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Incidence of *Salmonella typhi* in fruit juices sold in Allahabad city and their antibiotic susceptibility pattern

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Abstract
Continuous rise in the number of outbreaks of food borne multi drug resistant (MDR) typhoid in India is an escalating problem and is linked to fresh fruit juices. MDR isolates of *Salmonella typhi* are on rise and are becoming a challenge for timely and appropriate treatment. In present work eighty fruit juice samples (40 each of pomegranate and orange) were collected from different locations of Allahabad City. The samples were analyzed for the presence of *Salmonella typhi*. The isolated *Salmonella typhi* were subjected to ten commercial antibiotic employing disc diffusion assay. Total 22 isolates of *Salmonella typhi* were collected from juice samples and incidence of *Salmonella typhi* from these samples was found to be 25% ($16.9x10^4$cfu/ml) in case of orange and 30% ($6.08x10^4$cfu/ml) in pomegranate juice. Among the ten commercial antibiotics tested, ofloxacin and chloramphenicol showed 100% sensitivity against *Salmonella typhi* isolates followed by co-trimoxazole, gatifloxacin and ciprofloxacin with a sensitivity of 95.45%. The least sensitivity (18.18%) shown by ampicillin and intermediate sensitivity was observed in cefixime (36.36%), nalidixic acid (68.18%), ceftriaxone (72.73%) and norfloxacin (90.91%). It was observed that out of total 22 isolates only one was found to be multi drug resistant. Appropriate administration of hygienic measures such as checking the quality of water used for the dilution as well as prevailing unhygienic condition related to washing of utensils and maintenance of the premises may reduce risk.

Keywords: Fruit juices, unprocessed, *Salmonella typhi*, multi drug resistance pattern

Introduction
Fruit juices are well recognized for their nutritive values, minerals and vitamins contents. In many countries they are common man's beverages and are sold at all public places and roadside shops. However in view of their ready consumption, quick methods of cleaning, handling and extraction, they could often prove to be a public health threat. There are reports of food borne illness associated with the consumption of fruit juice at several places in India and elsewhere (Parish, 1997; Canada, 2000; Sandeep *et al*., 2001) [25, 27]. Considering its nutritive value and palatability fruit juices are highly recommendable. However, bearing in mind the method of extraction, an inevitable question arises over safety. There are reports of food borne illness associated with the consumption of fruit juices at several places in India (Parish, 1997) [28]. Most fruits contain bacterial counts upto 1.0x105cfu/cm^2 on their surface (Harrigan, 1998) [14]. Improper washing of fruit add these bacteria to extracts leading to contamination. Juices have shown to b potential source of bacterial pathogens (Sandep *et al*. 2001). Bryan (1977) [27, 4] reported that many microorganisms will enter the fruit juice at the time of extraction and cause contamination. Source of contamination may vary. It is mainly due to poor quality of water used for dilution, improper washing of fruits add these bacteria to extracts, prevailing unhygienic conditions, related to washing of utensils, maintenance of the premises and location by the side of a busy road or by the side of the waste disposal system. During transportation to the market or the processing plant mechanical damage may increase susceptibility to decay and growth of microorganisms may take place. The processing units of the juices are likely primary causes of high microbial load. There is no justification for processed ready to eat food being contaminated with these organisms and their presence even in small numbers results in such foods being of unacceptable quality or potentially hazardous (Schmidt *et al*., 1997) [28]. There are several reports that suggest that fruit juices have shown to be potential source of bacterial pathogens, notably E. coli 0157:H7, Salmonella spp., Shigella spp. and *Staphylococcus aureus* (Ryu and Beuchat 1998; Uljas and Igham 1998; Buchmann *et al*., 1999; Sandeep *et al.*, 2001) [26, 32, 27]. The incidence of Salmonella is also reported by (Lewis *et al*., 2006) [21] in grape, mango and orange juices. Typhoid fever continue to be a global health problem with an estimated 12 to 33 million cases occurring worldwide each year.

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Magnetic and Electron Spin Resonance Properties of $Ba_xSr_{2-x}TiCoO_6$ Double Perovskites

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Herein, the magnetic behavior of $Ba_xSr_{2-x}TiCoO_6$ (BSTC) double perovskites synthesized by the conventional solid-state reaction route is investigated. To understand the complexity of B-site cations and their distribution in different valance states, X-ray photoelectron spectroscopy (XPS) is performed. To understand the magnetic interactions at lower temperatures, variation of magnetization in both zero-field-cooled and field-cooled conditions is studied in the temperature range from 2 to 300 K. Temperature dependence of inverse susceptibility is explained by modified Curie–Weiss law. Weak ferromagnetic and antiferromagnetic interactions are found in BSTC compounds, causing the randomness and frustrations and leading to a spin-glass-like behavior. To gain further insights, electron spin resonance (ESR) measurements are also carried out in BSTC ceramics. ESR measurement suggests the occurrence of Jahn–Teller glass analogous to the spin-glass behavior in BSTC ceramics.

1. Introduction

Double perovskite oxides has been a fascinating research topic in the past few decades, due to their intriguing magnetic, electrical, dielectric, and colossal magnetoresistance properties.[1–3] Moreover, these double perovskites also displayed interesting properties like transition from insulating to metallic or even half metallic.[4,5] The general formula of double perovskite is $A_2B'B''O_6$, where A is a divalent alkaline earth metal and B′ and B″ represent transition metals. The schematic of cubic double perovskite with a random octahedral arrangement is shown in **Figure 1**a. The interaction between two transition metals or even the same metals with different valence states induces new exchanges, resulting in interesting magnetic properties.[6–8] It was reported that when the B-site was occupied by both ferromagnetic and nonferromagnetic metals, double perovskites exhibited a wide range of magnetic behaviors such as antiferromagnetism,[9] ferromagnetism,[10] magnetic frustration,[11] colossal magnetoresistance,[1,2] multiferroicity,[12] etc. Sr_2FeMoO_6-based double perovskites were reported to possess colossal magnetoresistance-type half-metallic ferromagnetic behavior with ≈415 K Curie temperature.[2] On the contrary, Sr_2CoMoO_6 showed an insulating antiferromagnetic behavior ($T_N = 37$ K) and converted into semiconductor ferromagnetic upon chemical reduction.[1] Moreover, some other double perovskites demonstrated antiferromagnetic behavior at a low temperature depending on the combination of cations.[8]

In the current investigation, efforts have been made to understand the magnetic behavior of Ba-doped Sr_2TiCoO_6 (STC) double perovskite, in which B-site is occupied by the ferromagnetic Co ion and nonferromagnetic Ti ion.[13] STC double perovskite has appeared to be an interesting material because it is a combination of $SrTiO_3$, a band insulator,[14] and $SrCoO_3$, a ferromagnetic material.[15] Our group recently reported that the thermoelectric performance of the p-type polycrystalline STC double perovskites could be enhanced by barium doping.[13] These ceramics exhibited a high Seebeck coefficient and low thermal conductivity. Glass-like thermal conductivity of these double perovskites was attributed to their low-temperature relaxor ferroelectric behavior, following Vogel–Fulcher Law, which was originally derived for spin glass.[16] Therefore, it is intriguing to study the magnetic behavior of $Ba_xSr_{2-x}TiCoO_6$ (BSTC) double perovskites. Trivalent Co^{3+} is found to be stabilized in low-spin (LS) (t_{2g}^6), intermediate-spin (IS) ($t_{2g}^5e_g^1$), as well as high-spin (HS) ($t_{2g}^4e_g^2$) states. If HS magnetic ions are

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Boundary Values of Degenerate Configuration Core of White Dwarfs using Ramanujan's Method

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Abstract

In this paper we have found out boundary values of degenerate configuration core of White Dwarf using Ramanujan's method. By converting non-linear Lane Emden-type equation for degenerate core into a series using an iterative method. Considering the first five terms of the series numerical values has been calculated. The applied method is efficient and simplifies the calculation. The obtained result has been compared with exact values. Ramanujan's method and the new iterative method are used for the first time to solve the Lane Emden equation for white dwarf core.

Keywords: Lane Emden-type Equation; Iterative method; Ramanujan's method.

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1. Introduction

Star, always a source of wonder as well as science is the most common existent we find in a galaxy and white dwarf, the later evolutionary stage of a star holds the second position. Stars which have masses less than 8 M_{sun} will end up in this form. The first white dwarf identified is Sirius B. White dwarfs differ from other stars in some fundamental way, firstly they are much fainter as compared to an average star of same mass, as all helium and hydrogen inside the core is converted to oxygen and carbon and no further fusion takes place because of its lower initial mass thereby prevents the generation of internal pressure. Instead of energy generation the gradual emission of large amount of stored heat is the reason for the luminosity of white dwarfs, as it moves on HR diagram.

Secondly the degenerate nature of electron gas in the interior of white dwarfs, as they don't follow perfect gas equation [1]. The extreme outer layers of white dwarf contains non degenerate matter which follows the gas law, $P \propto T$ .The core of white dwarf is highly dense and electrons are packed tightly and all the energy levels from ground level up are filled obeying Pauli's Exclusion Principle and electron gas attains the status 'degenerate gas'. Degenerate configurations follow the relation $P= K_1\rho^{5/3}$ in non-relativistic conditions

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EXPLORATION AND CONSERVATION OF SUGANDHAMANTRI (HOMALOMENA AROMATICA (SPRENG.) SCHOTT.): A VALUABLE MEDICINAL PLANT OF NORTH EAST INDIA

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ABSTRACT

Homalomena aromatica is a highly demanded medicinal plant used in the name of Sugandhmantri for the cure of rheumatoid Arthritis, ulcer and related disorders as well as in perfumeries for the preparation of oriental perfumes. It is widely distributed in Northeastern India i.e. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura and is widely traded from Manipur to the markets of Kanpur, Kannauj etc. in Uttar Pradesh, Kolkata in West Bengal and other part of the Country. Thus to fulfill the requirement of pharmaceuticals there will be need for cultivation and conservation of this plant. Accordingly, study has been aimed to develop easily accessible agro- technique for cultivation by the farmers at an easily accessible manner. *H. aromatica*, The native of Northeast India is a highly demanded medicinal plant. In Northeast India the plants of *H. aromatica* is distributed in Mizoram in Serchip and Mamit forest divisions, Senapati, Ukhrul, East Imphal and West Imphal and different foot hill areas of Arunachal Pradesh and Nagaland and several part of Meghalaya. It is also distributed in Bangladesh and China. Its cultivation is through rhizome with bulbils initiating from the mature rhizome. Authors had developed various cultivation parameters in Moonbul Nursery, Tinali bazar, Longding road, Hozai (Assam) and Regional Ayurveda Research Institute, Itanagar (Arunachal Pradesh) through rhizome bulbils.Since traded drug is the rhizome of the plants there is an urgent need of cultivation through the techniques described in the present communication cultivation, of *H. aromatica* can be made by establishing plant nurseries.

KEYWORDS: Rhizomatous, Araceae, Sugandhmantri, Sesqueterpenoids, Rhizome cuttings.

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One year update on the COVID-19 pandemic: Where are we now?

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ABSTRACT

We are living through an unprecedented crisis with the rapid spread of the new coronavirus disease (COVID-19) worldwide within a short time. The timely availability of thousands of SARS-CoV-2 genomes has enabled the scientific community to study the origin, structures, and pathogenesis of the virus. The pandemic has spurred research publication and resulted in an unprecedented number of therapeutic proposals. Because the development of new drugs is time consuming, several strategies, including drug repurposing and repositioning, are being tested to treat patients with COVID-19. Researchers have developed several potential vaccine candidates that have shown promise in phase II and III trials. As of 12 November 2020, 164 candidate vaccines are in preclinical evaluation, and 48 vaccines are in clinical evaluation, of which four have cleared phase III trials (Pfizer/BioNTech's BNT162b2, Moderna's mRNA-1273, University of Oxford & AstraZeneca's AZD1222, and Gamaleya's Sputnik V vaccine). Despite the acquisition of a vast body of scientific information, treatment depends only on the clinical management of the disease through supportive care. At the pandemic's 1-year mark, we summarize current information on SARS-CoV-2 origin and biology, and advances in the development of therapeutics. The updated information presented here provides a comprehensive report on the scientific progress made in the past year in understanding of SARS-CoV-2 biology and therapeutics.

1. Introduction

We have now been living with COronaVIrus Disease (COVID-19) for the past year. COVID-19 emerged in December 2019, and in March of 2020 was declared a pandemic by the World Health Organization. The devastating effect of the causative SARS-CoV-2 virus has infected millions of humans across 218 countries and terrotories and led to more than 1.4 million deaths globally as of 24 November 2020. The pandemic has significantly affected biomedical researchers, by first halting research and then resulting in the concentration of scientific resources toward better understanding the SARS-CoV-2 virus and developing vaccines and therapeutics (Palayew et al., 2020; Zamora-Ledezma et al., 2020). The advent of genomics technologies and computational approaches has accelerated scientific breakthroughs in the past year. There has been exponential growth in the number of scientific publications related to COVID-19. The genome sequence of the virus appeared online on January 10, and within weeks, the structures of several viral proteins were determined. Within months, clinical trials of vaccines and therapeutics began, and positive reports on vaccines are currently appearing. Moreover, an array of drugs approved for other viral infections are being studied for COVID-19 treatment in hundreds of clinical trials worldwide. Here, we review current knowledge related to SARS-CoV-2 gained in the past year, including its progression, pathology, prevention, and therapeutics. We discuss what is currently known about the virus and how far medicine has progressed in the fight against COVID-19.

2. Origin and diversification of human CoVs

Coronaviruses (CoVs) are a large group of viruses that infect the upper respiratory tract in humans and cause common cold and flu-like infections. Their name originates from the presence of club-shaped glycoprotein projections (called spikes) that arise from the surface of the viral envelope and impart a crown-like appearance to the viral particles, similarly to the Sun's corona (Fig. 1A). The CoVs belong to the order *Nidovirales* of the subfamily *Orthocoronaviridae* in the family *Coronoviridae*. All CoVs have zoonotic origin, and cause respiratory and intestinal infections in several animals, including humans. On the basis of genomic organization and phylogenetic relationships, CoVs are classified into four genera: α-CoV, β-CoV, γ-CoV, and δ- CoV. The α-CoVs and β-CoVs infect various mammals (such as bats, cattle, domestic animals,

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σ – PURITY AND σ- REGULAR RINGS AND MODULES

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ABSTRACT

The aim of this paper is to relativize the concept of M – purity and σ - purity defined and studied by Azumaya [6] with respect to an arbitrary hereditary torsion theory given by a left exact torsion radical σ and also relates these concepts with the notions of σ – purity as given by B. B. Bhattacharya and D. P. Choudhury [7]. We also develope the theory of $(M; \sigma)$ – purity and (μ, σ) – purity relative to a torsion theory with radical σ where M is a finitely generated or cyclic R – module and $\mu = (r_{ij})$ is an $i \times j$ matrix determined by a system of linear equations $\sum r_{ij}\, x_j = y_i$ where $y_i \in Y$ (a left R – module) for each $i \in I$ and $j \in J$ are unknowns, which is weaker than the usual purity and given a sufficient condition for these two coincide. In this present paper we relativize the concept of the σ – pure and σ – flatness of a module. We also discuss about σ – regular modules and weakly σ – regular modules and its inter relationship. We also discuss about finitely generated σ – flat modules and its condition for σ – projectivity in Noetherian ring.

Key words: Left R – modules, M – purity, (M, σ) – purity, σ – pure modules, (μ, σ) – purity, σ – flat modules, σ – regular modules, weakly σ – regular modules, σ – projective modules.

Subject classification: 16D99.

1. INTRODUCTION

The notion of purity plays a fundamental role in the theory of abelian groups as well as in module categories. In the first section of this paper we examine the purities by torsion modules, finitely generated torsion modules and cyclic torsion modules. Work in this direction was initiated by Walker [17], Stenstrom [14], Azumaya [6], B. B. Bhattacharya and D. P. Choudhury [7]. In this there is an attempt to relativize the usual Cohn [9] purity with respect to a torsion theory. We also develop the theory of $(M; \sigma)$ – purity and (μ, σ) – purity relative to a torsion theory with radical σ where M is a finitely generated or cyclic R – module and $\mu = (r_{ij})$ is an $i \times j$ matrix determined by a system of linear equations $\sum r_{ij}\, x_j = y_i$ where $y_i \in Y$ (a left R – module) for each $i \in I$ and $j \in J$ are unknowns, which is weaker than the usual purity and given a sufficient condition for these two coincide. A submodule A is (μ, σ) –pure in an R – module B if any system of linear equations $\sum r_{ij}\, x_j = a_i$ given by the row finite matrix $\mu = (r_{ij})$ in A. Whenever solvable in B in the form $x_j = b_j$ for which there are left ideals $D_i \in D$ (Where D is the Gabriel filter [16] of dense left ideals corresponding to the left exact torsion radical σ such that $D_j\, b_j \subseteq A$). The system is also solvable in A that is there are $a_j' \in A$, with $\sum r_{ij}\, a_j' = a_i$ for each $i \in I$ and $j \in J$. We view $\mu: \prod_J B \longrightarrow \prod_I B$ as a mapping by left matrix multiplication. In this present paper we relativize the concept of the σ – pure and σ –flatness of a module. We also discuss about σ – regular modules and weakly σ – regular modules and its inter relationship. We also discuss about finitely generated σ – flat modules and its condition for σ – projectivity in Noetherian ring. In this paper σ will denote a given left exact torsion radical and a torsion module means a module M for which $\sigma(M) = M$. Suppose that M, B and C are left R – modules.

Definition 1.1: An epimorphism $p: B \longrightarrow C$ is said to be (M, σ) – pure if for each homomorphism $\emptyset: M \longrightarrow C$ with image $(\emptyset)$ a torsion module that is $\emptyset[M] \subseteq \sigma[B]$, there exists a homomorphism $\varphi: M \to B$ such that $p\circ\varphi = \emptyset$

$$\begin{array}{ccccc} & & M & & \\ & & \downarrow \varphi & & \\ B & \xrightarrow{p} & C & \longrightarrow & 0 \end{array}$$

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(FG,σ) – PURE FLATNESS AND LOCALLY σ –PROJECTIVITY IN MODULES

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Abstract: We observe that the finitely split sequences of **Azumaya**[6] are nothing but the FG –pure sequences studied by **Choudhury** [8]. We relatativize this concept and also that of finite projectivity of **Azumaya**[6] with respect to a torsion theory and study the inter-relationship between these concepts. We also consider finite σ –projectivity or

(FG,σ) – pure flatness, cyclically σ – pure projectivity and cyclically σ – pure flat, the concept of locally σ – projectivity and locally σ – splitness and study its inter-relationship with (FG,σ) – purity.

Key words: Left R – modules, (FG,σ) – purity, σ – pure projective modules, flat modules, cyclically σ – pure projectivity, locally σ – splitness.

Subject classification: 16D99

1. Introduction

The notion of purity plays a fundamental role in the theory of abelian groups as well as in module categories. In the FG – purity which is same as finite splitness with respect to a given hereditary torsion theory which is given by a connection of (FG,σ) – purity with $\mathcal{T}_F$ – purity (torsion purity) of a left exact torsion radical σ. We also relativize the concept of finite (cyclic) σ – extension and finitely (cyclically) σ –splitness. We also, give the results of $(\mu,\ \sigma)$ – purity where μ is the matrix with a finite number of columns (single column) of the linear equation $\sum r_{ij}\, x_j = a_i$ given by the row finite matrix. We also, give the

results of essentially σ –closed sub-modules.

In this present paper we relativize the concept of finitely σ – compact modules. We call a module M, (FG,σ) – pure at if every sequence is (FG,σ) – pure. We observe that the torsion σ – purity of **Bhattacharya** and **Choudhury**[7] reduces to usual purity, (FG,σ) – splitness and cyclic σ – purity becomes purity relative to cyclic modules that is singly (cyclically) σ – pure. We also give the results of the characterization of a Noetherian like condition on the torsion theory.

2 Finite σ – projectivity or (FG,σ) – pure Flatness

We know that a module M is projective if and only if every exact sequence

$$0 \longrightarrow A \longrightarrow B \longrightarrow M \longrightarrow 0$$

splits and M is flat if and only if all such sequences are pure. **Stenstrom**[14], proposition(**11.1**)] , **Azumaya**(6) has called a module M finitely or singly projective if all such sequences are finitely or pure flat if every such sequence is (FG,σ) – pure. Similarly cyclically σ – pure flat modules M are those which render every short exact sequence $0 \longrightarrow A \longrightarrow B \longrightarrow M \longrightarrow 0$ cyclically σ – pure. Observe that in case of trivial torsion theory in which every module is torsion purity **Bhattacharya** and **Choudhury**[7] reduces to usual purity, (FG,σ) –purity reduces to FG – purity or finite splitness, and cyclic σ –purity becomes purity relative to cyclic module that is singly splitness of **Azumaya** [6]. Accordingly the concepts of (FG,σ) – pure flatness and cyclical pure flatness which are nothing but finite or single projectivity as defined by **Azumaya** [6].

A module M has been called a σ – flat if every sequence $0 \longrightarrow A \longrightarrow B \longrightarrow M \longrightarrow 0$ is

σ – pure **Bhattacharya** and **Choudhury**[7].

Proposition 2.1: Every (FG,σ) – pure flat module is , σ – flat and finitely,

σ –pure projective.

Proof: Suppose that M is (FG,σ) – pure flat. Consider any exact sequence

$0 \longrightarrow A \longrightarrow B \longrightarrow M \longrightarrow 0$. As M is (FG,σ) – pure flat, this sequence will be

(FG,σ) – pure. Thus maps from finitely generated modules M with torsion images lift to maps to B. Hence maps from finitely presented module with torsion images to M also lifts. Hence the sequence is σ – pure. This proves that M is σ – flat, on the other hand if the

above sequence is taken to be pure then by (FG,σ) – pure flatness the sequence is (FG,σ) – pure, giving that M is finitely σ – pure projective as every pure epimorphism onto M is (FG,σ) – pure.

Proposition 2.2: If a left R – module M is flat and finitely σ – pure projective, then it is (FG,σ) – pure flat.

Proof: Consider any short exact sequence $0 \longrightarrow A \longrightarrow B \longrightarrow M \longrightarrow 0$ as M is flat, this sequence is pure and then by finite σ – pure projectivity of M the sequence is

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Purity relative to a cyclic module

Ashok Kumar Pandey

Abstract
We study relative projectivity and injectivity classes of exact sequences with respect to the classes of cyclic modules. A characterization of cyclic pure exact sequences has given in terms of exactness of a certain sequence of submodules of the modules appearing in the given sequence. We also study the concept of relative divisibility of elements in submodules (known as RD- purity). We give the generalization of the proposition of Stenstrom. We characterize the preservation of exactness by cyclic modules $R|I$ where I be a left ideal of the ring R. We also relate the $M-$ purity in Quasi- projective module [9]. We also try to define $\mathcal{A}-$Copure for a class $\mathcal{M}$ of modules and co-relate $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective with it. We derive some results dualize certain results of R.B. Warfield.

Keywords: Left $R-$ modules, Ideals, Ideal purity, cyclic module, $\mathcal{A}-$Copure, $RD-$ purity, cocyclic copurity, $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective modules

Introduction

The notion of purity plays a fundamental role in the theory of abelian groups as well as in module categories. In similar manner module- purity plays an important role in the study of $R-$ module categories. The aim of the present paper is to study some aspects of purity relative to a fixed cyclic module $R|I$ for a left ideal I. We try to give the *characterization of cyclic pure exact sequences has given in terms of exactness of a certain sequence of submodules of the modules appearing in the given sequence. We also study the concept of relative divisibility of elements in submodules (known as* RD- purity*). We* give the generalization of the proposition of Stenstrom [13]. We characterize the preservation of exactness by cyclic modules $R|I$ where I be a left ideal of the ring R. We also relate the $M-$ purity in Quasi- projective module [9]. We also try to define $\mathcal{A}-$Copure for a class $\mathcal{M}$ of modules and corelate $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective with it. We derive some results dualize certain results of R.B. Warfield [15]. In this paper R refers to a ring with identity, which need not be necessarily commutative. Also by an $R-$ module we always mean a left $R-$ module.

Definition1.1. An exact sequence is said to be M- pure

$$\begin{array}{c} M \\ \downarrow \\ 0 \to A \xrightarrow{\alpha} B \xrightarrow{\beta} C \to 0 \end{array}$$

if given $f: M \longrightarrow C$, there exists $f': M \longrightarrow B$ such that $(\beta o f') = f$.
Now we shall consider purity with respect to a fixed cyclic left $R-$module $R|I$. Where R is a left $R-$ module and I is a left ideal of R [6].

Proposition1.2: For a left ideal I, a submodule K of M is $R|I-$ pure if and only if given $m \in M$ such that $Im \subseteq K$. there exists $m' \in M$ such that $Im' = 0$ and $(m - m') \in K$, where $R|I$ is a fixed cyclc left module.

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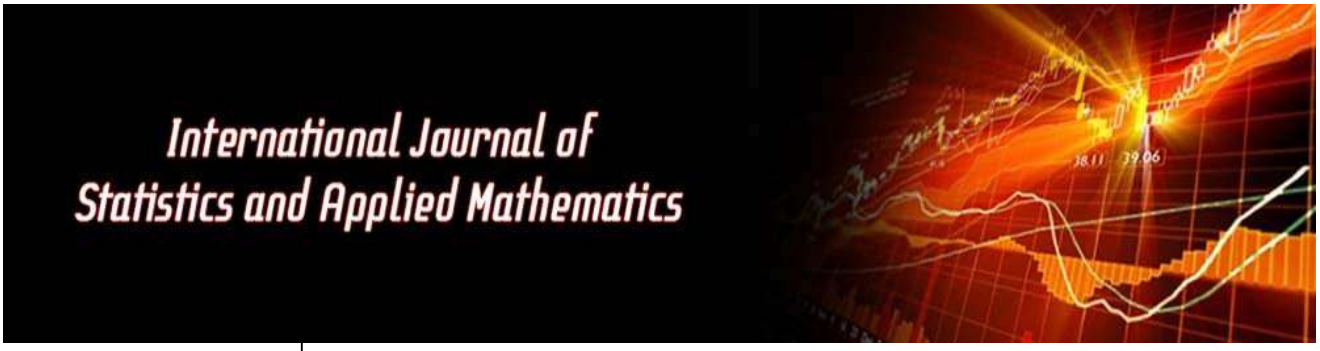

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Purity relative to a cyclic module

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Abstract
We study relative projectivity and injectivity classes of exact sequences with respect to the classes of cyclic modules. A characterization of cyclic pure exact sequences has given in terms of exactness of a certain sequence of submodules of the modules appearing in the given sequence. We also study the concept of relative divisibility of elements in submodules (known as RD- purity). We give the generalization of the proposition of Stenstrom. We characterize the preservation of exactness by cyclic modules $R|I$ where I be a left ideal of the ring R. We also relate the $M-$ purity in Quasi- projective module [9]. We also try to define $\mathcal{A}-$Copure for a class $\mathcal{M}$ of modules and co-relate $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective with it. We derive some results dualize certain results of R.B. Warfield.

Keywords: Left $R-$ modules, Ideals, Ideal purity, cyclic module, $\mathcal{A}-$Copure, $RD-$ purity, cocyclic copurity, $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective modules

Introduction
The notion of purity plays a fundamental role in the theory of abelian groups as well as in module categories. In similar manner module- purity plays an important role in the study of $R-$ module categories. The aim of the present paper is to study some aspects of purity relative to a fixed cyclic module $R|I$ for a left ideal I. We try to give the *characterization of cyclic pure exact sequences has given in terms of exactness of a certain sequence of submodules of the modules appearing in the given sequence. We also study the concept of relative divisibility of elements in submodules (known as* RD- purity*). We* give the generalization of the proposition of Stenstrom [13]. We characterize the preservation of exactness by cyclic modules $R|I$ where I be a left ideal of the ring R. We also relate the $M-$ purity in Quasi- projective module [9]. We also try to define $\mathcal{A}-$Copure for a class $\mathcal{M}$ of modules and corelate $\mathcal{A}-$Copure injective or $\mathcal{A}-$Copure projective with it. We derive some results dualize certain results of R.B. Warfield [15]. In this paper R refers to a ring with identity, which need not be necessarily commutative. Also by an $R-$ module we always mean a left $R-$ module.

Definition1.1. An exact sequence is said to be M- pure

$$\begin{array}{ccccccccc} & & & & & & \mathrm{M} & & \\ & & & & & & \downarrow & & \\ 0 & \to & A & \xrightarrow{\alpha} & B & \xrightarrow{\beta} & C & \to & 0 \end{array}$$

if given $f: M \longrightarrow C$, there exists $f': M \longrightarrow B$ such that $(\beta o f') = f$.
Now we shall consider purity with respect to a fixed cyclic left $R-$module $R|I$. Where R is a left $R-$ module and I is a left ideal of R [6].

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σ – PURITY AND σ- REGULAR RINGS AND MODULES

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ABSTRACT

T*he aim of this paper is to relativize the concept of $M-$ purity and σ - purity defined and studied by Azumaya [6] with respect to an arbitrary hereditary torsion theory given by a left exact torsion radical σ and also relates these concepts with the notions of $\sigma-$ purity as given by B. B. Bhattacharya and D. P. Choudhury [7]. We also develope the theory of $(M;\ \sigma)-$ purity and $(\mu,\sigma)-$ purity relative to a torsion theory with radical σ where M is a finitely generated or cyclic $R-$ module and $\mu=(r_{ij})$ is an $i\times j$ matrix determined by a system of linear equations $\sum r_{ij}\ x_j=\ y_i$ where $y_i\in Y$ (a left $R-$ module) for each $i\ \in\ I$ and $j\ \in\ J$ are unknowns, which is weaker than the usual purity and given a sufficient condition for these two coincide. In this present paper we relativize the concept of the $\sigma-$ pure and $\sigma-$ flatness of a module. We also discuss about $\sigma-$ regular modules and weakly $\sigma-$ regular modules and its inter relationship. We also discuss about finitely generated $\sigma-$ flat modules and its condition for $\sigma-$ projectivity in Noetherian ring.*

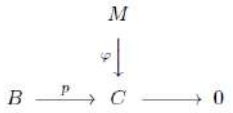
Key words: *Left $R-$ modules,$M-$ purity, $(M,\sigma)-$ purity, $\sigma-$ pure modules, $(\mu,\sigma)-$ purity, $\sigma-$ flat modules, $\sigma-$ regular modules, weakly $\sigma-$ regular modules, $\sigma-$ projective modules.*

Subject classification: *16D99.*

1. INTRODUCTION

The notion of purity plays a fundamental role in the theory of abelian groups as well as in module categories. In the first section of this paper we examine the purities by torsion modules, finitely generated torsion modules and cyclic torsion modules. Work in this direction was initiated by Walker [17], Stenstrom [14], Azumaya [6], B. B. Bhattacharya and D. P. Choudhury [7]. In this there is an attempt to relativize the usual Cohn [9] purity with respect to a torsion theory. We also develop the theory of $(M;\ \sigma)-$ purity and $(\mu,\sigma)-$ purity relative to a torsion theory with radical σ where M is a finitely generated or cyclic $R-$ module and $\mu=(r_{ij})$ is an $i\ \times\ j$ matrix determined by a system of linear equations $\sum r_{ij}\ x_j=\ y_i$ where $y_i\ \in\ Y$ (a left $R-$ module) for each $i\ \in\ I$ and $j\ \in\ J$ are unknowns, which is weaker than the usual purity and given a sufficient condition for these two coincide. A submodule A is $(\mu,\sigma)-$pure in an $R-$ module B if any system of linear equations $\sum r_{ij}\ x_j=\ a_i$ given by the row finite matrix $\mu=(r_{ij})$ in A. Whenever solvable in B in the form $x_j\ =\ b_j$ for which there are left ideals $D_i\ \in\ D$ (Where D is the Gabriel filter [16] of dense left ideals corresponding to the left exact torsion radical σ such that $D_j\,b_j\ \in\ A$). The system is also solvable in A that is there are $a_j^{'}\in A$, with $\sum r_{ij}\ a_j^{'}=\ a_i$ for each $i\ \in\ I$ and $j\ \in\ J$. We view $\mu\colon\prod_J B\ \longrightarrow\ \prod_I B$ as a mapping by left matrix multiplication. In this present paper we relativize the concept of the $\sigma-$ pure and $\sigma-$flatness of a module. We also discuss about $\sigma-$ regular modules and weakly $\sigma-$ regular modules and its inter relationship. We also discuss about finitely generated $\sigma-$ flat modules and its condition for $\sigma-$projectivity in Noetherian ring. In this paper σ will denote a given left exact torsion radical and a torsion module means a module M for which $\sigma(M)\ =\ M$. Suppose that M,B and C are left $R-$ modules.

Definition 1.1: An epimorphism $p:\ B\ \longrightarrow\ C$ is said to be $(M,\sigma)-$ pure if for each homomorphism $\emptyset:\ M\ \longrightarrow\ C$ with image $(\emptyset)$ a torsion module that is $\emptyset[M]\ \subseteq\ \sigma[B]$, there exists a homomorphism $\varphi:\ M\ \rightarrow\ B$ such that $po\varphi\ =\emptyset$



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Antimicrobial activity of *Cynodon dactylon* against MDR bacteria

ADM David, Shreya Gupta, Saurabh N Singh and Arun S Moses

Abstract
The antimicrobial activity of *Cynodon dactylon* (Grass) were determined and compared against 2 Gram+ve bacteria (*Staphylococcus aureus* and *Bacillus cereus*) and 2 Gram-ve bacteria (*Salmonella typhi* and *Escherichia coli*), which are Multi Drug Resistant (MDR). The *Cynodon dactylon* leaves were crushed and their extract was taken in Propanol. The efficiency of the extract were tested against MDR bacteria through well diffusion assay. In this endeavor the antimicrobial assay extract show inhibitory or antimicrobial activity against MDR bacteria. The propanol extract of *Cynodon dactylon* showed maximum antimicrobial activity against *Staphylococcus aureus* (Gram+ve) followed by *Bacillus cereus* (Gram+ve) while there is no antimicrobial activity obtained against *Salmonella typhi* (Gram-ve) and *Escherichia coli* (Gram-ve). On the basis of present finding it was concluded that the extract possess antimicrobial and pharmacological properties, hence can be used parallel to synthetic drugs which have undesirable side effects.

Keywords: *Cynodon dactylon*, MDR, antimicrobial activity, *S. aureus, B. cereus, S. typhi, E. coli*

Introduction
Infectious disease accounts for high proportion of health problems. Mortality due to these infections continues to be a major problems. Infections due to variety of microbial agents, such as pathogenic *Staphylococcus aureus, Bacillus cereus, Salmonella typhi* and *Escherichia coli* which are Multi Drug Resistant (MDR) are most common (Mukherjee *et al*.,1998) [7]. In present time multiple drug resistance in pathogenic microbes become a serious problem of humankind world wide (Peng *et al*.,2006) [8]. Synthetic drugs are not only expensive but also often associated with side effects. Therefore we have to control microbial infection via new infectious fighting strategies. However, the previous studies of rapid, widespread emergence of resistance for new antimicrobial agents indicates that even new families of these agents will have a short life expectancy while there are some advantages of using medicinal plants, such as often better patience tolerance, fewer side effects, relatively less expensive, acceptance due to long history of use and being renewable in nature. For all these reasons, researcher are increasingly turning their attention to herbal products, for development of new better drugs against multiple drug resistant microbial strains (Benkeblia, 2004) [3]. With the increasing incidence of antibiotic resistance by several pathogenic microbial agents, antimicrobial evaluation of medicinal plants has become the need of the hour. Biomolecules derived from plants have an advantage of being less toxic in comparison to synthetic agents (Gideon *et al*.,2016) **[6]**. According to WHO more than 80% worlds' population depends upon traditional medicine for their primary healthcare needs. Herbal medicine support about 75-80% of whole population and major part of routine therapy involves use of plant extract and active constituents (Akerele,1993) [1]. Medicinal plants are rich in various secondary metabolites of antimicrobial activities such as terpenoids, flavenoids, saponins, alkaloids alkenyl phenols, tannins, phorbol esters and glycoalkaloids. The screening of products of plants for antimicrobial properties have shown that the higher plants represent a potential source of novel antibiotic prototypes (Afolayan, 2003). The increased incidence of multiple resistances in human pathogenic microorganisms in recent years, largely due to unselective use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. This has forced scientist to search for new antimicrobial substances from medicinal plants. However, very few information is available on such activity of plants and out of 4 lakhs plant species on earth, only some has been studied for antimicrobial activities. Plant based medicinal substances are basis of many of the modern pharmaceuticals we use today for our various ailments. The plant kingdom harbors an inexhaustible source of active ingredients invaluable in intractable disease.

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Perspective Article

Micellization of amphiphilic host–guest inclusion complexes of polymers based on β–cyclodextrin trimer and adamantane

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Keywords:
Host–guest
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Miktoarm star polymer

ABSTRACT

The present work aims to study the self–aggregation of amphiphlic miktoarm star polymers synthesized via the inclusion complexation of adamantyl terminated poly(methyl methacrylate) (ADM–PMMA) guest, into β–cyclodextrin grafted polyacrylamide (β–CD–PAM) and β–cyclodextrin trimer (3–β–CD) grafted polyacrylamide (3–β–CD–PAM) star polymer hosts, separately. β–CD and 3–β–CD based hosting star polymers have been synthesized through solution polymerization technique and the guest adamantyl terminated poly(methyl methacrylate) through the technique of atom transfer radical polymerization (ATRP) by using an adamantine–based ATRP initiator. Further, the guest polymer has been incorporated into the host polymer via molecular recognition between adamantyl moiety and β–CD. Construction of β–CD–PAM–b–ADM–PMMA and 3–β–CD–PAM–b–ADM–PMMA miktoarm star polymers has been examined by ^{1}H NMR and 2D ^{1}H NOESY NMR spectra. Their critical micellar concentrations have been estimated by using fluorescence spectroscopy. Further, sizes of the self–aggregates have been anticipated by dynamic light scattering and transmission electron microscopic investigations.

1. Introduction

In recent years, supramolecular polymer chemistry has received much attention because of the advantages to achieve easily more complex structures and functions by the supramolecular polymers formation [1,2]. The development of supramolecular nanotechnology has been pioneered by host–guest inclusion complexations [3]. The well–known molecular hosts, with defined structures and hydrophobic cavities, which are capable to form inclusion complexes with polymer guests, are cyclodextrins (CDs) [4]. As CDs possess the bucket like structure having hydrophobic core and hydrophilic exterior shell, they improve the biocompatibility of nanodelivery systems [5]. In the construction of supramolecular structures, commonly used CDs are α–CD and β–CD, due to their good inclusion ability [6–9].

β–Cyclodextrin, having conical structure, is a water soluble cyclic D–glucopyranose heptamer [10,11]. Its water solubility is attributed to the rims of hydroxy groups. Moreover, the less hydrophilic cones enable it to have stable host–guest interactions with the hydrophobic molecules having suitable geometry [12,13]. Synthesis procedure of β–CD trimer (3–β–CD) has been reported by our group earlier [14]. 3–β–CD, fabricated by the click reaction [15] between triprop–2–ynyl benzene–1,3,5–tricarboxylate and mono–6–deoxy–6–azido–β–cyclodextrin, consists of three hydrophobic cavities with truncated cone–shapes. On the other hand, adamantane is a well–known molecule which forms host–guest complexes with β–CDs [16,17] and it has the greatest affinities due to its high hydrophobicity and complementary size for β–CD [18]. Since the last two decades the inclusion complexation between β–CD and adamantane derivatives has got much interest to study as the adamantyl moiety fits, perfectly, inside the cavity of β–CD and the later has excellent biocompatibility [19]. According to the literature, the inclusion of adamantyl guests by almost all β–CD polymer substituents are accessible [20]. Unimers having guest and host moieties of adamantyl and β–cyclodextrin residues respectively form linear supramolecular structures by self–association.

Nakahata et al., have reported the construction of supramolecular hydrogels by utilizing host–guest interactions of polymers, their self–healing and redox responsive properties [21]. Schmidt et al., have detailed the synthesis of supramolecular miktoarm star polymers using host–guest interactions of cyclodextrin and adamantine [22]. Bai et al., have reported β–CD based supramolecular self–assemblies constructed

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ORIGINAL PAPER

pH tempted Micellization of β-Cyclodextrin based Diblock copolymer and its application in solid/liquid separation

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Abstract

This work focuses on facile synthesis of pH responsive diblock copolymers based on acrylamide (AM) and 2-Acrylamido-2-methyl-1-propane sulfonic acid (AMPS) grafted on β-Cyclodextrin and have application in solid/liquid separation. β-CD based chain transfer agent (CTA) has been synthesized by one pot synthesis method. Three different grades of β-Cyclodextrin based Macro CTA were synthesized through RAFT polymerization technique. Macro CTA have been used further in synthesis of five different grades of β-CD grafted pH-responsive diblock copolymers i.e. (β-CD-PRP's) by varying the amount of AMPS. The polymeric materials were characterized by Fluorescence Spectroscopy, FT-IR, GPC, ^{1}H-NMR, SEM, TEM, TGA, and XRD. β-CD-PRP's shows their micellization properties at acidic pH < 6.57 with polymer conc. > 0.336 mg/mL and has also been studied for removal of model contaminant (kaolin). Among all grades of diblock copolymers, grade 3 shows best performance in the removal of kaolin from aqueous solution at 7 and 5 pH values.

Keywords RAFT polymerization · Block copolymers · Micellization · β-Cyclodextrin based pH responsive polymers · Solid/liquid separation

Introduction

In recent years, external stimuli-responsive block copolymers synthesis by RAFT technique has been of extensive interest. The advantage of RAFT technique is applicable to a wide range of monomers under a broad range of experimental conditions [1].

Remarkable progress has been made in the development of smart polymers or "stimuli responsive polymers". The responsive polymers have been the subject of considerable interest in environmental remediation & biomedical field for applications such as solid/liquid separation, heavy metal removal, toxic dye removal, drug delivery and enzyme recovery respectively [2–4].

The most important actuates of stimuli responsive polymers are Ph [5–7], temperature [8–13] and ionic strength [14–17]. pH responsive polymers show abrupt phase transitions even with mild changes in pH. Poly(2-Acrylamido-2-methylpropanesulfonic acid) (PAMPS) is one such responsive polymer that undergoes chemical and morphological changes with pH. PAMPS has received much attention in the past few years due to its strongly ionizable sulfonate group. It dissociate completely throughout the pH range [18]. PAMPS is hydrophilic in its deprotonated (charged) state (pH > 7), but it becomes hydrophobic in protonated state (pH < 7) and precipitate out from aqueous solution.

In last few decades, numerous research articles have focused on synthesis of graft block copolymers by using natural polysaccharides/oligosaccharides. These graft copolymers possess both hydrophilic/hydrophobic and stimuli responsive segments that can assemble in water spontaneously or in response to some stimuli providing mesostructures (Micelles) with different range of morphologies [19–22]. These natural polysaccharides/oligosaccharides based self-assembled micelles have considerable advantages including abundance, renewability, ecofriendliness and cost effectiveness [23, 24].

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10965-020-02095-4) contains supplementary material, which is available to authorized users.

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Production of π^0 and η mesons in U+U collisions at $\sqrt{s_{NN}} = 192$ GeV

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Measurement of jet-medium interactions via direct photon-hadron correlations in Au + Au and d + Au collisions at $\sqrt{s_{NN}} = 200$ GeV

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