitz's formalism produce a viable, although inequivalent, quantum description of the MEGBD action. Nevertheless, the main motivation of the manuscript, viz. "canonical formulation of higher-order theories of gravity following different prescriptions in some cases lead to equivalent and in some other cases inequivalent phase-space structures", remains unaltered.

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Degenerate Hamiltonian operator in higher-order canonical gravity — The problem and a remedy

Abhik Kumar Sanyal

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Abstract

Different routes towards canonical formulation of a classical theory result in different canonically equivalent Hamiltonians, while their quantum counterparts are related through appropriate unitary transformation. However, for higher-order theory of gravity although two Hamiltonians emerging from the same action differing by total derivative terms are related through canonical transformation, the difference transpires while attempting canonical quantization, which is predominant in non-minimally coupled higher-order theory of gravity. We follow Dirac's constraint analysis to formulate phase-space structures, in the presence (case-I) and absence (case-II) of total derivative terms. While the coupling parameter plays no significant role as such for case-I, quantization depends on its form explicitly in case-II, and as a result unitary transformation relating the two is not unique. We also find certain mathematical inconsistencies in case-I, for modified Gauss–Bonnet-Dilatonic coupled action, in particular. Thus, we conclude that

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GOVERNMENT, ECONOMIC INDEPENDENCE AND EMPOWERMENT OF WOMEN IN INDIA

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ABSTRACT

State is one of the significant predetermined factors in the context of women empowerment. Taking other parameters constant, this factor alone has the capacity to decide the fate of her women citizens both in progressive or regressive manner like Turkey in Kamal Pasha regime or the modern Saudi or Iran in conservative regime. However, the constitution of India neither discriminate its womenfolk on any grounds of law (if there is some positive discrimination like reservation of seats for women in panchayat election) nor it supports any differentiating practices in the name of tradition or else but the statistics reflecting the status of women is alarming and we are far behind the developed regions in all sense and our government programmes are sometimes not at all inclusive, particularly in the context of gender. However, the situation has been changing gradually over time and the state has accepted women as active agents rather than a passive recipient in development programmes and schemes. Against this backdrop, this study seeks to investigate the mainstreaming process of women through government interventions. First the study analyzes the relationship between state and gender and then it gone through different government programmes and clubs them in different categories.

KEYWORDS : *Gender, State, Government Policies.*

I. INTRODUCTION:

Indian Planning Commission started operating on the 1st of April, 1950 to assess the need of the country for human capital and material resources and to formulate economic plans for their balanced and effective utilization. The first plan commenced in 1950-51 and was followed by a series of plans. The first five year plan expressed clearly the long term objectives or goals of economic planning as follows: "Maximum production, full employment, the attainment of economic equality and social justice which constitute the accepted objectives of planning under present-day conditions are not really so many different ideas but a series of related aims which the country must work for" (Chapter 2, 1st Five Year Plan). Keeping with these objectives, 'Rural Development' always remains as the key agenda of Indian planning. The ultimate objectives of rural development were the eradication of poverty and improving the quality of the masses. In this process of development, initially, the gender aspect found little or no significance. The present paper will try to locate the changes in the status of women in mainstream programmes over time.

II. GENDER AND STATE:

In a developing country, which is trying to raise the average standard of living of the women citizens along with their male counterpart, the state necessarily has to play a big role. Well-designed policies have the capacity to upshot more equitable distribution of opportunities and hinder inter-generation transmission of inequality particularly in the context of gender. But to reach the target, these policies could face some challenges. One of the major challenges of government policies in India is the existence of chronic intra-state

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Review

Mechanisms of Sodium Transport in Plants—Progresses and Challenges

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Abstract: Understanding the mechanisms of sodium (Na^+) influx, effective compartmentalization, and efflux in higher plants is crucial to manipulate Na^+ accumulation and assure the maintenance of low Na^+ concentration in the cytosol and, hence, plant tolerance to salt stress. Na^+ influx across the plasma membrane in the roots occur mainly via nonselective cation channels (NSCCs). Na^+ is compartmentalized into vacuoles by Na^+/H^+ exchangers (NHXs). Na^+ efflux from the plant roots is mediated by the activity of Na^+/H^+ antiporters catalyzed by the salt overly sensitive 1 (SOS1) protein. In animals, ouabain (OU)-sensitive Na^+, K^+-ATPase (a P-type ATPase) mediates sodium efflux. The evolution of P-type ATPases in higher plants does not exclude the possibility of sodium efflux mechanisms similar to the Na^+, K^+-ATPase-dependent mechanisms characteristic of animal cells. Using novel fluorescence imaging and spectrofluorometric methodologies, an OU-sensitive sodium efflux system has recently been reported to be physiologically active in roots. This review summarizes and analyzes the current knowledge on Na^+ influx, compartmentalization, and efflux in higher plants in response to salt stress.

Keywords: sodium influx; ouabain-sensitive ATPase; sodium efflux; ouabain; Na^+; K^+-ATPase

1. Introduction

Soil salinity affects agriculture globally. Salinization can occur as a result of natural causes, such as the close proximity to coastal areas, or be anthropogenic, due, for instance, to poor irrigation practices that lead to the accumulation of high concentrations of salts. Saline soils contain high concentrations of salts such as $CaSO_4$ and Na_2CO_3, although NaCl is the dominant salt [1]. The primary effects of salinity on plants are: (1) the osmotic effect leading to a water deficit due to high concentrations of solutes present in the soil; (2) ion-specific stresses leading to K^+ deficiency due to altered K^+/Na^+ ratios [2]. Alteration of the K^+/Na^+ ratio is due to the increase in the influx of Na^+. Under saline conditions, Na^+ influx is facilitated through pathways that generally function for K^+ influx, as the ionic radii of Na^+ and K^+ in their hydrated forms are similar, making the discrimination between the two ions difficult. As a result of this failure in discrimination, plants growing in saline soils suffer from Na^+ toxicity and K^+ deficiency. The toxic levels of Na^+ present in the cytoplasm at high concentrations must be lowered in order to maintain a low cytosolic Na^+ concentration and a high K^+/Na^+ ratio by mechanisms that function to: (1) reduce Na^+ influx into root cells; (2) compartmentalize Na^+ into vacuoles; (3) increase Na^+ efflux from root cells [3,4]. These processes of Na^+ detoxification and cellular osmotic adjustment are important for plants to tolerate salt stress [5]. The present review discusses the progresses made so far in understanding the mechanisms of sodium transport, such as Na^+ influx in the roots via non-selective cation channels (NSCCs), its effective compartmentalization in vacuoles via Na^+/H^+ antiporters (NHX), and Na^+ efflux from the roots upon sensing salt stress via the salt overly sensitive (SOS) pathway (Figure 1). More importantly, this review provides a detailed account of the

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Review

Novel perspectives on the molecular crosstalk mechanisms of serotonin and melatonin in plants

Soumya Mukherjee

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Highlights

- Significant role of serotonin and melatonin signaling with phytohormones and other associated biomolecules.
- Auxin-serotonin crosstalk in relation to PIN protein functioning and root growth.
- Long distance signaling responses of serotonin in association with auxin, jasmonic acid, salicylic acid and ABA.
- Nitrogen metabolism and nitrosative stress associated with melatonin signaling.
- Developments in hydrogen sulphide-melatonin signaling in plants.