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Regular Article - Experimental Physics

High-spin states of ^{204}At: isomeric states and shears band structure

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Abstract High-spin states of neutron-deficient trans-lead nucleus ^{204}At were populated up to $\sim$ 8 MeV excitation through the ^{12}C + ^{197} Au fusion evaporation reaction. Decay of the associated levels through prompt and delayed γ-ray emissions were studied to evaluate the underlying nuclear structure. The level scheme, which was partly known, was extended further. An isomeric 16^+ level with observed mean lifetime $\tau = 52 \pm 5$ ns, was established from our measurements. Attempts were made to interpret the excited states based on multi quasiparticle and hole structures involving $2f_{5/2}$, $1h_{9/2}$, and $1i_{13/2}$ shell model states, along with moderate core excitation. Magnetic dipole band structure over the spin parity range: 16^+–23^+ was confirmed and evaluated in more detail, including the missing cross-over $E2$ transitions. Band-crossing along the shears band was observed and compared with the evidence of similar phenomena in the neighbouring ^{202}Bi, ^{205}Rn isotones and the ^{203}At isotope. Based on comparison of the measured $B(M1)/B(E2)$ values for transitions along the band with the semiclassical model based estimates, the shears band of ^{204}At was established along with the level scheme.

1 Introduction

The nuclear structure of the neutron-deficient nuclei very near the doubly magic ^{208}Pb nucleus has been one of the major areas of experimental investigation for many reasons. Firstly, many of these nuclei were studied to look for applicability of shell model with moderate core excitation to explain the high-spin states [1–3]. These studies were possible due to the availability of cooled High Purity Germanium (HPGe) based γ-ray detectors with unprecedented energy resolution to pin point the basic structural subtleties. Secondly, the yield of neutron-deficient trans-lead nuclei populated to high-spin states by fusion evaporation pathway is very low due to depletion of the compound nuclei by the competing fission channels. However, large array of HPGe detectors and the Clover detectors made available over the last three decades, along with versatile techniques of channel selection, made it possible to probe these nuclei to very high spin and excitation energy. Thirdly, these nuclei with a few valence protons and neutron holes, which belong to relatively high-j orbitals ($f_{5/2}$, $h_{9/2}$, and $i_{13/2}$), are expected to manifest various co-operative phenomena as the collectivity sets in for the high-spin states.

With moderate core excitations as the basis, these nuclei ($Z \sim 82$, $N \sim 120$) first evolve from a spherical to weak oblate shape. The valence particles and holes tend to align along the rotational symmetry axis giving rise to evolution of collective phenomena, the simplest manifestation being the observation of a series of magnetic dipole transitions between the high-spin states which appear to be regularly or semi-regularly placed following some order pattern. The magnetic dipole band, interpreted physically by the shears mechanism, has been explained by the tilted axis cranking (TAC) model [4,5]. Shape co-existence and shape transition due to transformation from weak oblate shape to prolate

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Contradiction and Negotiation: New Economic Policy and Industrial Policy Transition in West Bengal, 1987 – 2000

Dr. Abhinandan Das

Abstract:

India's transition in 1991 to a regime of 'structural adjustment' is a watershed in the post-independence Indian economy. As an effect of this New Economic Policy (NEP), the traditional and indigenous industries were exposed to a severe crisis. In West Bengal, the impact of NEP onslaught was greater. In West Bengal the situation became even worse in respect of the industries, both in the private and public sectors, which had already started becoming sick for various reasons, including lack of investment, old machineries, managerial inefficiency and lack of ability to withstand competition in the market. Initially, the NEP faced massive mass opposition mobilised by the left-wing parties, but later the Left Front government adopted its own policy to revive the stagnating industrial condition of the state. This article attempts to analyse this policy transition and its impact on industries in West Bengal from 1987-2000.

Keywords*: NEP, Left Front, West Bengal, Industry*

By the beginning of 1990s, India witnessed a sharp break from the earlier period of Nehruvian mixed economic policy. During the tenure of the Narasimha Rao-led Congress government, the New Economic Policy (NEP) was adopted in 1991, though the ground was prepared earlier. In the mid-1980s, the *Licence-Permit Raj* was withdrawn, and India's economy was gradually opened up to foreign investors and domestic private players under the initiative of the then Prime Minister Rajiv Gandhi. He adopted some pro-market policies of import liberalisation, concessions to foreign capital, and reforms were also introduced in the field of telecommunication, broadband system, etc. The Monopoly and Restrictive Trade Practice Act (MRTP) was redefined; electronic machinery, machine tool, drug-related industries, etc., were de-licenced; and private production of telecommunication equipment was also allowed during this period (Nayar, 1990, pp.58-63). However, Rajiv Gandhi's reform policy and his pro-business budget of 1985 were highly criticised within the Congress party itself because it was a sharp break from the earlier policy of a 'socialistic pattern of development' as an exclusive aim.[1] The trade union organisations also opposed his privatisation plan of public sector units and the oppositions cornered him by the Bofors scandal.[2] In

[1] *Rajiv Gandhi, Selected Speeches and Writings-1986*. Government of India. New Delhi, Publication Division, (1989), pp. 66-72.

[2] In 1986 the Government of India signed an arm deal with Swedish arms manufacturer AB Bofors for the supply of Howitzer guns for the Army. It was alleged that to secure the contract the company had bribed top Indian politicians and army officers. The scandal became a political agenda against the Rajib Gandhi led government in the late 1980s. For more details, see Henrik Westander. (1992). *Classified: The Political*

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Full Paper

Cananginone Abrogates EMT in Breast Cancer Cells through Hedgehog Signaling

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Abstract

Cananginones, a family of linear acetogenins found as secondary metabolites in the plant kingdom, show cytotoxicity against several types of cancer cells. We aimed to investigate the efficacy of cananginone and its mechanism as an anti-cancer agent. Our initial screening of Cananginone against HepG2, PC3, A549, and MCF7 cells showed anti-cancer activities and is more potent against MCF7 cells, consistent with the previous report. Next, cell-based assays have revealed that cananginone abrogates cancer stem cell renewal as well as Epithelial-Mesenchymal Transition (EMT) and increased the ROS level beyond the threshold level thus reducing the viability of

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Ricci soliton on Sasakian manifolds admitting Zamkovoy connection

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Abstract. Object of this paper is to study Ricci soliton on concircularly flat, W_2-flat, W_3-flat, W_4-flat Sasakian manifolds with respect to Zamkovoy connection. Besides these, we discuss Ricci soliton on a Sasakian manifold satisfying $W_2^*(\xi, Y).R^* = 0$, where R^* denotes Riemannian curvature tensor with respect to Zamkovoy connection and W_2^*-denotes the W_2-curvature tensor with respect to Zamkovoy connection.
Keywords: Sasakian manifold, Zamkovoy connection, Ricci soliton, concircular curvature tensor, W_2-curvature tensor, W_3-curvature tensor, W_4-curvature tensor.

1. Introduction

The notion of Sasakian structure [16] was introduced by Japanese mathematician S. Sasaki in the year 1960. If a contact metric structure is normal then the structure is said to have a normal contact metric structure or a Sasakian structure. Thus a manifold with Sasakian structure is a normal contact metric manifold. In some respect Sasakian manifold may be viewed as an odd dimensional analogous of Kâhler manifold. Sasakian manifold was further studied by many authors. For details, we refer ([4], [9], [11], [5]) and the references therein.

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ZAMKOVOY CONNECTION ON LORENTZIAN PARA-KENMOTSU MANIFOLDS

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Abstract. In this paper we introduce a non-metric linear connection called Zamkovoy connection on Lorentzian para-Kenmotsu manifold and obtain η-Ricci soliton with respect to this connection. Moreover, we study concircularly flat, ϕ-concircularly flat Lorentzian para-Kenmotsu manifolds with respect to Zamkovoy connection. Besides these, we discuss ξ-pseudo projectively flat and ϕ-pseudo projectively flat Lorentzian para-Kenmotsu manifolds with respect to Zamkovoy connection.

Mathematics Subject Classification 2020 : 53D15, 53C05, 53C25

Key words and phrases : Lorentzian para-Kenmotsu manifold, Zamkovoy connection, concircular curvature tensor, pseudo projective curvature tensor

1. Introduction. The notion of Lorentzian para-Kenmotsu manifold has been introduced by A. Haseeb and R. Prasad (Haseeb and Prasad, 2021). Recently, N.V.C. Shukla and A. Dixit (Shukla and Dixit, 2020) studied ϕ-recurrent Lorentzian para-Kenmotsu manifolds and find that such type of manifolds are η-Einstein. Further, V. Chandra and S. Lal (2020) studied some special results on 3-dimensional Lorentzian para-Kenmotsu manifolds.

In 2008, the notion of Zamkovoy canonical connection (briefly, Zamkovoy connection) was introduced by S. Zamkovoy (2008) for a para-contact manifold. And this connection was defined as a canonical para-contact connection whose torsion is the obstruction of para-contact manifold to be a para-Sasakian manifold. Later, A. Biswas and K. K. Baishya studied this connection on generalized pseudo Ricci symmetric Sasakian manifolds (Biswas and Baishya, 2019) and on almost pseudo symmetric Sasakian manifolds (Biswas and Baishya, 2019). This connection was further studied by A.M. Blaga (Blaga, 2015). In 2020, A. Mandal and A. Das et al. (Mandal and Das, 2020) studied in detail on various curvature tensors of Sasakian and LP-Sasakian manifolds admitting this connection. For an n-dimensional almost contact metric manifold M equipped with an almost contact metric structure (ϕ, ξ, η, g) consisting

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SOME CURVATURE PROPERTIES AND RICCI SOLITON ON SASAKIAN MANIFOLD ADMITTING A METRIC CONNECTION

ABHIJIT MANDAL, GOPAN SAHA AND ASHOKE DAS

Abstract. In this paper we study Ricci solitons on pseudo-projectively flat, quasi-pseudo-projectively flat and quasi-concircularly flat Sasakian manifolds with respect to a new metric connection. Besides these, we study Ricci solitons on some special type of Sasakian manifolds satisfying certain conditions.

1. INTRODUCTION

The concept of Ricci flow and its existence was introduced by R.S. Hamilton [6] in the year 1982. He observed that the Ricci flow is an excellent tool for simplifying the structure of a manifold. This concept was developed to answer Thurston's geometric conjecture which says that each closed three manifolds admits a geometric decomposition. The Ricci flow equation is given by $\frac{\partial g}{\partial t} = -2S$, where g is a Riemannian metric, S is Ricci curvature tensor and t is the time. Hamilton [7] also introduced a self similar solution of the Ricci flow equation which is known as Ricci soliton and it is represented by a triple (g, V, λ), where g is a Riemannian metric, V is a vector field and λ is a scalar, which satisfies the equation:

$$L_V g + 2S + 2\lambda g = 0, \tag{1.1}$$

where S is Ricci curvature tensor, $L_V g$ denotes the Lie derivative of g along the vector field V. The Ricci soliton is said to be shrinking, steady or expanding according as $\lambda < 0$, $\lambda = 0$ or $\lambda > 0$, respectively. If the vector field V is gradient of a smooth function h, then the Ricci soliton (g, V, λ) is called a gradient Ricci soliton and the function h is called the potential function. Ricci soliton was further studied by many researchers. For more details we refer [12, 17, 20, 21] and their references.

Sasakian manifold [18] was defined by Japanese mathematician S. Sasaki in the year 1960. If a contact metric structure is normal, then the structure is said to have a normal contact metric structure or a Sasakian structure. Sasakian manifolds have been studied by many authors. For instance, we see [3–5, 14] and their references.

In 2008, the notion of a new linear connection named as Zamkovoy canonical connection was introduced by S. Zamkovoy [24] for a para-contact manifold. And, this connection was defined as a canonical para-contact connection whose torsion is the obstruction of para-contact manifold to be a para-sasakian manifold. Later on, various curvature tensors in

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SOME CURVATURE PROPERTIES OF PARA-KENMOTSU MANIFOLD WITH RESPECT TO ZAMKOVOY CONNECTION

ABHIJIT MANDAL, AFSAR HOSSAIN SARKAR,
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ABSTRACT. In the present paper we study some properties of the para-Kenmotsu manifold with respect to Zamkovoy connection. We discuss locally ϕ-symmetric para-Kenmotsu manifold with respect to the Zamkovoy connection. Also, we study Ricci Soliton on para-Kenmotsu manifold with respect to Zamkovoy connection. Besides these, we discuss W_i-curvature tensor (i=0,1,2...9) with respect to Zamkovoy connection on para-Kenmotsu manifold.

Key words and phrases : Para-Kenmotsu manifold, Zamkovoy connection, Ricci soliton, W_i-curvature tensor.
2020 Mathematics Subject Classification: 53C15.

1. INTRODUCTION

The notion of para-Kenmotsu manifold analogous to the structure of Kenmotsu manifold [7] was introduced by Welyczko [23]. Also, Sinha and Sai Prasad [19] introduced para-Kenmotsu manifolds as a subclass of para-contact manifold. Further, para-Kenmotsu manifolds have been studied by many researcher. For instance, we see ([4], [12], [13], [17], [18]) and the references therein.

In 2008, the notion of Zamkovoy canonical connection (briefly, Zamkovoy connection) on para contact manifold was introduced by S. Zamkovoy

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ON PSEUDO-PROJECTIVE CURVATURE TENSOR OF SASAKIAN MANIFOLD ADMITTING ZAMKOVOY CONNECTION

ABHIJIT MANDAL AND ASHOKE DAS

ABSTRACT. The purpose of the present paper is to study some properties of Sasakian manifolds with respect to Zamkovoy connection. Here, we study pseudo-projectively flat, quasi-pseudo-projectively flat and ϕ-pseudo-projectively flat Sasakian manifolds admitting Zamkovoy connection. Further, we study generalized pseudo-projective ϕ-recurrent Sasakian manifolds along with some more curvature properties of Sasakian manifolds with respect to Zamkovoy connection.

Key Words: Sasakian manifold, Zamkovoy connection, pseudo-projective curvature tensor.
2010 Mathematics Subject Classification: Primary: 53C15; Secondary: 53C25.

1. INTRODUCTION

A linear connection $\bar{\nabla}$ defined on a Riemannian manifold M is said to be symmetric if torsion $\bar{T}$ of $\bar{\nabla}$ defined by

$$\bar{T}(X,Y) = \bar{\nabla}_X Y - \bar{\nabla}_Y X - [X,Y],$$

is zero for any vector fields X, Y on M, otherwise, it is said to be non-symmetric. In 1932, Hayden [12] gave the idea of a metric connection on a Riemannian manifold and later named such connection a Hayden connection. A linear connection $\bar{\nabla}$ is called metric connection on a

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ZAMKOVOY CONNECTION ON LORENTZIAN PARA-SASAKIAN MANIFOLDS

ABHIJIT MANDAL

Abstract. The object of the present paper is to introduce a new non-metric linear connection named as Zamkovoy connection in Lorentzian para-Sasakian manifolds (briefly, LP-Sasakian manifolds). In this paper we obtain expressions for Riemannian curvature tensor (R^*), Ricci tensor (S^*), Ricci operetor (Q^*) and scalar curvature (r^*) with respect to Zamkovoy connection in LP-Sasakian manifolds. Moreover, we study generalized recurrent and generalized concircular ϕ-recurrent LP-Sasakian manifolds with respect to Zamkovoy connection. Besides these, we discuss an LP-Sasakian manifold M satisfying $W^*(X,Y).R^* = 0$, for all vector fields X, Y on M, where W^* denotes concircular curvature tensor with respect to Zamkovoy connection.

1. INTRODUCTION

Zamkovoy connection was introduced by S. Zamkovoy [16] and it was defined as a canonical para-contact connection whose torsion is the obstruction of para-contact manifold to be a para-sasakian manifold. In [1,2], A. Biswas and K.K. Baishya studied this connection for a generalized pseudo Ricci symmetric Sasakian manifolds as well as for an almost pseudo-symmetric Sasakian manifolds. Motivated by their studies, I have tried to introduce Zamkovoy connection on LP-Sasakian manifolds and to find some properties of LP-Sasakian manifolds with respect to this connection. Zamkovoy connection was further studied by A. M. Blaga, A. Mandal, A. Das [3, 7–9].

The Zamkovoy connection ∇^* for an n-dimensional almost contact metric manifold M equipped with an almost contact metric structure (ϕ, ξ, η, g) consisting of a $(1,1)$ tensor field ϕ, a vector field ξ, a 1-form η and a Riemannian metric g, is defined as

$$\nabla^*_X Y = \nabla_X Y + (\nabla_X \eta)(Y)\xi - \eta(Y)\nabla_X \xi + \eta(X)\phi Y, \quad \forall X, Y \in \chi(M), \tag{1.1}$$

where $\chi(M)$ denotes the set of all vector fields on M.

In 1989, K. Matsumoto [10] first introduced the notion of LP-Sasakian manifolds. In this context it may be mentioned that I. Mihai and R. Roşca [11] also introduced independently the notion of LP-Sasakian manifolds in 1992. The generalized recurrent manifolds was introduced by Dubey [6] and it was studied by De and Guha [4]. The ϕ-recurrent LP-Sasakian manifold was studied by A.A. Shaikh [13]. Moreover, the ϕ-concircularly flat LP-Sasakian manifold was studied by A. Taleshian [14]. Apart from this, the properties of LP-Sasakian manifolds were studied by several authors. For instance, we see [5,12] and their references.

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RESEARCH ARTICLE

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Effector functions of Th17 cells are regulated by IL-35 and TGF-β in visceral leishmaniasis

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Abstract

Visceral leishmaniasis (VL) is a debilitating human pathogenesis in which the body's immune functions are severely compromised. Various subsets of T cells, including Th17 cells are important regulators of immune responses observed in various pathologies. The role of Th17 cells and its correlation with immuno-regulatory cytokines are however not well understood in human VL. Herein we studied how IL-17 is associated with the progression of *Leishmania donovani* infection using murine model of VL. We found induction of a strong IL-17 response at the early phase of infection which progressively reduced to basal level during chronic VL. The mechanistic study of this behavior was found to be linked with the role of regulatory T cells ($CD4^+CD25^+$ T cells) that suppresses the proliferation of the Th17 cell population. Moreover, TGF-β and IL-35 derived from $CD4^+CD25^+$ T cells are the key mediators for the downregulation of IL-17 during chronic VL. Thus, this study points to an antagonistic effect of Tregs and Th17 cells that can be used for designing better therapeutic and preventive strategies against leishmaniasis.

KEYWORDS

IL-35, immune suppression, immune therapy, leishmania, regulatory T cells, TGF-β, Th17

Abbreviations: CFSE, carboxyfluorescein succinimidyl ester; IFN-γ, interferon gamma; IL, interleukin; Lag, leishmanial antigen; LDA, limiting dilution assay; LDU, Leishman-Donovan units; MCP-1, monocyte chemoattractant protein-1; NO, nitric oxide; RORγt, retinoic-related orphan receptor gamma-t; TGF-β, transforming growth factor beta; Th1, T helper type 2 cells; Th17, T helper type 17 cells; TNF-α, tumor necrosis factor alpha; Treg, regulatory T cells.

Mohammad Asad and Abdus Sabur are Co-first Authors.

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LP-SASAKIAN MANIFOLDS EQUIPPED WITH ZAMKOVOY CONNECTION AND CONHARMONIC CURVATURE TENSOR

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Abstract. The paper concerns with some results on conharmonically flat, quasi-conharmonically flat and $\phi-$conharmonically flat LP-Sasakian manifolds with respect to Zamkovoy connection. Also, it contains study of generalized conharmonic $\phi-$recurrent LP-Sasakian manifolds with respect to Zamkovoy connection. Moreover, the paper deals with LP-Sasakian manifolds satisfying $\mathcal{K}^*(\xi, U).R^* = 0$, where $\mathcal{K}^*$ denotes conharmonic curvature tensor and R^* denotes Riemannian curvature tensor with respect to Zamkovoy connection, respectively.

Key words and Phrases: LP-Sasakian manifold, Zamkovoy connection, Conharmonic curvature tensor

1. Introduction

In 1989, K. Matsumoto [13] first introduced the notion of Lorentzian para-Sasakian manifolds (briefly, LP-Sasakian manifolds). Also, in 1992, I. Mihai and R. Rosca [14] introduced independently the notion of Lorentzian para-Sasakian manifolds in classical analysis. The generalized recurrent manifolds was introduced by Dubey [8] and it was studied by De and Guha et al. [6]. In this context, $\phi-$recurrent LP-Sasakian manifold was first studied by A. A. Shaikh, D. G. Prakasha and Helaluddin Ahmad [15]. On the other hand, $\phi-$conharmonically flat LP-Sasakian manifold was introduced by A. Taleshian [16]. Apart from these, the properties of LP-Sasakian manifolds were studied by several authors, namely U. C. De [7], C. Ozgur [17] and many others.

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By studying objects, images and writings left behind by participants and observers and investigating the 'fragile hope' embedded in these productions, this monograph has unearthed a rich resource for those interested in the hidden and forgotten facets of the First World War's links with colonial India. The lives, memories and contemporary responses obscured by time have been painstakingly collected and surveyed. Their haunting quality and resonance are perhaps best captured in these lines of a Punjabi folksong by women quoted at the beginning of the book: 'The war pains me like hot sand in a cauldron/ every household now has widows.' By unraveling the cultural imprints of chaos, ravages and pain in the wake of a conflict between colonial powers more than 100 years ago, this book enriches our understanding of the war and those who bore its burdens. It arrives at a time when the most powerful states of the planet continue to pursue the goals of imperialism and millions die as a result from Afghanistan to Yemen.

Suchetana Chattopadhyay
Jadavpur University (Kolkata)

Suchetana Chattopadhyay, *Voices of Komagata Maru: Imperial Surveillance and Workers from Punjab in Bengal*, Tulika Books, New Delhi, 2018, xxi – 178, Rs. 575 (Hardback), ISBN: 978-81-934015-8-3.

On the eve of the World War I Calcutta was not only a commercial passage of the British Empire, but an important centre of colonial authority of surveillance and practicing repressive policies to secure imperial interest. As a hotbed of colonial capital in Eastern India and connected with global markets it also attracted migratory labour forces from all over South Asia that gave the area a multicultural identity. This cosmopolitan character of Calcutta and its hinterland also shaped the political identity of this region in where anti-colonial protest of underground revolutionaries led by the middle class Bengali *bhadralok* community intermingled with the struggle of poor migrant labourers. During the early war-time era in Bengal, Punjabi Sikh migrant passengers of the *Komagata Maru* were massacred upon arrival due to colonial repression and racial discrimination – 21 of them including some local inhabitants were shot dead by the British troops; several were arrested and some kept under surveillance in the coming decades also. This single event played a vital role in instigating various forms of anti-colonial and anti-capitalist resistance in India throughout the 1920s and 1930s. The existing scholarships on the Ghadar movement or the *Komagata Maru* incident have neglected this historioghaphic thread of colonial repression and emergence of Punjabi people's resistance from below in Bengal. In the backdrop of the *Komagata Maru* incident, this monograph traces the way in which trans-regional surveillance and repression of the Empire from above and its counter resistance from below connected the Bengal hinterland with Punjab, East Asia and North America.

broke from their elitist confinement and tried to forge links with the Ghadar and pan-Islamist organizations, the Punjabi Sikh activists, in turn, used the network of underground revolutionary activism, *gurudwaras* and neighbourhood communities to resist British oppression. Thus, a pan-nationalist revolutionary network was gradually emerging which played a crucial role in the anti-colonial movement during wartime and in the post-war period.

The fourth chapter is an account of the forgotten memory of active participation of Punjabi Sikh inhabitants of Calcutta and its hinterland in working class movements and left politics of post-war Bengal. Here the author traces how personal memory of imperial racism and repression of Gurdit Singh and other activists who travelled on *Komagata Maru* influenced the collective memory of the working class people irrespective of religious identity and prompted them to join hands against anti-imperialist and anti-capitalist agitation throughout the late colonial period.

By way of conclusion, Chattopadhyay successfully traces the inter-connections between the passage of the Punjabi Sikh migratory workforce, uprooted by the colonial land revenue policy, memory of their miseries, colonial repression and also formation of collective resistance of these migrants. This study represents an alternative historiographical account, completely different from the popular narrative which portrayed the migrant Punjabi Sikh workforce of Bengal either as a martial race, loyal to the colonial authority or a trouble making rioting community. Through this alternative narrative Chattopadhyay upholds the development of political consciousness among the migrant minority as a working class diaspora and their collective resistance alongside other working people irrespective of caste and religion for better wages and livelihood, and transformation of their political self from Ghadar inspired anti-colonial mobilization to the left-lining revolutionary consciousness and communist internationalism that led to the formation of political branch organizations like *Kirti Dal* and *Naujawan Bharat Sabha* in Bengal. The incident of *Komagata Maru* was pivotal in this transformation.

Overall, this is a classic example of historical research exploring unaddressed historical narrative from below, which connects many events of global with local, everyday memory with longue duree. It deals with archival materials and other secondary sources unused so far. Use of various rare archival photographs gives an extra weight; through them readers can feel the essence of a forgotten memory of rebels and their habitat in the past century. The work must be regarded as an insightful research mapping a neglected terrain of historiography triggered by a traumatic event of colonialism's violent history. Chattopadhyay opens up aspects of diaspora studies and people's history of late colonial Bengal which could be a great resource for future researchers.

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Metal-free multicomponent approach for the synthesis of propargylamine: a review

Sujit Ghosh *[a] and Kinkar Biswas *[b]

Propargylamines are important classes of alkyne coupled amine compounds used in heterocyclic chemistry and pharmaceuticals chemistry and have a large impact as a pharmacophore used in medicinal chemistry. One of the straightforward approaches for the synthesis of this class of compound is A3 coupling, a three-component coupling reaction among aldehyde, alkyne (terminal acetylene) and amine. However, there are many methods other than conventional three component alkyne–aldehyde–amine (A3) coupling which have also been reported for the synthesis of propargylamine. Most of these methods are based on the metal catalyzed activation of terminal alkyne. From the perspective of green and sustainable chemistry, the scientific community should necessarily focus on metal-free techniques which can access a variety of propargylamines. There are only a few reports found in the literature where propargylamines were successfully synthesized under metal-free conditions. This present review article neatly and precisely encompasses the comprehensive study of metal-free protocols in propargylamine synthesis putting forth their mechanisms and other aspects.

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1. General introduction

Propargylamines are important classes of organic scaffolds,[1] and have significant importance as intermediates for the synthesis of multifunctional amino derivatives,[2] natural products,[3] as well as biologically active compounds.[4] Asymmetric propargylamines are important precursors for the synthesis of many drug molecules.[5] Annulation, cyclization and cascade transformation of various derivatives of propargylamine lead to the formation of miscellaneous heterocyclic compounds,[6] such as pyrroles,[7] pyrrolines,[8] pyrrolidine,[9] pyrazines,[10] pyrazoles,[11] thiazoles,[12] thiazolidines,[13] isoxazoles,[14] oxazolidines,[15] pyridines,[16] dihydropyridines,[17] *etc.*

Among the various methods of its synthesis, metal catalytic A3 coupling reaction,[18] is the major one. One-pot three-

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Dr Sujit Ghosh received his M.Sc. degree in Chemistry with specialization in organic chemistry (2007) from University of North Bengal, India. Afterwards, he joined the group of Prof. Basudeb Basu at University of North Bengal as a doctoral student. His doctoral work was based on the various 'greener approaches' towards organic transformations using transition metal catalysts and eco-friendly reaction media. Currently, he is working as an assistant professor in chemistry at Raiganj Surendranath Mahavidyalaya, India. The area of various fields of his research interest is development of greener reaction methodology, organic synthesis, designing new organic molecules and organometallic reactions.

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PROJECTIVE CURVATURE TENSOR WITH RESPECT TO ZAMKOVOY CONNECTION IN LORENTZIAN PARA-SASAKIAN MANIFOLDS

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Abstract. The purpose of the present paper is to study some properties of Projective curvature tensor with respect to Zamkovoy connection in Lorentzian Para Sasakian manifold(briefly, LP-Sasakian manifold). We obtain some results on Lorentzian Para-Sasakian manifold with the help of Zamkovoy connection and Projective curvature tensor. Moreover, we study the LP-Sasakian manifold satisfying $P^*(\xi,U)\circ W_0^* = 0$ and $P^*(\xi,U)\circ W_2^* = 0$, where P^*, W_0^* and W_2^* are Projective curvature tensor, W_0- curvature tensor and W_2-curvature tensor with respect to Zamkovoy connection respectively.

Key words and Phrases: LP-Sasakian manifolds, Zamkovoy Connection, Projective Curvature tensor

1. INTRODUCTION

In 1989, K. Matsumoto [7] first introduced the notion of Lorentzian Para-Sasakian manifolds. Also, in 1992, I. Mihai and R. Rosca [8] introduced independently the notion of Lorentzian Para Sasakian manifolds(briefly, LP-Sasakian Manifolds) in classical analysis. In an $n-$ dimensional metric manifold the signature of the metric tensor is the number of positive and negative eigenvalues of the metric. If the metric has s positive eigenvalues and t negative eigenvalues then the signature of the metric is (s,t). For a non-degerate metric tensor $s+t=n$. A Lorentzian manifold is a special case of a semi Riemannian manifold, in which

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ON M-PROJECTIVE CURVATURE TENSOR OF SASAKIAN MANIFOLDS ADMITTING ZAMKOVOY CONNECTION

ABHIJIT MANDAL[1] AND ASHOKE DAS

ABSTRACT. The purpose of the present paper is to study some properties of Sasakian manifold admitting Zamkovoy connection. We study $M-$ Projectively flat, as well as $\phi-M-$Projectively flat Sasakian manifolds admitting Zamkovoy connection. Moreover, we discuss locally $M-$Projectively $\phi-$symmetric Sasakian manifold with respect to Zamkovoy connection. Besides these, we discuss Sasakian manifolds satisfying $\overline{M}(\xi,U)\circ\overline{R}=0$, where $\overline{M}$ and $\overline{R}$ are $M-$Projective curvature tensor and Riemannian curvature tensor with respect to Zamkovoy connection respectively.

1. INTRODUCTION

The notion of Sasakian structure [12] was introduced by Japanese mathematician S. Sasaki in the year 1960. If a contact metric manifold is normal then the manifold is said to be a Sasakian manifold. In some respect, Sasakian manifolds may be viewed as an odd dimensional analogues of Kâhler manifolds.

In 1971, Pokhariyal and Mishra [9] introduced the notion of $M-$Projective curvature tensor on Riemannian manifold. Properties of the $M-$projective curvature tensor in Sasakian manifolds were studied by R.H. Ojha [7]. Also, in [11], R.H. Ojha studied some properties of $M-$Projective curvature tensor in

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PSEUDO PROJECTIVE CURVATURE TENSOR ON SASAKIAN MANIFOLDS ADMITTING ZAMKOVOY CONNECTION

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(*Received 21 October 2020, revision received 6 December 2020*)

Abstract. The purpose of the present paper is to study some properties of Sasakian manifolds admitting Zamkovoy connection. In this paper we obtain expressions for pseudo projective curvature tensor $(\overline{P}^*)$, Riemannian curvature tensor (R^*), Ricci tensor (S^*), Ricci operetor (Q^*) and scalar curvature (r^*) with respect to Zamkovoy connection in Sasakian manifold. We also study pseudo projectively flat, quasi pseudo projectively flat and $\phi-$pseudo projectively flat Sasakian manifolds admitting Zamkovoy connection. Moreover, we study generalized pseudo projective ϕ-recurrent Sasakian manifolds with respect to Zamkovoy connection. Besides these, we discuss Sasakian manifolds satisfying $\overline{P}^*(\xi, X) \circ R^* = 0$, where $\overline{P}^*$ denotes pseudo projective curvature tensor and R^* denotes Riemannian curvature tensor with respect to Zamkovoy connection respectively.

Mathematics Subject Classification 2010 : 53C15, 53C25.

Key words and phrases : Sasakian manifolds, Zamkovoy connection, pseudo projective curvature tensor.

1. Introduction. Sasakian manifold (Sasaki, 1960) with Riemannian metric was defined by Japanese mathematician S. Sasaki in the year 1960. Sasaki manifolds may be viewed as an old dimensional analogue of Kâhler manifolds. This manifold was further studied by several authors, namely B. P. Charles, James Sparks, Shing-Tung Yau, Z. Olszak, M. C. Chaki and M. Tarafdar (Boyer and Galicki, 1999, Dario, James and Shing-Tung, 2008, Olszak, 1978 and Chaki and Tarafdar, 1990).

In Riemannian manifold of dimension $n > 2$, the pseudo projective curvature tensor was introduced by B. Prasad (Prasad, 2002) in 2002. In 2011, H. G. Nagarjuna and G. Somashekhara showed that every pseudo projectively flat and pseudo projective semi symmetric Sasakian manifolds are locally isomorphic to unit sphere. The properties

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Research Article

Immunodetection of *Alternaria alternata* and Evaluation of Antifungal Compounds in Tea Leaf Tissues Following Challenge Inoculation with Pathogen

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Abstract

Varietal resistant test of tea against *Alternaria alternata* was done following whole plant inoculation technique. Among the ten tea varieties tested, four were found to be highly resistant, four were highly susceptible and rest two were moderately resistant. Polyclonal antibody (PAb) raised against mycelial antigens of *A. alternata* and IgG was purified by ammonium sulphate precipitation and DEAE – Sephadex column chromatography. Effectiveness of raising antibody against the pathogen was confirmed by agar-gel double diffusion test and optimization of antigen and antibody concentrations was done using PTA-ELISA format. The pathogen could be detected in leaf tissues following inoculation with *A. alternata* using PTA-ELISA and dot immunobinding assay. Cellular localization of the pathogen was also evident as bright fluorescence mainly in mesophyll tissues using PAb of *A. alternata* labeled with FITC. Catechin extracted from healthy and infected tea leaves were compared by HPLC. A corresponding decrease in EGCG, and increase in GC, EPC, GCG and ECG were observed. Antifungal compounds isolated from healthy and *A. alternata* inoculated tea leaves exhibited clear inhibition zone at R_F 0.65 in chromatographic bioassay. On the basis of their colour reaction on TLC and UV-spectra compound was identified to be pyrocatechol. Resistant varieties accumulated 497-573 µg/g fresh wt tissue and susceptible varieties accumulated 257-286 µg/g fresh wt tissue of pyrocatechol respectively, after 48h after inoculation with *A. alternata,* while a low concentration (69-110 µg/g fresh tissue) of this compound was detected in healthy leaf tissue.

Key words: *Alternaria alternata*, catechin, DIBA, indirect immunofluorescence, PTA-ELISA, pyrocatechol, tea

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CONTENTS

Arise ! Awake ! And stop not till the goal is reached. –Swami Vivekananda

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Root colonization with Arbuscular mycorrhizal fungi and Dark septate Endophytes in Tea plants

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Root colonization with arbuscular mycorrhizal fungi (AMF) and dark septate endophyte (DSE) were studied in fifteen tea varieties, of which six UPASI varieties (UP-2, UP-3, UP-8, UP-9, UP-26 and BSS-2) and nine Tocklai varieties (TV-18, TV-9, T-17, TV-22, TV-23, TV-25, TV-26, TV-29 and TV-30) being grown in Tea Germplasm Bank (15 year old bush in experimental field) of Department of Botany, University of North Bengal. The physical nature of arbuscules, vesicles, intraradical hyphae and dark septate endophyte associations were studied extensively to determine the colonization impact of these tea varieties. Highest percentage of root colonization (86-88%) were noticed in some UPASI varieties of which biclonal seed stock (BSS-2) yielded highest root colonization. Besides, among nine Tocklai tea varieties tested, TV-29 yielded highest (87%) root colonization. Paris type hyphae are abundant in all the varieties that come from *Glomus* sp. along with some coiled arbuscular structure that proves the infections of some *Gigaspore* species. The mycelium of dark septate endophyte (DSE) was observed in all the tea varieties but most extensively was in BSS-2, UP-3, UP-8, TV-18, T-17, TV-22 and TV-26.

Key words : Arbuscular mycorrhizal fungi, dark septate endophyte, *Glomus*, *Gigaspora*, root colonization.

INTRODUCTION

Tea (*Camellia sinensis* (L.) O. Kuntze.), is the major plantation crop of North- East India and forms the backbone of the economy of this region. It is a perennial and survives for more than 100 years. After water, tea is the most widely consumed beverage in the world. Tea contains catechins, a type of antioxidant. In a freshly picked tea leaf, catechins can comprise up to 30% of the dry weight. Catechins are highest in concentration in white and green teas, while black tea has substantially fewer due to its oxidative preparation. It has a cooling, slightly bitter, astringent flavour which is enjoyed by many people. The major tea growing areas of India are Darjeeling, Terai and Dooars of West Bengal, Assam and Nilgiri (Kerala and Tamil Nadu). The high quality and distinct flavour and aroma of Darjeeling tea is a result of unique climate, soil, altitude and processing methods prevalent in Darjeeling. In tea plantations, with the reduction in the permissible levels of chemicals which can be used, there is urgent need for identification and selection of beneficial microbes which have the potential to control diseases and also increase productivity. Arbuscular mycorrhizas are by far the most prevalent of all mycorrhizal categories with more than 80% of all plant species showing an association involving a few fungal genera in the Glomeromycota. Mycorrhizas increase nutrient uptake from the soil. Also it can be used in the biocontrol of pathogenic fungi and nematodes (Chakraborty, 2019). Dark septate endophytes (DSE) are a group of hetero-geneous endophytic fungi which are characterized by melanized hyphae within plant roots. Critically the role of DSE is still not understood. The occurrence of arbuscular mycorrhizal fungi and association of dark septate endophytes in tea root system of Darjeeling, Tocklai and UPASI varieties are discussed in the present study.

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MATERIALS AND METHODS

Host Plants

Fifteen tea varieties, of which six UPASI varieties (UP-2, UP-3, UP-8, UP-9, UP-26 and BSS-2) and

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FULL LENGTH ARTICLE

Evaluation of leaf extracts of *Azadirachta indica*, *Catharanthus roseus* and *Diplazium esculentum* on tea plants for induction of resistance against *Alternaria alternata*

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Among the ten tea varieties tested for screening of disease resistance against *A. alternata*, Teen Ali 17/1/54 showed most susceptible reaction towards the pathogen. Foliar application of aqueous leaf extracts of three selected plants (*Azadirachta indica*, *Catharanthus roseus* and *Diplazium esculentum*) on tea plants (Teen Ali 17/1/54) were evaluated against *Alternaria* blight disease. Reduction in disease incidence by application of these extracts was evident. The level of defense enzymes such as phenylalanine ammonia lyase, chitinase and β-1, 3-glucanase following challenge inoculation of ten tea varieties with *A. alternata* were determined. Time course accumulation of these defense enzymes were found to be higher in untreated inoculated plants in comparison to untreated healthy plants and increased accumulation of all three defense enzymes were further noticed in treated inoculated tea plants in comparison to treated healthy plants. Indirect immunofluorescence studies revealed that tea leaf tissue exhibited high level of chitinase deposition mainly in the mesophyll tissues following treatment with aqueous leaf extracts of *A. indica*, *C. roseus* and *D. esculentum*. The investigation support the hypothesis that plant extract may induce indirectly defense reactions in tea plants towards the foliar fungal pathogen.

Key words: *Camellia sinensis*, *Alternaria alternata*, plant extract, *Azadirachta indica*, *Catharanthus roseus*, *Diplazium esculentum*, induced resistance.

INTRODUCTION

Tea [*Camellia sinensis* (L.) O. Kuntze] is one of the most important plants from the economic viewpoint and being a perennial is always challenged by pests and pathogens. Alternaria blight, a foliar disease of tea caused by *Alternaria alternata* (Fr.) Keissler is very common in the nursery grown plants (Fig. 1). Disease symptoms appear as greyish brown patches on the young leaves. Older leaves were less susceptible. Symptoms first appear in the tip region and the margin of the leaves, which extend towards the midrib following which the leaves curl, and die. It causes serious infection leading defoliation of leaves. It causes considerable damage to the plants maintained in the nursery as well as in the field (Chakraborty *et al*, 2006).

Integrated plant disease management has been considered as a holistic approach keeping in view the agroecological system and the overall situation of

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Internal Oligoguanidinium Transporter: Mercury Free Scalable Synthesis, Improvement of Cellular Localization, Endosomal Escape, Mitochondrial Localization and Conjugation with Antisense Morpholino for NANOG Inhibition to Induce Chemosensitization of Taxol in MCF-7 Cells

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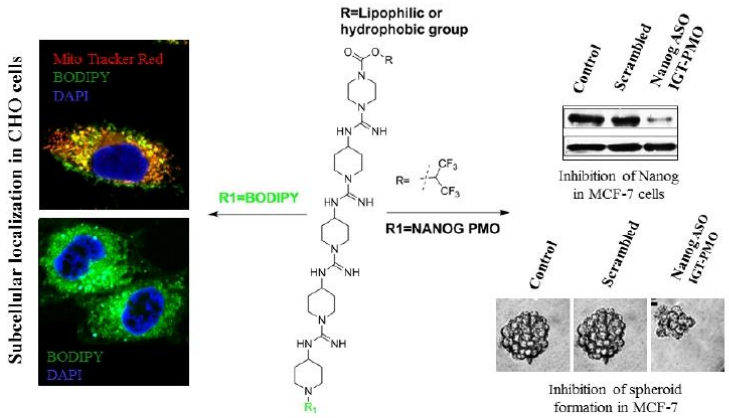

ABSTRACT: A non toxic delivery vehicle is essential for the therapeutic applications of antisense phosphorodiamidate morpholino oligonucleotides (PMOs). Though guanidinium rich or arginine rich cellular transporter conjugated Vivo-PMO or PPMO has been developed for in vivo application, however, either their toxicity or stability has become an issue. Previously we reported non-peptidic internal guanidinium transporter (IGT) mediated delivery of PMO for gene silencing and got encouraging results. In this paper we report the synthesis of IGT using Hg-free method for scale up and *N*-terminal modification of IGT with a suitable hydrophobic or lipophilic group to improve the cell permeability, endosomal escape, mitochondrial localization and to reduce toxicity in MTT assay. For the delivery of PMO, IGT-PMO conjugate was synthesized to target *NANOG* in cells, a transcription factor required for cancer stem cell proliferation and embryonic development and is involved in many cancers. Our data shows IGT-PMO-facilitated NANOG inhibition and thereby the prevention of EpCAM-N-Cadherin-Vimentin axis mediated epithelial to mesenchymal transition (EMT) in MCF-7 cells. Moreover, unlike taxol, NANOG inhibition influences the expression of stemness factor c-Myc, Hh-Gli signaling proteins, other cancer related factors and their respective phenotypes in cancer cells. To the best of our knowledge, this is the first report to illustrate that the IGT-PMO-mediated NANOG inhibition increases the therapeutic potential of taxol and induces G0-G1 arrest in cancer cells to prevent the cancer progression. However, it warrants further investigations in other cancer cells and preclinical platforms.

INTRODUCTION

Phosphorodiamidate morpholino oligomers (PMO, 20-25mer) (**Figure 1**a)[1] are routinely used for gene silencing where they are designed to be complementary to the 5′ leader sequences or to the first 25 bases of 3′ to the AUG translational start site, and they act by steric blocking mechanism[2]. Their neutral backbone, nuclease stability, long-term activity, water solu-

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Evaluation of a Tubulin-Targeted Pyrimidine Indole Hybrid Molecule as an Anticancer Agent

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Several small molecules targeting microtubule dynamics have been developed because microtubules are considered to be one of the most successful cancer chemotherapeutic targets. In this regard, taxol is most worthy to mention which stabilizes microtubule polymer thereby causing defectsinmitotic spindle assembly, chromosome segregation and cell division resulting in cancer inhibition. In this direction, we have earlier reported a small molecule called Pyrimidine-Indole-Hybrid (**PIH** (**P**)) which was found to inhibit ciliogenesis by inhibiting both the acetylation and polymerization of tubulin subunits. Here, we have evaluated the anticancer activities of **PIH** (**P**) and its water soluble derivatives. Three water soluble derivatives of **PIH** (**P**) namely **6A**, **6B** and **6C** were synthesized. Among **PIH** (**P**) series of compounds, **PIH** (**P**) and **6C** were found to be the most potent compounds showing anti-proliferative and cytoskeletal disrupting activities against MCF-7 cells. Not only that, **PIH** (**P**) and **6C** also showed a promising effect in preventing cancer cell migration, invasion and colony-formation and helped to reduce spheroid formation by several-folds. They have potential to inhibit the activity of proteins (N-Cadherin, Vimentin) responsible for Epithelial to Mesenchymal Transition (EMT). Hence, this class of compound could be a new antimitotic agent that is different from taxol with respect to mechanism, particularly by destabilizing tubulin rather than causing stabilization.

1. Introduction

Microtubules along with microfilaments and intermediate filaments form the cytoskeleton of cell which regulates cell growth, movement and homeostasis.[1–4] Alterations in the expression of tubulin isotypes, microtubule-associated proteins (MAPs) and the post- translational modifications of tubulin lead to a wide variety of cancers and at the same time these changes are also known to influence drug resistance.[4,5] In this context it is worthy to mention that increased acetylation of α tubulin has been observed in cancer.[6] With the understanding of microtubule-based signaling pathways involved in cancers, a multi targeted therapy[7] or mitosis-specific agents[8] might be more coherent to eliminate cancer cells efficiently and also to limit the possibilities of drug resistance. In this regard, many small molecules have emerged as potential cancer treatment strategies as they are less expensive and more convenient to administer.[3,7,9–14] The most well-known anti mitotic drug, Taxol, has been found to stabilize microtubule polymerization,thereby causing defects in mitotic spindle assembly, chromosome segregation, cell division and also can activate non-cancerous cells of the immune system all of which leads to cancer inhibition.[15–18] In our laboratory, the mechanism of action of a small molecule based on pyrimidine indole hybrid (**PIH** (**P**)) structure was delineated and found to inhibit ciliogenesis by inhibiting the polymerization of tubulin subunits.[19] This result encouraged us to study the anticancer activity of **PIH** (**P**). For any drug to achieve the required pharmacological response, one of the important parameters to be taken into consideration is its solubility in water. In this paper, we report the synthesis of water soluble derivatives of **PIH** (**P**) and evaluate their anticancer activities through the inhibition of acetylated α-tubulin and other tumor inducing proteins in MCF-7 cells.

2. Results and Discussion

2.1. Chemistry

Our earlier report[19] suggested that substitution can be incorporated very easily at 1 or 2- position of indole in **PIH** (**P**) without changing much in the biological activity. Accordingly, for the synthesis of water soluble derivatives of **PIH** (**P**) we then decided to incorporate water soluble moiety in the indole part at this position keeping the hydrazine part of the molecule intact. Following the previously reported protocol the hydrazine pyrimidine derivative (**5**) was synthesized and characterized by X-ray crystal analysis (Supplementary figure S1). We chose triethylene glycol monomethyl ether as water

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PARASITOLOGY

Evaluation of Cysteine Protease C of *Leishmania donovani* in Comparison with Glycoprotein 63 and Elongation Factor 1α for Diagnosis of Human Visceral Leishmaniasis and for Posttreatment Follow-Up Response

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ABSTRACT Visceral leishmaniasis (VL) is a threat in many developing countries. Much effort has been put to eliminating this disease, for which serodiagnosis remains the mainstay for VL control programs. New and improved antigens as diagnostic candidates are required, though, as the available antigens fail to demonstrate equal optimum performance in all areas of endemicity. Moreover, these diagnoses are dependent on invasive serum sampling. In the current study, we cloned and expressed *Leishmania donovani* cysteine protease C (CPC) and evaluated its diagnostic and test-of-cure possibilities by detecting the antibody levels in human serum and urine through ELISA and immunoblot assays. Two immunodominant antigens, recombinant glycoprotein 63 (GP63) and elongation factor 1α (EF1α), identified earlier by our group, were also assessed by employing human serum and urine samples. Of these three antigens in ELISAs, CPC demonstrated the highest sensitivities of 98.15% and 96% positive testing in serum and urine of VL patients, respectively. Moreover, CPC yielded 100% specificity with serum and urine of nonendemic healthy controls compared to GP63 and EF1α. Urine samples were found to be more specific than serum for distinguishing endemic healthy controls and other diseases by means of all three antigens. In all cases, CPC gave the most promising results. Unlike serum, urine tests demonstrated a significant decrease in antibody levels for CPC, GP63, and EF1α after 6 months of treatment. The diagnostic and test-of-cure performances of CPC in the immunoblot assay were found to be better than those of GP63 and EF1α. In conclusion, CPC, followed by GP63 and EF1α, may be utilized as candidates for diagnosis of VL and to assess treatment response.

KEYWORDS immunology, infection, diagnosis, leishmaniasis, recombinant antigens, parasitology

Leishmaniasis is a set of diseases manifested by the infection of parasites belonging to the genus *Leishmania*. The parasites are carried to the mammalian hosts by the bite of an infected female sandfly of either the genus *Lutzomyia* (New world) or the genus *Phlebotomus* (Old world) (1). More than 20 species of *Leishmania* are responsible for infecting mammals, resulting in a wide spectrum of clinical manifestations. This includes visceral leishmaniasis (VL), cutaneous leishmaniasis (CL), and mucocutaneous leishmaniasis (MCL). The most serious of all clinical forms is VL, also known as kala-azar,

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MANAGEMENT INDUCED CHANGES IN POND WATER QUALITY AND GROWTH PERFORMANCE OF GOLDFISH, *Carassius auratus* (L.), IN TWO 11-WEEK GROWTH EXPERIMENTS CONDUCTED DURING THE SUMMER AND WINTER SEASONS

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Abstract

To assess the seasonal influence on the growth performance of goldfish, Carassius auratus (L.) in earthen ponds maintained under different production management regimes, two 11-week growth experiments were conducted during two different seasons (summer and winter) under tropical conditions in India. Weight gain, survival rate and fish deformities were compared among four management regimes in each season: (1) fish larvae fed with live zooplankton (LF); (2) direct fertilization with poultry manure (PM); (3) direct fertilization with cow dung (CD); (4) a control system (C), where a commercial diet containing 32% crude protein was applied. The LF treatment produced significantly higher weight gain and survival rate of goldfish ($P < 0.05$) in both the trials through maintenance of better water quality and greater abundance of zooplankton in the system. Fish deformities were highest in the C treatment in both the experiments. Water temperature averaged 27.5°C and 16.2°C, respectively, in the summer and the winter trials. Average weight gain and survival rates of goldfish achieved during the winter trial were considerably lower than the summer trial ($P < 0.05$).

Key words: *aquaculture management, fish production, goldfish, seasonal effect, water quality.*

INTRODUCTION

The bulk of ornamental fishes in the international aquarium trade is of freshwater origin and is farm-raised (Livengood and Chapman, 2007). The goldfish, *Carassius auratus* (L.), is a very popular ornamental fish and has a market for individuals as small as 4 g (minimum), that typically requires only about ten weeks of growth to attain the saleable size (Jha et al., 2006a; Jha, 2017). One of the critical bottlenecks that culturists have to face is the survival of the larvae that has just made the transition from an endogenous to an exogenous feeding habit in nursery tank conditions. Now, the same larvae, which have grown to about two weeks, are stocked under intensive culture conditions for quick growth in short period. Therefore, the level of expertise required in production management, particularly with relation to water quality is higher with ornamental fish than any other type of aquaculture (Watson and Shireman, 1996).

The fish are subjected to different kinds of aquaculture management that varies from farm to farm. The use of organic manures in ornamental fish production has been documented (Jha et al., 2004; Jha and Barat, 2005a). However, using organic manure can result in negative environmental impact (Jha, 2007) and supply of exogenous live food can be an effective alternative (Jha and Barat, 2005b; Jha et al., 2006b; 2008; Jha, 2019). Fish are unable to perform de novo synthesis of carotenoids (Goodwin, 1984) and rely on costly dietary supply to achieve their natural pigmentation (Paripatananont et al., 1999), since the market value of ornamental fish increases with intensity of skin colouration (Nica et al., 2019). Since Indian farmers are generally unable to provide costly dietary supplements, they stress on the supply of live food instead. Taking advantage of the tropical climate, fish culturists in India have the opportunity to harvest multiple crops throughout the year (Jha et al., 2007) where pond water temperature falls below 20°C for only three months in a year, i.e. mid-November to mid-February.

In the present experiment, two 11-week growth trials were conducted during two different seasons (summer and winter) to assess the

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Spectroscopic study of ^{38}K above the 31.67 μs isomer

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High-spin states of ^{38}K above the 31.67 μs (τ_m) isomer, populated through the ^{12}C(^{28}Si, np)^{38}K reaction with a 110 MeV ^{28}Si beam, have been studied by using the Indian National Gamma Array (INGA) facility. Two new levels and four new transitions have been added to the existing level scheme. The spins and parities of most of the levels above the isomer have been assigned, modified, and confirmed from $R_{\rm DCO}$, $R_{\rm ADO}$, and linear polarization measurements. The multipole mixing ratios (δ) for a few transitions have been measured. Large-basis shell-model calculations have been performed to understand the microscopic origin of these levels. In our calculations, different particle restrictions in sd- and pf-shell orbitals were used to reproduce the experimental level energies. Two-nucleon transfer spectroscopic factors have also been calculated for the levels above the isomer to support the new spin and parity assignments. Prediction of collective excitation at high excitation energy in ^{38}K is also discussed.

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I. INTRODUCTION

Nuclei in the neighborhood of doubly closed ^{40}Ca usually exhibit the characteristic of spherical single-particle excitation spectra [1] and their excitation spectra are well explained by the spherical shell model [2–7]. Recent developments of detector and data-acquisition systems made it possible to study these nuclei at higher angular momentum and excitation energy. As a result, the coexistence of single-particle and collective excitations have been observed in a few sd shell nuclei, viz., ^{40}Ca [8], ^{36}Ar [9], ^{35}Cl [10], etc. In these nuclei, the single-particle excitations are mostly dominant at low excitation energies and collective excitations in terms of normal deformed or even superdeformed (SD) bands are found at relatively higher excitation energies. Shell-model calculations with multiparticle multihole excitation have been performed successfully to understand the microscopic origin of these observed SD bands. The origin of the observed SD bands in ^{40}Ca [8], ^{36}Ar [9], ^{35}Cl [10] nuclei are explained in terms of 8p-8h [11], 4p-4h [12], and 3p-3h [10] excitations, respectively, in shell-model calculations. The presence of α-cluster structure of the states of these SD bands has already been discussed in Refs. [10,13,14]. The presence of α clusters at low excitation energy has been predicted recently in the non-α-conjugate ^{34}S nucleus [15]. The α-cluster structure in ^{34}S and ^{35}Cl has been studied by using shell-model calculations [10,15]. Therefore, this region gives us an opportunity to investigate experimentally the interplay between single-particle and collective-mode excitations and interpret them theoretically by using large-basis shell-model calculations.

^{38}K is an odd-odd ($N = Z = 19$) nucleus in the upper sd shell. In the recent past, we investigated the high-spin structure of a few upper sd shell nuclei, viz., ^{33}S [2], ^{34}Cl [3], ^{35}Cl [10], and ^{37}Ar [7]. The low-lying states of these nuclei are primarily generated from single-particle excitations. However, at higher excitation energy, the signature of collective excitation has been found. In ^{35}Cl, a superdeformed band has been observed above 8 MeV excitation energy. A candidate superdeformed band has been identified in ^{33}S [2] above 3 MeV excitation energy. In ^{34}Cl and ^{37}Ar, large configuration mixing in terms of different particle partitions in their calculated wave functions obtained from shell-model calculations clearly indicate the presence of collective excitations at higher excitation energy. It has also been noted that two normal deformed bands generated from 4p-4h excitation have also been reported in ^{38}Ar [16]. ^{38}Ar is the isobaric partner nucleus of ^{38}K. So, one may also expect collective excitations at higher excitation energy in ^{38}K, generated from multiparticle multihole excitations.

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REVIEW ARTICLE

Ion-exchange Resins and Polypeptide Supported Catalysts: A Critical Review

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Abstract: Heterogeneous catalysis represents one of the important areas in the field of organic synthesis. Major developments have been emerged during last few decades and polymer-supported catalysts have been employed successfully in various catalytic organic transformations. Ion-exchange resins and polypeptides are two important examples of such heterogeneous polymer-supported catalysts among others because of their easy accessibility, stability, recoverability and reusability. Cross-linked ion-exchange resins and polypeptides are highly insoluble, which make them better choice in terms of their easy separation from the reaction mixture and subsequent recyclability. The present review article provides an overview of different types of ion exchange resins as polymer-supported catalysts such as amberlite resin, polystyrene resin, polyionic gel-based systems, ion-exchange resins and proline-immobilized species, PEG-bound poly (amino acid), amino acid anchored with Merrifild resin, amphiphilic block polypeptides *etc.* Their preparation, characterizations and catalytic applications in diverse organic transformations have been presented with critical analysis on their stability, mechanistic overview and suitability *etc.*

Keywords: Ion-exchange resins, polypeptides, polymer supports, nanoparticles, cross-coupling reactions.

1. INTRODUCTION

The Green chemistry promotes environmentally benign protocols comprising of energy consumption, atom efficiency and sustainability of chemical processes [1, 2]. Over the last three decades, scientists have concentrated on the exploration of new methods to replace toxic and harmful solvents by more environmentally benign alternatives [3-15]. Additionally, the design of more environmentally important and low impact protocols, including the use of magnetically separable nanomaterials [16-18], solvent-free reactions [19, 20], ultrasound-assisted reactions [21] and microwave-assisted organic synthesis (MAOS) [22-24] are also considered as greener protocols. Again, catalysis is considered as a foundational stone of green chemistry. Conventionally, the homogeneous catalysts are frequently applied in classical organic reactions to achieve target molecules. Suitably designed heterogeneous catalysts offer several advantages over homogeneous counterparts including easy separation and recyclability. Several polymeric materials and composites have been applied as heterogeneous catalysts.

Organic synthesis is mainly assisted by catalysis and further on by catalyst recovery and recycle [25, 26]. Catalyst recovery and reuse is the most emerging part in chemical transformations. Catalytic technologies leading to the synthesis of chemicals are still largely dominated by homogeneous catalysts, whose separation from the reaction products and reuse is a major concern [27-29]. Due to the easier workup and integration in reactor equipment, the chemical industry has a strong preference for solid catalysts [30-32]. In order to recover and recycle the homogeneous catalysts, various techniques were developed over the last two decades involving the immobilization of a catalyst precursor onto an insoluble support material, so that the catalyst can be quantitatively separated by filtration and recycled. Preformed molecular homogeneous chemical catalysts (usually metal complexes or organometallic compounds) are most conveniently anchored to diverse materials through non-covalent binding. This is referred to as the heterogenization of homogeneous catalysts [33, 34]. The use of ion-exchange resins as Bronsted and/or Lewis solid acid catalysts can be recovered by simple extraction procedures [35-38]. The present article focuses primarily on diverse applications of ion-exchange resins and polypeptide supported catalysts in various organic reactions.

A variety of solids, often like inorganic and organic surfaces and their hybrid materials, draw immense attention to the field of catalysis. In this short review, we mainly emphasize organic polymeric solids and biocompatible renewable polymeric surfaces (ion exchange resin and polypeptides) involved in many organic reactions and various techniques of catalyst recovery include precipitation, filtration, decantation, centrifugation and magnetic separation have been carefully discussed.

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REVIEW ARTICLE

Recent Advances in Microwave Promoted C-P Cross-coupling Reactions

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Abstract: Organophosphorous compounds are of potential importance in diverse fields. They are often used as intermediates for making functionalized phosphine ligands as well as find vast applications in the areas of industrial, agricultural and biological chemistry. The microwave-assisted synthesis of C-P bonds has become increasingly popular because of its various advantages over conventional heating in the perspectives of green chemistry.

This review article has primarily focused on the synthesis of various organophosphorous molecules *via* microwave promoted C-P cross-coupling reactions under metal-catalyzed or metal–free conditions over the last two decades. The synthesis of phosphine ligands on 4,4′-bisquinolone structural framework, disubstituted phosphinic acid esters, vinyl phosphines, aryl- and vinylphosphonates, sugar and nucleoside phosphonates, aminobisphosphonates, triphenyl phosphines, water-soluble tertiary phosphine oxides and many other potentially useful organophosphorous compounds have been illustrated critically. The Hirao reaction, Michaelis-Arbuzov reaction and Sandmeyer type of reactions are generally involved in creating C-P bonds. The role of various metal catalysts, solvents, bases, additives and temperature in different literatures are carefully discussed.

Keyword: Organophosphorous, C-P bonds, cross-coupling, hirao reaction, michaelis-arbuzov, sandmeyer

1. INTRODUCTION

Organophosphorus compounds (containing at least one carbon–phosphorus bond) are considered important for the field of organic synthesis, material sciences, agricultural filed, industrial field, transition metal–catalyzed reactions, Metal-Organic Frameworks (MOFs) preparation and synthesis of biologically active molecules [1-9]. As a result, research on this field has attracted immense attention in the recent years. Over the last two decades, various synthetic methodologies for the preparation of organophosphorous compounds have been reported [10, 11]. Access to various organophosphorous molecules by a traditional addition reaction, Michaelis-Arbuzov reaction, has received particular attention [12-17]. Microwave is one of the electromagnetic radiations where the region (0.3 GHz-300 GHz) lies between radiowave (Rf) and Infrared (IR) frequencies with relatively large wavelengths (1 mm-1 m). This unconventional Microwave (MW) energy source has been used for heating food materials for almost the last five decades [18] and also being utilized for a variety of chemical applications including organic synthesis and material science over the last three decades [19-30]. Microwave heating during reactions has some advantages over conventional heating not only in terms of reaction rate acceleration or milder reaction condition but also for higher chemical yields involving lower usage of energy and different reaction selectivities. The two types of microwave effects are specific microwave effect and non-thermal microwave effect. Specifically, in the microwave technique, the heating effect cannot be easily emulated through the conventional heating methods. On the other hand, unusual observations in microwave chemistry can be explained by non–thermal microwave effects which do not involve the transfer of microwave energy into thermal energy [31].

The present article has primarily focused on the role of microwave irradiation technique used in various C-P bond forming reactions [32, 33] with possible mechanistic discussion, other critical aspects and the advantages over conventional heating techniques. The discussion has been categorized on the type of synthetic routes of organophosphorous compounds.

2. SYNTHESIS OF VARIOUS C-P BOND FORMING COMPOUNDS

2.1 Synthesis of Vinyl Phosphine

The conversion of vinyl triflates to vinylphosphines [34] can be functionalized through secondary phosphine functionalization (Scheme **1**). The preparation of polymeric phosphine ligands can be achieved through this process. The vinylphosphines synthesized by this protocol are fairly pure. The characterization of vinyl aryl phosphines was quite difficult. These phosphines were finally characterized through the conversion to the more stable borane complex. The dou-

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Nuclear Data Sheets for A=218

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Abstract: The evaluated data are presented for 11 known A=218 nulcides (Pb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa and U). For ^{218}Pb, ^{218}Bi, ^{218}At and ^{218}Pa, data are available only for the ground states. For ^{218}U, only the g.s. and a high-spin isomer are known, with no data on γ-ray transitions available. For ^{218}Po, ten excited states are known from ^{218}Bi decay, with no knowledge on the multipolarities of gamma-ray transitions. For ^{218}Th, five excited states in the g.s. band are known from an in-beam γ-ray study. Data on level half-lives, multipolarities and mixing ratios of gamma transitions is generally lacking for A=218 nuclei. The static magnetic dipole moment has been measured for only an isomer in ^{218}Fr. With the exception of a new nuclide, ^{218}Pb, and measurements of half-lives of ground states of a few nuclides of A=218 and A=222, no substantial structure information has become available since the previous evaluation in 2006. Q values are adopted from 2017Wa10 (AME-2016). The present evaluation supersedes the previous A=218 ENSDF evaluations, 2006Ja03, 1995El08, 1987El12 and 1977To13. This evaluation was carried out as part of a joint IAEA-ICTP workshop for Nuclear Structure and Decay Data, organized and hosted by the IAEA, Vienna, and ICTP, Trieste, October 15-26, 2018.

Cutoff Date: All data received prior to October 30, 2019 have been considered. The main source of bibliographic search was the NSR database (2011Pr03) available at NNDC, BNL webpage: www.nndc.bnl.gov/nsr/.

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General Comments: Theoretical conversion coefficients from BrIcc code (2008Ki07) have an implied uncertainty of 1.4%, when not stated. In the averaging procedure, the recommended uncertainty is generally not below the lowest experimental uncertainty in a set of data points.

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REVIEW

Task-Specific Properties and Prospects of Ionic Liquids in Cross-Coupling Reactions

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Abstract

Ionic liquids (ILs) are considered as highly useful materials for potential diverse uses such as greener and more convenient alternatives to volatile organic solvents, reagents, additives, ligands and co-solvents. Thermal stability, negligible vapor pressure and high polarity with ionic environments have possibly conferred some unique physico-chemical properties and a wider electrochemical window on ILs. More importantly, these properties are tuneable, depending on variations in alkyl chains and counter-anions. On the other hand, various transition-metal-catalyzed cross-coupling reactions constitute an important backbone of contemporary organic synthesis. A vast number of C–C and C-heteroatom cross-coupling reactions are reported in the presence of ILs, often showing better performance. The influence of IL on the action of a given catalyst or on the course of a reaction can be relatively complex, and is not understood well enough to be able to draw succinct conclusions. However, there are a few reports in the literature that help understand the role of actual and active catalytic species stabilized in an IL environment. Stabilization, which can be either helpful or detrimental to catalysis depends on specific circumstances. This review article is aimed primarily at summarizing the various applications of ILs during the past decade, focusing as far as possible on the task-specific properties of ILs in transition-metal-catalyzed C–C and C-heteroatom cross-coupling reactions. Several successful achievements and noteworthy progress in this field of research leads to the sensible conclusion that future prospects in this field of research are not only bright but promise new horizons.

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Research Article

Evaluation of different water exchange regimes for optimizing growth and production of koi carp, *Cyprinus carpio* in tanks

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Abstract: The effect of different water exchange regimes on the growth and survival of koi carp, *Cyprinus carpio* in tanks provided with the supply of exogenous zooplankton as the food was investigated. Fish larvae (0.15±0.012g) were stocked in outdoor concrete tanks at 0.5 fish/l (T1 and T2); 1.0 fish/l (T3 and T4); and 1.5 fish/l (T5 and T6) and cultured for three months. The water exchange rate was 10% once daily in T1, T3 and T5 and twice daily in T2, T4 and T6. Values of dissolved oxygen were highest in T2, followed by T4, T1, T6, T3 and T5. The T5 treatment showed the highest concentrations of conductivity, NH_4-N, NO_2-N, NO_3-N, PO_4-P, and bicarbonate alkalinity, which were significantly higher than the other treatments. The final body weight of *C. carpio* ranged from 4.01 to 8.22g in the different treatments. At harvest, maximum weight gain was achieved in the T2, followed by T4, T1, T6, T3 and T5 in descending order. There was a significant difference in the survival of koi carp among the treatments, ranging from 56.43% (T5) to 96.32% (T2). The percentage and number of fish exceeding a total weight of 5g were estimated from the size-frequency distribution at the end of the study and was significantly higher in T6 (P<0.05) than other treatments. From the present study, a daily water exchange of 20% could support higher stocking densities of koi carp in tanks and result in high productivity, measured in terms of the number of marketable fish.

Keywords: Aquaculture management, Ornamental carp, Fish production, Water quality.

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Introduction

Animal manure has been traditionally employed by culturists in India and neighbouring countries to augment the production of plankton, a natural food item for fish (Chakrabarti & Jana 1998; Gupta & Noble 2001; Jha et al. 2004). However, using high amounts of animal manure can reduce the water quality (Boyd 1982; Singh et al. 1991) and thereby result in stress and impairment of normal metabolism in fish leading to fatigue, disease, and high mortality (Francis-Floyd 1990).

Ornamental fish, unlike food fish, are sold individually and have to be visually attractive to be accepted in the market, and stressed fish may be aesthetically unattractive to potential customers (Jha & Barat 2005a). Hence, particular pond management techniques need to be developed to create the best environment for the fish.

Since most farmers in India cannot afford high-cost recirculating systems or aeration, manual water exchange in production tanks has been the only viable alternative to intensify production in ornamental fish culture units (Jha et al. 2004; Jha & Barat 2005a). On average, about 65.71% farmers in neighboring Bangladesh exchange water regularly in their ponds (Shofiquzzoha et al. 2017). An exchange of 5% of standing water volume from the tanks every day resulted in high production of koi carp, *Cyprinus carpio* Linnaeus, 1758 stocked at a density of 0.2 fish/L with a direct application of poultry manure (Jha & Barat 2005a) and 0.3 fish/L with application of a pellet diet (Jha & Barat 2005b).

frontiers in Immunology

ORIGINAL RESEARCH
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EBI-3 Chain of IL-35 Along With TGF-β Synergistically Regulate Anti-leishmanial Immunity

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Immunosuppression is a characteristic feature of chronic leishmaniasis. The dynamicity and the functional cross talks of host immune responses during *Leishmania* infection are still not clearly understood. Here we explored the functional aspects of accumulation of immune suppressive cellular and cytokine milieu during the progression of murine visceral leishmaniasis. In addition to IL-10 and TGF-β, investigation on the responses of different subunit chains of IL-12 family revealed a progressive elevation of EBI-3 and p35 chains of IL-35 with *Leishmania donovani* infection in BALB/c mice. The expansion of CD25 and FoxP3 positive T cells is associated with loss of IFN-γ and TNF-α response in advanced disease. *Ex-vivo* and *in vivo* neutralization of TGF-β and EBI-3 suggests a synergism in suppression of host anti-leishmanial immunity. The down-regulation of EBI-3 and TGF-β is crucial for re-activation of JAK-STAT pathway for induction as well as restoration of protective immunity against *L. donovani* infection.

Keywords: regulatory T cells, *Leishmania*, immune response, interleukin-35, transforming growth factor beta, immune suppression

INTRODUCTION

Maintenance of immunological self-tolerance and homeostasis by restraining disproportionate and detrimental immune responses is primarily mediated by regulatory cytokine secreting lymphocytes (1). Conversely, expansion of regulatory cellular and cytokine milieu may lead to compromised immunity against certain infections such as *Brucella*, HIV, helminthes, and *Mycobacteruim tuberculosis* including antitumor host immune responses (2–5). However, the correlation between effector and regulatory cell populations especially in terms of sensing and secretion of cytokines during diseased condition is still not well understood (6).

Visceral leishmaniasis (VL) is a potentially lethal disease caused by parasitisation of cellular components of innate immune system by *Leishmania donovani/Leishmania infantum* (7). A dysfunctional cell mediated immune response is one of the characteristic features of chronic VL (8, 9). Several studies have suggested the role of IL-10 and TGF-β in subversion of proinflammatory response in active VL (10, 11). Despite crucial evidences of the role of these cytokines in augmenting VL pathology, the mode of action of these immunosuppressive cytokines is not clearly understood (12). Apart from IL-10 and TGF-β, the role of other immunosuppressive cytokines in VL is yet to be established. IL-35 has been reported for its immunosuppressive activity in autoimmunity and infectious diseases (13–15). IL-35 is a heterodimeric cytokine with two polypeptides "α" and "β" chains. These polypeptides may participate in the construction of two or more cytokines for

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Cosmological time crystal: Cyclic universe with a small cosmological constant in a toy model approach

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A new form time crystal has been proposed, and some of its consequences have been studied. The model is a generalization of the Friedmann-Robertson-Walker (FRW) cosmology endowed with noncommutative geometry corrections. In the minisuperspace approach, the scale factor undergoes the time periodic behavior, or Sisyphus dynamics, which allows us to interpret this cosmological time crystal as a physically motivated toy model to simulate the cyclic universe. Analyzing our model purely from the time crystal perspective reveals many novelties such as a complex singularity structure (more complicated than the previously encountered swallowtail catastrophe) and a richer form of Sisyphus dynamics. In the context of cosmology, the system can serve as a toy model in which, apart from inducing a form of the cyclic universe feature, it is possible to generate an arbitrarily small positive effective cosmological constant. We stress that the model is purely geometrical without introduction of matter degrees of freedom (d.o.f.).

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I. INTRODUCTION

In this paper, we aim to apply the fascinating concept of classical time crystal (CTC), proposed by Shapere and Wilczek [1,2] (see [3] for a recent review), in an extended model of Friedmann-Robertson-Walker (FRW) cosmology. Specifically, the extension is induced by a noncommutative (NC) gravity contribution with an underlying quantum gravity perspective. It was derived by Fabi, Harmes, and Stern [4]. In a nutshell, two of our principal results are the following:

(i) The scale factor borrows the Sisyphus-like periodic behavior that characterizes the CTC, but more importantly for our present interest, it can naturally serve as a physically motivated toy model for a cyclic universe, conceived by Steinhardt and Turok [5].[1]
(ii) Once again, borrowing a CTC feature, the minimum energy state (or ground state) consists of a condensate, leading to an arbitrarily small positive cosmological constant Λ.

Furthermore, it needs to be stressed that our model is purely geometric in the sense that no matter d.o.f. are added from the outside. This should be contrasted with recent works in cosmological CTC [6], where a scalar field model with eternal oscillations in an expanding FRW spacetime was discussed (see also [7] for further developments on the model). From a TC perspective as well, there is some novelty as recent works [8] concerning the physical realization of TC are all in the quantum domain,[2] whereas our framework is purely classical. The only classical example studied so far is in [1,2] that is not very realistic.

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[1]We note that the perspective of cyclic cosmology [5] and that in the present model is somewhat different although, in the former, quantum gravity effects are not considered to be significant, whereas in the latter, the cyclic cosmological features emerge due to the noncommutative contributions which in turn are generally thought to be induced by quantum gravity effects. We consider a closed universe.

[2]The quantum TC was proposed by Wilczek [9] with experimental models for quantum TC in [10].

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Observational constraints on oscillating dark-energy parametrizations

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We perform a detailed confrontation of various oscillating dark-energy parametrizations with the latest sets of observational data. In particular, we use data from the joint light curve analysis (JLA) sample from supernoave type Ia, baryon acoustic oscillations (BAO) distance measurements, cosmic microwave background (CMB) observations, redshift space distortion, weak gravitational lensing, Hubble parameter measurements from cosmic chronometers, and we impose constraints on four oscillating models. From the analyses, we find that the best-fit characters of almost all models are bent towards the phantom region; nevertheless, in all of them, the quintessential regime is also allowed within 1σ confidence level. Furthermore, the deviations from ΛCDM cosmology are not significant; however, for two of the models they could be visible at large scales, through the impact on the temperature anisotropy of the CMB spectra and on the matter power spectra. Finally, we perform the Bayesian analysis, which shows that the current observational data support the ΛCDM paradigm over this set of oscillating dark-energy parametrizations.

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I. INTRODUCTION

The Universe acceleration at late times is one of the most interesting findings of modern cosmology, and thus there are two main directions that one could follow to explain it. The first way is to keep general relativity as the gravitational theory and introduce new components, that go beyond the standard model of particle physics, collectively known as the dark energy sector [1,2]. The second way is to construct a modified gravitational theory, whose additional degrees of freedom can drive the Universe acceleration [3–5].

At the phenomenological level, both the above approaches lead to a specific Universe accelerated expansion, that can be quantified by the evolution of the (effective in the case of modified gravity) dark energy equation-of-state parameter. Hence, parametrizations of the dark energy fluid can lead to reconstructions of the Universe late-time expansion. The basic idea relies on the fact that the dark energy equation-of-state parameter $w_x = p_x/\rho_x$, with ρ_x and p_x the dark energy density and pressure, respectively, can be parametrized using different functional forms in terms of the cosmological redshift.

In principle, there is not a theoretical guiding rule to select the best $w_x(z)$; however using observational data, it is possible to find viable parametrizations. In the literature, one can find many parametric dark energy models, that have been introduced and fitted with observational data: (i) one-parameter family of dark energy models [6] (ii) two-parameters family of dark energy parametrizations, namely, Chevallier-Polarski-Linder parametrization [7,8], linear parametrization [9–11], logarithmic parametrization [12], Jassal-Bagla-Padmanabhan parametrization [13], Barboza-Alcaniz parametrization [14], etc., (see [15–25]), (iii) three-parameters family of dark energy parametrizations [26], and (iv) four-parameters family of dark energy parametrizations [26–28].

One of the interesting parametrizations is the class of models in which $w_x(z)$ exhibits oscillating behavior [25,29–39]. The oscillating dark energy models are appealing and prove to lead to desirable cosmological behavior. In particular, they can alleviate the coincidence problem, since they may lead to both accelerating and decelertaing phases in a periodic manner [30], and thus to dark matter and dark energy density parameters of the same order. Furthermore, one can construct oscillating dark energy models that can unify the current acceleration with the early-time inflationary phase [31].

The main question that arises naturally is whether oscillating dark-energy models are in agreement with the

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Tale of stable interacting dark energy, observational signatures, and the H_0 tension

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Abstract. We investigate the observational consequences of a novel class of stable interacting dark energy (IDE) models, featuring interactions between dark matter (DM) and dark energy (DE). In the first part of our work, we start by considering two IDE models which are known to present early-time linear perturbation instabilities. Applying a transformation depending on the dark energy equation of state (EoS) to the DM-DE coupling, we then obtain two novel stable IDE models. Subsequently, we derive robust and accurate constraints on the parameters of these models, assuming a constant EoS w_x for the DE fluid, in light of some of the most recent publicly available cosmological data. These include Cosmic Microwave Background (CMB) temperature and polarization anisotropy measurements from

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Bengali Women's Writings in the Colonial Period: Critique of Nation, Narration, and Patriarchy

Sanchayita Paul Chakraborty and Dhritiman Chakraborty

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Citations 1

Abstract

Critical engagements like the first autobiography written by a Bengali woman, Rasasundari Devi, and the non-fictions by Kailashbasini Devi, Krishnabhabini Das, and other women writers in the second half of the nineteenth century contested the imagined idealization of the Hindu domesticity and conjugality as spaces of loveableness and spiritual commitment. They criticized coercion in child-marriages and the forceful injunctions of the Hindu scriptures on both married and widowed women. Such rhetoric of quasi empowerment needs to be disaggregated to perpetuate issues of 'double colonization,' 'dual-hold' in feminism in India. The question is whether there can be any grounds of women's agency in the Indian tradition. Eurocentric critiques are ill-equipped to politicize all modalities of a culture of social exclusion in Hindu imaginaries. Henceforth, as questions of equality, emancipation, and empowerment are fiercely debated in the public domain in contemporary India, we need to argue how immanent dissenting woman subjectivity can originate to counteract multiple patriarchies formed in Indian immediacies.