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# Banana lectin (BanLec) induces non-specific activation of basophils and mast cells in atopic subjects

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## Abstract

Dietary lectins play a major role in the activation of mast cells / basophils by bridging cell surface IgE glycans to release histamine and other mediators. In the present study, the effect of mannose / glucose-specific banana lectin (BanLec) on the activation of mast cells / basophils from non-atopic and atopic subjects has been investigated. BanLec was purified from banana pulp in a yield of 7 mg/kg. Leukocytes isolated from heparinized blood of non-atopic / atopic subjects were used for quantitation of the released histamine. Approximately 28.2% of the atopics (n = 117) was positive by skin prick test (SPT) to purified BanLec (100 µg/mL concentration), and all the non-atopics (n = 20) were negative. Maximal release of histamine was seen at 2 µg of BanLec. In percent histamine release, an increase of 35-40% is observed in case of atopics (n = 7) compared to non-atopics (n = 5), and the histamine release from atopic and non-atopic subjects correlates fairly well with the total serum IgE levels ( $R^2 = 0.817$ ). BanLec also induces release of histamine (26.7%) from mast cells present in rat peritoneal exudate cells.

BanLec can significantly activate and degranulate mast cells and basophils by cross-linking the  $\alpha$ -mannosidic core mannose of IgE glycans in atopic population as compared to non-atopic population; the activation is marginal in the non-

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 QUANTITATIVE PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT ACTIVITIES OF SOME CITRUS FRUITS OF SOUTH INDIA

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## ABSTRACT

**Objective:** The current investigation was contemplated to evaluate the phytochemicals and *in vitro* antioxidant activities in peel and pulp of some commercially grown citrus fruits of South India, namely, lemon (*Citrus aurantifolia*), orange (*Citrus reticulata*), sour orange (*Citrus aurantium*), pomello (*Citrus grandis*), and citron (*Citrus medica*).

**Methods:** The peel and pulp of the fruits were separated and subjected to cold extraction using 70% alcohol. The extracts obtained were screened for the presence of their phytoconstituents using various qualitative and further quantified for major constituents. Further, the *in vitro* antioxidant activity was assayed by different radical scavenging methods, namely, 2,2-diphenyl-1-picrylhydrazyl superoxide anion, nitric oxide, lipid peroxidation inhibition, iron chelating activity, and reducing power assay at different concentrations.

**Results:** All the citrus fruits have shown significant *in vitro* antioxidant activity for the parameters assessed, wherein peel extracts recorded superior antioxidant potential than their corresponding pulps. The broad range of activity of the extracts suggests that multiple mechanisms mediated by the phytoconstituents are responsible for the antioxidant activity.

**Conclusion:** The study thus revealed that peel and pulp of citrus fruits are potential sources of bioactive compounds which are reflected in antioxidant activity and supports their health-promoting claims of plethora of investigations.

**Keywords:** Citrus fruits, Peel, Pulp, Qualitative and quantitative, *In vitro* antioxidant activity.

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## INTRODUCTION

Oxygen being an obligatory element of life, living systems have evolved to survive in the presence of molecular oxygen and for most biological systems [1]. Many of the harmful effects of oxygen are ascribed to the formation and activity of reactive oxygen species (ROS) behaving as oxidants, which have a tendency to donate oxygen to other substances. Most of the ROS are free radicals and are extremely reactive and short lived [2]. Free radicals occur continuously in all cells as part of normal metabolism. At low concentration, some of the free radicals offer positive physiological effect *in vivo*, and this includes defense against infectious agents by phagocytosis, energy production, cell growth, function in different cellular signaling systems, and the induction of a mitogenic response [1]. On the other hand, these free radicals are detrimental to the integrity of biological tissue and mediate their injury. The mechanism of damage involves lipid peroxidation (LPO), which destroys cell structures, lipids, proteins, and nucleic acids [3,4]. The human body has an array of mechanisms, especially enzymatic and non-enzymatic antioxidant systems, to protect cells and their constituents against ROS and free radical-induced damage [5].

Oxidative stress is a condition which occurs due to imbalance between free radicals and antioxidant defense system. Oxidative stress plays an important contributory role in the process of aging and pathogenesis of numerous diseases such as diabetes, cancer, neurodegenerative diseases, and respiratory tract disorder [5-7]. To counteract oxidative stress, the body produces an armory of antioxidants to defend itself. It is the role of antioxidants to neutralize or clear free radicals that can affect the cells. The body's internal production of antioxidants is not

enough to neutralize all the free radicals. The body can be helped to defend itself by increasing dietary intake of antioxidants [8].

Antioxidants are the substances, compounds, or nutrients in our foods which can prevent or slow oxidative damage to our bodies. These agents are able to antagonize the deleterious effects of free radicals within our body [9]. Recent investigations have shown that the antioxidants of plant origin with free-radical scavenging properties could be useful as therapeutic agents in several diseases caused due to oxidative stress [10]. Many synthetic antioxidant compounds have shown toxic and/or mutagenic effects, which have stimulated the interest of many investigators to search natural antioxidant [1,11]. Natural products, mainly obtained from dietary sources, provide a large number of antioxidants. It is increasingly being accepted that fruits and vegetables have many health-promoting properties [12], and the consumption of fruit juices, beverages, and hot drinks has been showed to be inversely associated with morbidity and mortality from degenerative diseases [9].

The genus *Citrus*, which belongs to the family of Rutaceae, is rich genera of edible fruits of various species, and they are one of the main fruit tree crops grown worldwide. Citrus fruits have long been valued as part of a nutritious and tasty diet. Citrus and their products are a rich source of vitamins, minerals, and dietary fiber that are essential for normal growth and development and overall nutritional well-being. Fruits are used raw, pickled, and are esteemed for desert, made into jams and marmalades. Many *Citrus* species are recognized for their medicinal, physiological, and pharmacological activities including antimicrobial, antioxidant, anticancer, anti-inflammatory, and hypoglycemic activities [13]. The health benefits of *Citrus* fruit

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**ANTIOXIDANT ACTIVITY OF DIFFERENT TEA SAMPLES**

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**ABSTRACT**

Tea, *Camellia sinensis* is one of the most popular beverages consumed worldwide as green, black or Oolong tea. The present study was carried out to evaluate the antioxidant potential of commercially available seven different tea samples, green tea plain and formulated teas viz. green tea lemon, green tea tulsi, green tea mint, branded black tea, unbranded black tea and green tea of Chinese origin. Aqueous extracts of the all the tea samples were evaluated for the qualitative phytochemical screening and assayed for their antioxidant activities viz. DPPH, Nitric Oxide radical scavenging assay, Reducing power and Total Antioxidant capacity. The results of qualitative phytochemical screening revealed the presence of several bioactive compounds. The antioxidant activities of all the seven tea samples showed the different tea extracts manifesting varying antioxidant potentials. Further, among the extracts under study green tea tulsi (GTT) and green tea plain (GTP) has exhibited comparatively higher antioxidant activity followed by GTL, GTM, CGT, BT and UBBT. The results on the antioxidant potentiality of different tea samples are discussed.

**KEYWORDS:** Tea, Phytochemicals, Antioxidant activity.

**INTRODUCTION**

Reactive oxygen species are formed during normal cellular metabolism, but when present in high concentration they become toxic. Mammalian cells possess intracellular defences such as superoxide dismutase, catalase or glutathione peroxidase, in order to protect the cells against excessive levels of free radicals. Also exogenous addition of compounds such as vitamins (A, E, b-carotene), minerals (selenium, zinc), or proteins (transferrin, ceruloplasmin, albumin) can provide additional protection.<sup>[1]</sup> These natural antioxidants or other compounds that can neutralize free radicals may be of central importance in the prevention of vascular diseases and some forms of cancer.<sup>[2,3]</sup>

Tea is one of the most popular beverages consumed worldwide. Tea, from the plant *Camellia sinensis*, belonging to the family *Theaceae* is consumed in different parts of the world as green, black, or Oolong tea. These teas are differed in processing methods and chemical composition.<sup>[4,5]</sup> The chemical composition of tea leaves has been well documented. The main constituents of tea leaves are polyphenols.<sup>[4]</sup> The fresh tea leaves contain caffeine (approximately 3.5% of the total dry weight), theobromine (0.15–0.2%), theophylline (0.02–0.04%) and other methylxanthines, lignin (6.5%),

organic acids (1.5%), chlorophyll (0.5%) and other pigments, theanine (4%) and free amino acids (1–5.5%), and numerous flavour compounds.<sup>[6]</sup> In addition, a wide variety of other components exists, including, flavones, phenolic acids and carbohydrates, alkaloids, minerals, vitamins and enzymes.<sup>[7]</sup> The flavanols of tea mainly includes quercetin, kaempferol, myricetin and their glycosides.

Several epidemiological studies and clinical trials showed that green tea may reduce the risk of many chronic diseases. This beneficial effect has been attributed to the presence of high amounts of polyphenols which are potent antioxidants. In particular, green tea may lower blood pressure and thus reduce the risk of stroke and coronary heart disease. Some animal's studies have suggested that green tea might protect against the development of coronary heart disease by reducing blood glucose levels and body weight.<sup>[8]</sup> Currently, the tea companies are marketing tea in combination with various formulations such as lemon, mint, honey, ashwagandha, ginger, aloe vera, tulsi etc. in order to supplement health benefits of tea and some of these have become popular choice among the consumers. Therefore the present investigation was aimed to

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## Studies on in vitro antiproliferative activities in cruciferous vegetables

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### Abstract

Cruciferous vegetables have drawn a great deal of attention in cancer research because of their potential protective properties. In the present study, four vegetables viz., cabbage, cauliflower, kohlrabi and radish were procured and processed for cold extraction procedure using 70% ethanol. The extracts were subjected to the qualitative phytochemical analysis, quantitative estimation of glucosinolates content and *in vitro* antiproliferative activity by MTT assay on MCF7, DL and NIH-3T3 cell lines. The results of qualitative phytochemical analysis showed the presence of several bioactive compounds viz., polyphenols, flavonoids, terpenoids, steroids, glycosides and alkaloids. Quantitative estimation of glucosinolates in terms of potassium thiocyanate equivalence/5 mg of extract revealed that the cabbage has highest content of glucosinolate (122.6 µg) followed by cauliflower (109 µg), kohlrabi (101.6 µg) and radish (60.2 µg). The four cruciferous vegetables registered notable cell proliferation inhibition at different concentrations (50, 100, 200, 400 and 800 µg/mL) in a dose dependent manner against three different cell lines. The results of antiproliferative activity was expressed in terms of IC<sub>50</sub>. Among the four vegetables, cabbage showed considerable cytotoxicity and cell proliferation inhibition with an IC<sub>50</sub> value of 192.5, 189.7, 589.7 µg/mL followed by cauliflower (378.7, 398.9, 597.9 µg/mL), kohlrabi (389.5, 396.9, 619.7 µg/mL) and radish (415.4, 423.3, 703.6 µg/mL) in three different cell lines MCF7, DL and NIH-3T3, respectively. The present study underlines the epidemiological surveys that cruciferous vegetables possess anticancer effects might be due to the presence of glucosinolates augmented with other phytochemicals.

**Key words:** Cruciferous vegetables, phytochemicals, anti-proliferative, MTT, Cell lines

### Introduction

Epidemiological studies have consistently linked that abundant consumption of fruits and vegetables lowers the risk of developing several types of cancers (Block *et al.*, 1992; Liu *et al.*, 2002). Cancer is one of the most significant causes of human death. Cruciferous vegetables have drawn a great deal of attention in cancer research because of their potential protective properties (Kim *et al.*, 2009). Various assays are in use to determine the effect of a drug on cells propagated *in vitro*. They range from simple assays that measure cell viability after drug exposure, i.e. dye exclusion that measures membrane integrity and effect of the drug on cell growth, to other assays that measure cell viability, indirectly, by assessing the ability of the cell to reduce compounds such as MTT, XTT, MTS, SRB, and alamarBlue or to generate ATP (Giuseppe *et al.*, 2006). Perusal of literature related to antioxidant and anticancer properties of cruciferous vegetables reveals that quite a number of experimental studies concentrated on antioxidant abilities of different cruciferous vegetables (Ismail and Lee, 2005; Lee *et al.*, 2007; Mohamed *et al.*, 2010; Joanna *et al.*, 2012). However the studies related to anticancer properties involving different cell lines is rather sporadic and concentrated on individual cruciferous vegetables particularly on broccoli species (Subramanian and Gowry, 2011; Remuka and Thangam, 2012; Chaudhary *et al.*, 2012). The advantage of MTT assay is its easy-to-use, safe and high reproducibility.

Moreover such attempt on Indian context is strangely scanty. Therefore the current study was carried out for antiproliferative activities of four cruciferous vegetables viz. cabbage, cauliflower, kohlrabi and radish by using MTT assay involving cell lines of different origin.

### Materials and methods

**Collection of selected cruciferous vegetables:** The selected four commonly consumed cruciferous vegetables of tropical India were procured from a local market of Shimoga, Karnataka. The vegetables includes cabbage (*Brassica oleracea* L. var. *capitata* L.), cauliflower (*Brassica oleracea* L. var. *botrytis* L.), kohlrabi (*Brassica oleracea* L. var. *gongylodes* L.) and radish (*Raphanus sativus* L.) which were authenticated by the Horticulture Department, Shimoga. The collected materials were processed for extraction procedures.

**Extraction:** After selection, each vegetable was washed under running tap water followed by washing with distilled water to remove the surface debris. For the cabbage, after wash the outer leaves were removed, the heads divided into four segments and were chopped into small pieces using a cutter. For cauliflower, the heads were obtained by cutting the main stalk. The florets, together with about 1cm of the stalk were cut off from the rest of the stalk and used as cauliflower samples. For kohlrabi, the foliage and most external stem layers were removed and the remaining edible stem portion was used for the analysis. Further

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BIOPROSPECTING OF MUNTINGIA CALABURA: BIOACTIVE COMPOUNDS AND ITS ANTIOXIDANT, ANTIMICROBIAL AND ANTHELMINTHIC ACTIVITY.

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ABSTRACT

Objective: Muntingia calabura is widely cultivated and has become one of the common roadside trees in most parts of the world. The present study aimed to evaluate medicinal property of leaves and fruits of M. calabura, by using antioxidant, antimicrobial and anthelmintic activities for methanol crude extract.

Methods: Standard methods were used to evaluate secondary metabolites in methanol crude extract of leaves and fruits of M. calabura. Total phenolic contents (TPC) were evaluated according to Folin-Ciocalteu method. The free radical quenching ability of extracts were explored by various in vitro assays, such as DPPH, hydroxyl radical scavenging and reducing power assay. Additionally, the antimicrobial and anthelmintic activity was conducted to evaluate the biological efficiency of the plant extract.

Results: Qualitative phytochemical analysis revealed the presence of alkaloids, saponins, tannins, glycosides, flavonoids and phenols. The reduction of free radical content were observed in dose dependent manner in all tested methods for both leaves and fruits methanol extract of the plant. Further, the antimicrobial activity of plant extract indicates the region where tested microorganisms failed to thrive and the methanol extract also showed evidence to have anthelmintic property.

Conclusion: The presence of secondary metabolites and biological activity of methanol crude extract of leaves and fruits of M. calabura ensure the pharmaceutical importance.

Keywords: Muntingia calabura; Antioxidant; Antimicrobial activity; Anthelmintic activity.

INTRODUCTION

Muntingia calabura is native to the American continent and is widely cultivated in warm areas of Asian region [1], gardens and along roadsides for ornamental and edible purposes in southern Taiwan [2]. Various parts of this tree have documented for its medicinal uses in both Southeast Asia and tropical America [3, 4]. The roots have been employed as an emmenagogue and the flowers of this species have been used to treat headaches, and as an antispasmodic, antispasmodic and diaphoretic. Infusions of the flowers of this plant are drunk as a tranquillizer and tonic in Colombia [3]. Phytochemical studies of various parts of this plant have identified many bioactive flavonoids, chalcones, sesquiterpene and phenolic compounds [3-7]. It has been shown that phytochemicals present in various plants exert beneficial effects on cardiovascular diseases such as stroke, coronary artery disease, atherosclerosis and hypertension [8]. These beneficial effects have been partly attributed to their ability to modulate nitric oxide (NO) pathways [9].

Currently the pharmaceutical industries are facing many challenges and favoring the use of plant natural products over the current chemo-clinical drugs available for the treatment of different diseases. Development of resistance to commercial antimicrobial drugs due to abuse of these drugs, the re-emergence of dangerous infectious diseases [10], high production costs and limited effective life span of the synthetic therapeutic agents [11] are important factors that have encouraged a widespread interest in drugs derived from plant extracts. The objective of the present study is to evaluate total phenolics, antioxidants capacity, antimicrobial and anthelmintic activity in Muntingia calabura.

MATERIALS AND METHODS

Collection and Extraction of plant material

The leaves and fruits were collected from its natural habitat in vidhyanagar, Shivamogga, Karnataka and authenticated at the Botany Department, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka. Leaves and fruits were washed, and rinsed with water to remove all the dirt and unwanted particles and then ground into small particles, weighed and mixed with methanol and were incubated for 7 days with occasional shaking. After one week incubation the mixture was filtered using Whatman No. 1 filter paper and the filtrate was concentrated under reduced pressure using a rotary evaporator (Buchi, Rota Vapor, R-205, Gernem). The obtained residue was dried and weighed. The dried material left off after evaporation were used for further studies.

Preliminary phytochemical screening

The methanol extract of M. calabura was screened for the presence of various phyto-constituents like steroids, alkaloids, glycosides, flavonoids, carbohydrates, amino acids, proteins and phenolic compounds as described by Kokate et al. (1990) [12].

Antioxidant activity

Determination of total phenol content

The total phenol content of extracts was determined using the Folin-Ciocalteu method [13]. The extracts were oxidized with Folin-

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Original article

## Design and synthesis of conjugated azo-hydrazone analogues using nano $\text{BF}_3\cdot\text{SiO}_2$ targeting ROS homeostasis in oncogenic and vascular progression



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## ARTICLE INFO

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Azo-hydrazone  
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Dalton's lymphoma ascites tumor

## ABSTRACT

Disrupted redox balance is implicated in multiple pathologies including malignant progression and tumor angiogenesis. In this investigation, we report the design and development of novel and effective ROS detoxifying azo-hydrazone molecules targeting malignant pathologies and neoangiogenesis. A series of azo-derivatives conjugated to hydrazones moieties (9a–j) were synthesized using Nano  $\text{BF}_3\cdot\text{SiO}_2$ . The compounds (9a–j) were screened for *in-vitro* antioxidant and lipid peroxidation inhibitory activity. Among the series 9a–j, compound 9f potently quenched biologically relevant radicals such as superoxide and hydrogen peroxide which emerged as the lead ROS detoxifying molecules. Compound 9f potently inhibited the proliferative capability of Daltons Lymphoma Ascites (DLA) tumor cells *in-vivo* in dose dependent manner. Regressed tumor progression was correlated with pronounced endogenous antioxidant enzyme superoxide dismutase and catalase *in-vivo*. Also, ROS levels were severely suppressed in 9f treated mice as assessed by lapsed lipid peroxidation. Altered enzymic and ROS levels *in-vivo* by 9f were implicated in suppressed VEGF secretion leading to regressed tumor neo-vasculature and tumor growth. Considering together, it is evident that the synthetic azo-hydrazone analogue 9f with potent ROS scavenging efficacy inhibits tumor progression and neo-angiogenesis.

## 1. Introduction

Redox homeostasis is dependent on the delicate balance between the rate and the magnitude of oxidant production and their elimination over time [1]. Oxidative stress generally describes a condition in which cellular antioxidant defence mechanisms are insufficient to inactivate ROS, or excessive ROS are produced, or both. Upregulated ROS levels lead to “non-specific” damage of macromolecules such as DNA, proteins and lipids [2]. This subsequently leads to generation of a new array of oxidation mediated metabolic agents through lipid and protein peroxidation, which are highly destructive than ROS themselves [3]. Growing body of evidence indicates that persistently high ROS levels have been detected in almost all cancers, as a consequence of genetic, metabolic and microenvironment-associated alterations [1]. As a consequence, deregulated redox balance is strongly implicated in multiple aspects of malignant progression and resistance to therapeutic interventions [4]. Tumor growth relies on formation of angiogenesis which

is a critical process in the growth, invasion, and metastases of transformed cells. Several lines of recent evidences suggest a pivotal role for ROS signalling in augmenting tumor angiogenesis aiding cancer progression. The reciprocity between oxidative stress and angiogenesis has been centered specifically on the VEGF signalling pathway, engaged in promoting neovasculature [3]. Therefore the phenomenon of ROS-driven cancer progression and angiogenesis has substantially fueled a long-standing interest in the development of effective antioxidant molecules to attenuate neoplastic proliferation through ROS detoxification [4]. Nitrogen-containing compounds are one of the most fruitful and extensively developing fields in chemistry. These compounds display various kinds of biological activities [5–7]. Hydrazones moiety plays an important key role in heterocyclic chemistry [8–13]. It is a class of organic compounds with structure  $\text{R}_1\text{R}_2\text{C} = \text{NNH}_2$ . Hydrazones nucleus exhibited immense pharmacological activities. They are present in many of the bioactive heterocyclic compounds that are of very important use because of their various biological and clinical applications.

**Abbreviations:** DLA, Daltons lymphoma ascites; VEGF, vascular endothelial growth factor; MVD, microvessel density; TBARS, thiobarbituric acid reactive substances; DPPH, 2,2-diphenyl-1-picryl-hydrazyl-hydrate; ROS, reactive oxygen species; ELISA, Enzyme linked immunosorbent assay; MDA, malondialdehyde; SOD, superoxide dismutase; H&E, hematoxylin and eosin


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## Accepted Manuscript

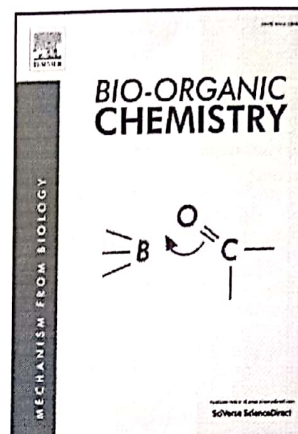
Synthesis of novel morpholine conjugated benzophenone analogues and evaluation of antagonistic role against neoplastic development

Mohammed Al-Ghorbani, Prabhu Thirusangu, H.D. Gurupadaswamy, V. Vigneshwaran, Yasser Issa, B.T. Prabhakar, Shaikath Ara Khanum

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Original article

## The anti-invasive role of novel synthesized pyridazine hydrazide appended phenoxy acetic acid against neoplastic development targeting matrix metallo proteases



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Pyridazine  
Metastasis  
Dalton's lymphoma  
MMPs  
Cancer

### ABSTRACT

Neoplastic metastasis is a major process where tumor cells migrate from the primary tumor and colonize at other parts of our body to form secondary tumor. Cancer incidences are rising and novel anti-neoplastic compounds with new mechanism of actions are essential for preventing cancer related deaths. In the current examination, a novel series of pyridazine analogues 6a-l was synthesized and evaluated against metastatic neoplastic cells. Experimental data postulated compound 6j has potential cytotoxic efficacy with prolonged activity against various cancer cells, including A549, HepG2, A498, CaSki and SiHa cells. Moreover, compound 6j arrests the A549 migration and invasions markedly by counteracting matrix metalloproteinase (MMP)-2 and MMP-9 expressions. Also, compound 6j proved its potentiality against Dalton's solid lymphoma progression *in-vivo* by abridging MVD and MMP expressions. Compound 6j interacts with MMP-2 and MMP-9 by H-bond in-silico, thereby down regulates the MMPs action in tumorigenesis. Altogether, we concluded that compound 6j down regulates MMP-2 and MMP-9 and thereby impairs metastatic cancer cell migration and invasions which can be translated into a potent anti-neoplastic agent.

### 1. Introduction

Cancer invasion and metastasis are pivotal events that renovate locally developing tumor into a systemic and life-threatening disease. Metastasis is a prime process where tumor cells spread from the primary tumor and colonize at distant organs to form secondary metastatic tumor and therefore, metastatic dissemination accounts for more than 90% of all cancer related deaths [1–4]. The cancer cells must migrate and invade through extracellular matrix (ECM), intravasate into the blood stream and lastly extravasate to form metastatic tumor [1,5,6]. In contrast to normal cells, cancer cells do not have physiological “termination signals” to stop the metastatic process [7–10].

Enhanced cell migration and invasion is an important hallmark of metastatic cancer cells. Hence, cancer cells degrade the ECM and basement membrane by overexpressing matrix metalloproteinases (MMPs) which allow the neoplastic cells to migrate and invade into the blood circulation for developing secondary tumor [5,6,8,10]. MMPs are engaged in executing a wide array of cellular and pathophysiological

functions including DNA transcriptional modifications, hematological pH regulation, elevating extracellular matrix digestion and many other functions *in vivo*. Taking into consideration, the importance of these pathophysiological functions, upregulation as well as deregulation of specific metallo proteases may play central role in several aspects of tumor development [11,12]. Most importantly, MMPs play a very crucial role in endothelial cell (EC) migration which facilitates the increased level of neovessel formation, aggressive tumor development and poor response to chemo and radiotherapies [5,6,10]. It is apparent that there is an urgency for innovative therapeutic strategies in the clinic to avoid metastatic spreading, hence, developing novel small molecules that specifically counteract tumor cell migration and invasion potency are critical for treatment of metastatic neoplasia.

Pharmaceutical science has initiated new era for the synthesis of plethora of organic molecules. Nitrogen-containing heterocyclic compounds have displayed various kinds of biological activities since a long time and increasing interest in the pharmaceutical science [13]. The pyridazine nucleus represents a versatile scaffold to develop new

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# Hepatoprotective Effect of Curcumin and Capsaicin against Lipopolysaccharide Induced Liver Damage in Mice

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### ABSTRACT

**Objective:** The present study was undertaken to evaluate the possible ameliorative role of curcumin, capsaicin and their combination against lipopolysaccharide (LPS) induced hepatic toxicity in mice. **Methods:** Animals were distributed into five experimental groups: Normal control, vehicle control, curcumin, capsaicin and combined curcumin and capsaicin treatment groups respectively, for 7 days prior to LPS induced liver toxicity (3 mg/kg b.w. in saline). Hepatoprotective effect of individual and combined spice principles were evidenced by the measurement of serum marker enzyme activities such as, SGPT, ALP and TB and it was further confirmed by histopathological observation of liver tissue section. **Results:** The administration of LPS increased serum nonspecific enzymes (SGOT; 174.2±3.79 IU/L, SGPT; 124.0±3.14 IU/L, ALP; 320.15±3.88 IU/L and total bilirubin level; 2.32±1.23 mg/dL), however dietary curcumin and capsaicin decreased the activities of these non-specific serum enzymes including total bilirubin indicating amelioration of the severe LPS induced hepatotoxicity, while the combined spice principles were more significant as shown by the levels of enzymes activities SGOT; 89.9±1.39 IU/L, SGPT; 85.9±1.83 IU/L, ALP; 138.4±2.05 IU/L including total bilirubin level; 0.86±0.03 mg/dL. **Conclusion:** Dietary curcumin and capsaicin individually are protective to LPS induced hepatotoxicity, the beneficial effect was found to be more when the two compounds were fed in combination.

**Key words:** Hepatoprotective Activity, Lipopolysaccharide, Curcumin, Capsaicin, SGOT, SGPT, ALP

### INTRODUCTION

Liver diseases have become one of the major causes for morbidity and mortality in all over the world. Liver cirrhosis is a significant cause of global health burden, with more than one million deaths in 2010. According to WHO report globally alcohol consumption is estimated to cause from 20% to 50% of liver cirrhosis and 325 million people were living with chronic hepatitis infections (HBV or HCV) worldwide and 1.34 million people died of viral hepatitis in 2015.<sup>1</sup> According to the medical certification of cause of death reports 2014, India ranks 61 position in the world ranking list with 68.1% of deaths due to liver diseases.<sup>2</sup> William Bernal *et al.*, (2013) reported that, in India 61% of acute liver failure was due to viral infections (Hepatitis A, B, and E), 7% was due to others and 31% of liver injury was due to unknown reasons.<sup>3</sup> Hepatotoxicity due to drug abuse to be the most common contributing factor for acute liver injury/failure in developed countries, where 53% and 68% of acute liver failure were documented in United States and United Kingdom respectively. Whereas, 1% drug induced liver damage was reported in India.<sup>4,5</sup>

Liver is the body's most complex and largest organ in the body. It plays a major role in maintenance of

internal environment, site of immune tolerance while initiating an adequate immune response to infectious agents, thereby acts as a primary line of defense in mucosal immunobiology. As an essential interface between the environment and the internal milieu, liver is continuously exposed to toxic effluents, drug metabolites, and infectious agents<sup>6</sup> etc. causing liver illness.

LPS is an outer membrane component of gram negative bacteria and widely used model to study the hepatic injury *in vitro* and *in vivo*. LPS induces the activation of kupffer cells, which initiates detoxification by removing of some polysaccharide moieties, which is then presented to hepatocytes for further metabolism.<sup>7-9</sup> However high concentration of LPS overwhelm the detoxification process by activating kupffer cells to release chemo-attractants, leukotrienes, interleukins and complement proteins which stimulate neutrophils and expression of adhesion molecules,<sup>10,11,12</sup> thereby activating hepatic macrophages to initiate lipid peroxidation, platelet aggregation, microthrombosis, consumptive coagulopathy and blocks sinusoids, results in the disturbance in microcirculation, cell injury and further tissue damage/sclerosis.<sup>13,14</sup>

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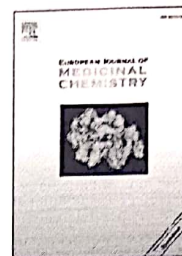
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## Accepted Manuscript

The Novel 4-Phenyl-2-Phenoxyacetamide Thiazoles modulates the tumor hypoxia leading to the crackdown of neoangiogenesis and evoking the cell death

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ESTIMATION OF TOTAL PHENOLICS, FLAVONOID AND *IN VITRO* ANTIOXIDANT  
ACTIVITY OF *CHROZOPHORA ROTTLEI*

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ABSTRACT

The present study was contemplated to evaluate the total polyphenols, flavonoids and *in vitro* antioxidant potential of *Chrozophora rotleri* Leaf extracts. The dried leaves were subjected to soxhlet extraction utilizing chloroform and methanol followed by preliminary qualitative phytochemical analysis. Total phenolic content was estimated by Folin-Ciocalteu method and Aluminium chloride method was used for flavonoid estimation. The *in vitro* antioxidant assays were determined by using various radical scavenging activities such as DPPH, superoxide anion, nitric oxide, hydroxyl, ferrous ion chelating activity and reducing power assay at different concentrations. The results of the total phenolic and flavonoid content estimation was expressed in terms of equivalence with standard and the antioxidant potentiality of various scavenging and chelating activity were expressed in terms of IC<sub>50</sub> values. The results showed that both methanol and chloroform extracts possess significant antioxidant activity. However methanol extract, was found to be superior to the chloroform extract in terms of parameters assessed. The study therefore suggests *Chrozophora rotleri* leaves, as a significant source of natural antioxidants, which might be helpful in preventing or slowing the progress of various oxidative stress-related diseases.

**KEYWORDS:** *Chrozophora rotleri*, *in vitro* antioxidant activities, radical scavenging, total phenolics and flavonoids.

INTRODUCTION

The reactive oxygen species (ROS) or free radicals are chemical entities that can exist separately with one or more unpaired electrons; they are produced by ultraviolet light, ionizing radiations, chemical reactions, environmental pollutants and metabolic processes. The most common reactive oxygen species includes superoxide (O<sub>2</sub><sup>-</sup>) anion, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), peroxy (ROO<sup>-</sup>) radicals, and reactive hydroxyl (OH<sup>-</sup>) radicals. The nitrogen-derived free radicals are nitric oxide (NO<sup>-</sup>) and peroxynitrite (ONOO<sup>-</sup>) anion.<sup>[1]</sup> Free radicals contribute to more than one hundred disorders in humans including atherosclerosis, arthritis, ischemia, liver disorder, and reperfusion injury of many tissues, central nervous system injury, gastritis, cancer etc.<sup>[2]</sup>

Many plants contained substantial amounts of antioxidants including vitamin C and E, carotenoids, flavonoids, tannins and thus can be utilized to scavenge the excess free radicals from the human body.<sup>[3]</sup> The

antioxidant activity of phenolics is mainly due to their redox properties, which allow them to act as reducing agents, hydrogen donors and singlet oxygen quenchers.<sup>[4]</sup> Interest in the search for natural antioxidants is increased over past few years as the reactive oxygen species production and oxidative stress have been shown to play vital role in number of disorders. Therefore, the need exists for safe, economic, powerful and natural antioxidants to replace the synthetic ones.<sup>[5]</sup>

*Chrozophora rotleri* A. Juss. ex Spreng. a dye yielding medicinal plant is a spreading herb in open places belonging to the family Euphorbiaceae, commonly called as Suryavarti. The plant occurs naturally throughout India, Myanmar, Thailand, Andaman Islands, and Malaysia. *C. rotleri* is traditionally used by the tribes and native medical practitioners for the treatment of various diseases. The roots are mainly used in asthma, burns, cold, cough, cuts, wounds and leaves are used in

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## SEASONAL DISTRIBUTION OF SOIL MYCOFLORA IN MATTAVARA STATE FOREST OF CHIKKAMAGALUR, KARNATAKA, INDIA

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### ABSTRACT

The soil fungi is an interesting group of organism which plays a major role in the ecosystem as primary decomposer in nutrient cycling whose diversity in a particular region depends upon the different climatic factors. Tropical forests are the dwelling place of greatest microbial activity. Unexplored soil of Mattavara forest was selected as study area situated between 12° 54' 42" and 13° 53' 53" north latitude and between 75° 04' 46" and 76° 21' 50" east latitude and is located in Chikkamagaluru district known as gate way of Western Ghats of Karnataka. Studies were conducted during different seasons from the year 2013 - 2014 to investigate the effect of physicochemical parameters to the seasonal distribution of soil fungi. Soil samples were collected out at the depth of 0 - 15 cm from triplicate sites in three different season's rainy (July), winter (November) and summer (April) by random sampling technique. The soil fungi were enumerated by using serial dilution method on PDA media supplemented with tetracyclins. A total of 39 genera and 102 species were isolated from the study area. Out of these 45 and 29 species in winter, 39 and 26 species in summer and 37 and 19 species in rainy season and classes *Douderomycolina* with highest percentages followed by *Zygomycotina*, *Ascomycotina*, *Oomycotina* and *Chytridomycotina* were recorded. Total number of colonies recorded during different seasons showed variations. More number of colonies and species isolated in winter followed by summer and rainy season showed deviation from the earlier reports may be due to change in the seasonal fluctuation and all the climatic factors responsible for the seasonal variation of fungal diversity in the study area.

**KEYWORDS:** Soil fungi, Seasonal distribution, Mattavara forest, fungal diversity



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**SURVEY AND COLLECTION OF JATROPHA CURCAS LINN.  
GERMPLASM IN CHIKKAMAGALURU, SHIVAMOGGA AND  
CHITRADURGA DISTRICTS OF KARNATAKA, INDIA**

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**Abstract**

*Jatropha curcas* Linn. endemic to Tropical America is a drought-resistant plant which recently gained much importance in Asia and Africa as a biodiesel crop. Though it has wide cultivation in these areas the characterization and conservation of genetic resources remain poor. The present study focuses on surveying and collection of *J. curcas* germplasm in the study area. The study area falls under three different Agro-climatic zone of Karnataka viz., Southern Transition Zone (STZ), Hillly Zone (HZ) and Central Dry Zone (CDZ). All the taluks falling under STZ showed the incidence of *J. curcas* cultivation. In HZ except for Sringeri, all the taluks had an occurrence of *J. curcas*. The nonoccurrence of *Jatropha* plants in this area had been found mainly because of behavioral factor rather than environmental. In none of the taluks of CDZ which included entire Districts of Chitradurga and Kadur taluk of Chikkamagaluru district, *J. curcas* cultivation was found. The unawareness shown by farmers to the crop was found to be the reason for the non cultivation of *Jatropha* plants in these areas. Among the districts, in Shivamogga all the taluks had a prevalence of *J. Curcas* cultivation. In all the surveyed area *J. curcas* was grown as a hedge plant. The accessions belonging to drier regions of STZ had more fruit density per meter of live fence than the accessions of HZ with wet climate.

**Keywords:** *Jatropha curcas*, STZ, HZ, CDZ, hedge plant, STJCA1-A12.

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## Estimation of Variation in Oil Yield and Characterisation of Oil Traits of Different Accessions of *Jatropha curcas* L. Found in Chikkamagaluru and Shivamogga Districts, Karnataka, India

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### ABSTRACT

The *Jatropha curcas* is a multipurpose shrub. Seed oil of *Jatropha* has the economic potential of replacing fossil fuel. In this study seed traits namely 100 seed weight, oil yield and oil traits of accessions of *Jatropha curcas* falling within the Hilly Zone and Southern Transition Zone in the Chikkamagaluru and Shivamogga districts have been examined. Significant variations were found between the accessions for 100 seed weight, which might have been because of interaction between genetic and environmental factors. Oil content of different accessions ranged between 30.98% and 30.93%. Significant variations were observed. Accessions of Hilly Zone with wet climate had better oil content than STZ accessions with drier climate. Among oil traits acid values of different accessions were well within the standard range for *Jatropha* oil. With the values for % FFA ranging from 0.804 to 2.864 a single-step transesterification could be employed for all the accessions during conversion of *Jatropha* seed oil to Fatty Acid Methyl Ester (FAME). Mean saponification values for different accessions ranged between 176.720 and 215.987. Iodine values recorded for different accessions were well within the permissible upper limit prescribed for biodiesel.

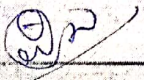
**Keyword:** *Jatropha curcas*, 100 seed weight, Oil yield, FFA, Acid value, Saponification value, Iodine value

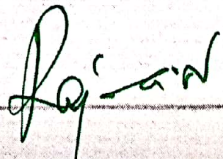
### INTRODUCTION

The multipurpose and drought resistant *Jatropha curcas* (L.) or physic nut is an oil yielding shrub. A native of tropical Central America has now widely been domesticated in Africa and Asia because of its ability to grow in various climatic zones of tropical and subtropical regions especially in marginal lands. Apart from the traditionally acclaimed uses, the *Jatropha* seed oil has the economic potential of replacing fossil fuels (Openshaw, 2000). In recent years, this biodiesel property of the crop has been exploited by many researchers (Agarwal, 2007).

In spite of this, full potential of the crop is yet to be realised. The main reason being absence of planned rational conventional breeding program. Its wide adaptability implies the existence of considerable amount of genetic variability which could be exploited for potential realisation. Quantitative characters such as yield and its determinants manifest significant degree of interaction with the environment, thus it is essential to analyze the variability present in the germplasm (Rao *et al.*, 2008). The results of Kaushik *et al.* (2007) revealing the divergence in seed oil traits from a limited number of locally collected accessions of *Jatropha* supports this claim. According to Rao *et al.* (2008), variation found in oil content in addition with seed morphological attributes presents a viable selection alternative from base seed material at a very early stage. This could be exploited in the genetic improvement programmes of *Jatropha*. Thus in this study, we have focused on estimating variation in seed traits (100 seed

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## ORCHIDACEOUS ADDITIONS TO THE FLORA OF CHIKKAMAGALURU DISTRICT (KARNATAKA)

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Received : 20th August 2018 Reviewed : 28th September 2018

### Abstract

Chikkamagaluru district is one of the 30 districts in Karnataka state consisting both arid and Malnad region of Western Ghats. Periodic field trips were undertaken to cover different vegetation types of the district. 65 species of orchids are found to be new additions to the flora of Chikkamagaluru district against 41 species of orchids reported earlier by Yoganarasimhan, *et al.*, (1981). Nine species recorded in the Flora of Chikkamagaluru district such as *Eria exilis*, *Thunia venosa*, *Dendrobium wightii*, *D. lawianum*, *Peristylus lawii*, *P. plantagineus*, *Goodyera procera*, *Liparis biloba* and *Eulophia emiliana* could not be collected in the recent field trips they are either becoming very rare or may be extinct from the district.

### Introduction

India is considered as one of the Mega Biodiversity regions in the world with two major Biodiversity Hot-spots – The Eastern Himalayas and the Western Ghats. These Hot-spots with their lush green and diverse forest types are the real treasure-houses of multitudinal biotypes remarkably co-existing in diverse environmental conditions (Hegde, 1997). One such precious treasure we inherit in our country in these treasure houses is perhaps the ORCHIDS – the loveliest of all the flowers in angiosperms and precious gift of nature that belongs to one of the largest angiosperm family Orchidaceae representing a culmination of evolution among the monocotyledons containing about 25,000 – 35,000 species belonging to 600-800 genera

which is known for their diversity of habits and habitats (Arditti, 1977).

### Materials and Methods

#### Study Area

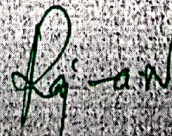
Chikkamagaluru district – one of the 30 districts in Karnataka state consist both arid and Western Ghats region, situated between 12°55' to 13°54' latitude and 75°5' to 76°22' longitude. The district harbors seven taluks viz. Sringeri, Koppa, Mudigere, Narasimharajapura (N.R. Pura), Tarikere, Kaduru and Chikkamagaluru.

According to Champion (1936), the area falls under the category "Western tropical evergreen" The district has significant extent of forest cover and broadly falls into Evergreen, Moist deciduous, Dry deciduous, Scrubby and

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# Over expression of stress responsive *Pennisetum glaucum 47* helicase (*PG47*) improves stress tolerance in groundnut (*Arachis hypogaea L*)

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### ABSTRACT

RNA helicases function as molecular motors that rearrange RNA secondary structure, potentially performing roles in any cellular process involving RNA metabolism in an ATP-dependent manner and play an important role in protein synthesis. *Pennisetum glaucum 47 (PG47)* RNA helicase overexpressed in groundnut (*Arachis hypogaea L.*) cultivar GPBD-4 improved drought tolerance. The transgenic plants were confirmed for presence, expression and stable integration by Kanamycin screening, genomic DNA PCR, RT-PCR and Southern analyses respectively. In T3 generation, the promising transgenic events were identified based on stress tolerance and improvement in productivity. The transgenic events showed enhanced stay-green phenotype and increased chlorophyll stability under drought stress. The transgenics also showed reduced chlorophyll retardation under NaCl, PEG and etherel-induced stress conditions. Transgenic plants showed increased yield than wild type under stress conditions. Results suggested that *PG47* RNA helicase contributing for enhanced drought-adaptive traits and improved productivity under water-limited conditions.

**Key words:** Drought, Groundnut, Stress tolerance, Yield.

**Abbreviation:** CLT- cellular level tolerance, PDH45- Pea DNA helicase 45, TDM-Total dry matter.

### INTRODUCTION

Groundnut (*Arachis hypogaea L.*) is an economically important oil and protein rich crop, whose seeds contain about 40 to 50% oil and 26 to 28% protein that has a significant impact in tropical and sub-tropical regions of Asia, Africa, North and South America. It is being cultivated on over 25.2million ha worldwide with a total production of 41.2 million tons with an average yield of 1.67 tons/ha. India is the second largest producer of groundnut accounting 8 million tons from 6 million ha (FAOSTAT, 2014) which needs to be increased up to 14.8 million tons by 2020 to meet the growing demand.

Drought and salt are major abiotic stresses that adversely affect crop productivity. Thus, identification of factors that confer resistance to these stresses would pave way to increasing agricultural productivity (Zhu 2002). Transgenic approaches have been attempted to improve tolerance to abiotic stresses. Many regulatory and functional genes that bring about cellular level tolerance are fairly well elucidated and the relevance of several candidate genes is well established. Helicases are the molecular motors belonging to the DEAD box protein family that catalyze the unwinding of nucleic acids in an ATP- dependent manner. Stress induced RNA helicases essential for survival during stress in plants (Tuteja and Tuteja, 2004).


RNA secondary structure rearrangements are catalyzed predominantly by members of the two protein families either RNA helicases or RNA-binding proteins (RBPs). RNA helicases refer to enzymes that use energy derived from the hydrolysis of a nucleotide triphosphate to unwind double stranded RNAs (De la Cruz, 1999). The majority of RNA helicases belong to the superfamily 2 (SF2), consists of three subfamilies, termed DEAD, DEAH and DExH/D, based on variations within a common DEAD (Asp-Glu-Ala- Asp) motif (Tanner and Linder 2001). The range of enzymatic activities, and thus potential physiological activities, exhibited by RNA helicases has expanded to include rearrangement of ribonucleoprotein (RNP) complexes via the removal or 'clearing' of protein from RNA and the combination of both RNA unwinding and RNA annealing to promote RNA-strand exchange, potentially through a branch migration mechanism. RNA helicases have been implicated in every step of RNA metabolism, including nuclear transcription, pre-mRNA splicing, ribosome biogenesis, nucleocytoplasmic transport, translation, RNA decay, RNAi, RNA editing and organellar gene expression (Rocak and Linder 2004). The amino-acid sequence of *PG47 (Pennisetum glaucum 47)* shows high homology with *PDH45 (Pea DNA helicase 45)*, translation initiation factor eIF- 4A from tobacco, *Arabidopsis thaliana*, maize and wheat (Pham

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et al. 2000). Overexpression of *PDH45* under constitutive promoter conferred salt tolerance in tobacco and rice with improved yield (Amin et al. 2012) and sugarcane (Sruthy et al. 2015). In the present study the emphasis is to overexpress RNA helicase, *PG47* to improve drought tolerance in groundnut. The stress-responsive RNA helicase *PG47* was overexpressed under RbcS promoter to improve cellular level tolerance (CLT) in a trait donor groundnut. The transgenic plants showed enhanced cell membrane thermo stability and up regulation of a few stress-responsive genes leading to abiotic stress tolerance and yield improvement in peanut.

**MATERIALS AND METHODS**

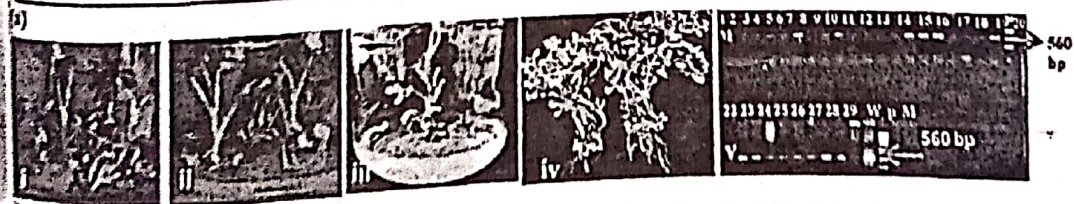
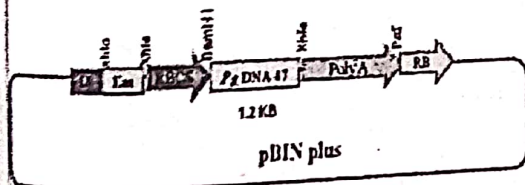
The plasmid cloning site of *PG47* was identified by sequential digestion of PBSK vector 1.2 kb fragment was released in *XhoI/BamHI* subsequently *PG47* fragment were end filled with *EcoR V* and digested with *Bam HI & XbaI* and ligated to in a TA vector. From TA vector *PG47* fragment released using *XbaI & BamHI* and ligated to in impact vector which contains RbcS promoter. Whole cassette (promoter, gene and terminator) was released with *Asc I & PacI* enzymes and ligated in to the binary vector pBin plus (Fig. 1a). The pBinplus*PG47* plasmid was mobilized to *Agrobacterium* strain LBA4404 by electroporation method and the positive clones were identified using colony PCR analysis with gene-specific primers. Insert was confirmed by digestion with *XbaI & BamHI* enzyme and also by PCR with gene specific primer and *npt II* primer.

**Plant transformation and selection of transgenic plants:** Seeds of groundnut (*A. hypogaea* L.) cv. GPBD-4 were obtained from the National, Seed Project (NSP), the Agricultural Research Station Dharwad, Karnataka, India. Seeds were surface sterilized according to Kiran et al. (2009).

Cotyledonary nodes were excised aseptically from 4-5 day old seedlings and inoculated on to modified Murashige and Skoog's (MS 1962) medium containing 3% (w/v) sucrose. All the cultures were maintained at a temperature of  $25 \pm 2^\circ\text{C}$  under a 16/8-h (light/dark) photoperiod provided by cool white, fluorescent lamps. For plant transformation, *PG47* was driven by RbcS promoter construct was used for plant transformation via *A. tumefaciens* (strain LBA4404). *Agrobacterium* was grown at  $28^\circ\text{C}$  in AB minimal medium supplemented with kanamycin (50 mg transgenic) and used to infect explants for 4-5 min at room temperature. Infected explants were inoculated on MS plus shoot initiation media (SIM) containing BAP (3 mgL<sup>-1</sup>), NAA (1 mgL<sup>-1</sup>), kanamycin (125 mgL<sup>-1</sup>) and cefotaxime (250 mgL<sup>-1</sup>). Once appreciable growth was seen, the explants were transferred on shoot proliferation media (SPM) containing BAP (3 mgL<sup>-1</sup>), NAA (1 mgL<sup>-1</sup>), kanamycin (125 mgL<sup>-1</sup>) and cefotaxime (250 mgL<sup>-1</sup>). Developed shoots were transferred to shoot elongation media (SEM) containing GA (1 mgL<sup>-1</sup>) kanamycin (125 mgL<sup>-1</sup>) and cefotaxime (250mgL<sup>-1</sup>) for shoot elongation. Plantlets were then transferred to root induction media (RIM) containing IBA (0.5 mgL<sup>-1</sup>), kanamycin (75 mgL<sup>-1</sup>) and cefotaxime (250 mgL<sup>-1</sup>). The rooted plantlets were transplanted into pots containing soilrite and covered with plastic bags to prevent dehydration, and subsequently allowed for hardening under controlled environmental conditions. After one week, the plants were transplanted to pots containing potting mixture and allowed to grow to maturity in the transgenic containment facility.

**Kanamycin germination assay:** For selection of transgenic plants, germinated seeds were soaked in kanamycin (400 ppm) for 5 h and subsequently transferred to sand medium supplemented with nutrient solution, and allowed to grow for 15 days. The plants with good root growth were selected and progressed to next generation (Fig 2a).

**Molecular analysis of transgenic plants: PCR Analysis:** Genomic DNA of transformed and wild type plants for molecular analysis was isolated, PCR was performed with the purified genomic DNA using primers for *PG47*, marker



**Fig 1: a:** Schematic diagram of constructed vector map for the over expression of *PG47*. **b:** Plant transformation: i) Shoot proliferation of putative transgenic peanut plantlets on selection medium containing BAP (3 mg L<sup>-1</sup>), NAA (1 mg L<sup>-1</sup>), kanamycin (125 mg L<sup>-1</sup>) and cefotaxime (250 mg L<sup>-1</sup>); ii) Shoot elongation of putative transgenic peanut plantlets on selection medium containing GA (1 mg L<sup>-1</sup>), kanamycin (125 mg L<sup>-1</sup>) and cefotaxime (250 mg L<sup>-1</sup>); iii) Rooting of putative transgenic peanut plantlets on selection medium containing IBA (0.5 mg L<sup>-1</sup>), kanamycin (75 mg L<sup>-1</sup>) and cefotaxime (250 mg L<sup>-1</sup>); iv) Increase in yield was observed in some of the putative transformants when compared to wild type v) Representative gel showing the PCR analysis of the putative transformants for RbcS forward and *PG47* gene-specific reverse primer. Lanes 1-25 Transgenics, W Wildtype, M1kbladder, P plasmid.

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### Review on production techniques of GI Crop, Udupi Mallige (*Jasminum sambac* (L.) Aiton)

HS Chaitanya, Nataraja S, Vikram HC and Jayalakshmi Narayan Hegde

#### Abstract

Jasmine, *Jasminum sambac* (L.) Aiton cv. Udupi Mallige belonging to family Oleaceae, is a fragrant commercial flower crop of coastal Karnataka. Udupi Mallige is being cultivated in homestead gardens and is concentrated in the surrounding villages of Shanakarpura, in Udupi district. The crop has been tagged under Geographical Indication (GI) due to its unique fragrance and quality flowers from Udupi region. Udupi Mallige is extensively used in religious functions and perfumery industry as it is having mild fragrance, which gives a feeling of optimism, euphoria and confidence. Its fragrance is also known to cure depression, nervous exhaustion and stress. Udupi Mallige which has been recognised internationally for its fragrance has got potential demand for export market, especially to Gulf countries. The crop flowers throughout the year and the peak flowering is observed during March-April (on season). There is a demand for Udupi Mallige flowers during October to February (off season), as most of the religious functions and marriage ceremonies tend to occur during off season. At present there are about 20,000 farmers cultivating this crop in small and marginal land holdings (0.02 to 0.2 acres). The retrospect of trend in area and production statistics of Udupi district from 2008-09 to 2016-17 reveals marginal decline in crop area. But this crop has been extended to neighbouring districts of the state. Studies on Udupi Mallige with respect to production of quality planting material, techniques for enhancing flower production during off season and increasing the keeping quality of the flowers is very limited. The review on the production techniques on Udupi Mallige gives good scope for exploring in the area of research and development in the future.

**Keywords:** Udupi Mallige, Geographical Indication (GI)

#### Introduction

Jasmine (in Kannada mallige) is an important traditional flower crop of our country. Although more than 2,000 species are known, 40 species have been identified in India and 20 species are cultivated in South India (Bhattacharjee, 1980) [6]. Also, in Karnataka a number of species have been covered all over the state, out of which Udupi Mallige is most commonly cultivated in Udupi district. The other important cultivars are Mysore Mallige (*Jasminum grandiflorum*) and Hadagali Mallige (*Jasminum auriculatum*). Recently, Mysore Mallige, Udupi Mallige and Hadagali Mallige have been registered under the Intellectual Property Rights (Anon., 2008) [1]. Geographical Indication status has provided executive rights to the local community to cultivate these three species and continue to grow for many more years. At present, Department of Horticulture, Government of Karnataka is encouraging farmers to promote cultivation of these cultivars through conducting workshops, financial assistance, formation of Farmer's Producers Organisation (FPO's) and market support. Udupi Mallige cultivation is very particular to southern parts of Udupi such as Shankarpura, Shirva, Belman, Kaup, Katapadi and surrounding areas. Udupi mallige is usually grown by small farmers. The average size of the land holdings is about 0.02 to 0.2 acres. Many of the farmers of this region depend directly on cultivation of Udupi Mallige for their livelihood (Krishnamurthy *et al.*, 1995) [9]. At present there are about 20,000 farmers in the Udupi district who are involved in the cultivation of Udupi mallige (Anon., 2013) [3]. The total area under this crop during 2008-09 in the Udupi district was about 325 ha with the production of 2389 metric tonnes (Anon., 2009) [2]. Whereas during 2016-17, total cultivated area of 214 ha was recorded with an annual production of 1391 metric tonnes of flowers (Anon., 2017) [4]. Growth trend of this crop is declining in area and production in Udupi district due to many reasons.

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# BIODIESEL PRODUCTION FROM FRESHWATER ALGAE AS A RENEWABLE SOURCE

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## Abstract

Biodiesel is a nontoxic and biodegradable alternative fuel that is obtained by the transesterification of triglyceride oil with monohydric alcohols. The need of energy is increasing continuously, because of increases in industrialization and population. The basic sources of this energy are petroleum, natural gas, coal, and etc. In this study three naturally occurring algal samples were collected from different areas of Shivamogga. Algae were identified in the Botany lab as *Spirogyra spp.*, *Oedogonium spp.* and *Zygnema spp.* oil was extracted from all the three dried algal samples and pH were analyzed. These results indicate that biodiesel can be produced from *Spirogyra spp.*, *Oedogonium spp.*

**Key words:** Biodiesel, transesterification, Algal oil, glycerine, biomass.

## Introduction

The basic sources of energy are petroleum, natural gas, coal, and etc. The need of energy is increasing continuously due to the increase in population and industrialization. The continued use of petroleum sources fuels is now widely recognized as unsustainable because of the depletion supplies and the contribution of these fuels to the accumulation of carbon dioxide in the environment leading to increase of global warming. In the last ten years, many studies have been conducted on biofuels for substituting fossil fuels and reduce the greenhouse gas (GHG) emission (Bastianoni *et al.*, 2008).

Biodiesel from oil crops, waste cooking oil and animal fat cannot realistically satisfy even a small fraction of the existing demand for transport fuels. Recent researchers involved not only the existing renewable sources available from land plants, but also those coming from aquatic systems. Algae (macro and micro) have been taken in consideration as a residual biomass ready to be used for energy purposes. Algae, especially micro algae, were found to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels (Chisti 2007 and 2008).

The idea of using algae as a source of fuel is not new, but it is now being taken seriously because of the

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increasing price of petroleum and more significantly, the emerging concern about global warming that is associated with burning fossil fuels (Chisti 2005).

Micro algae can provide several different types of renewable biofuels which include methane, biodiesel and bio-hydrogen. Oil productivity of many microalgae greatly exceeds the oil productivity of the best producing oil crops (Shay 1993).

## Materials and methods

### Algal Samples

The Algal samples were collected from the Santhekadur pond, Shivamogga. The algal biomass was collected from freshwater bodies by mesh net, after collection the samples were brought to the laboratory, Department of Botany, Sahyadri Science College (Autonomous), Shivamogga. And they were identified as *Spirogyra spp.*, *Oedogonium spp.* and *Zygnema spp.*

### Oil extraction

Algae were ground with motor and pestle as much as possible. The ground algae were dried for 20 min at 80°C in a incubator for releasing water. Hexane and ether solution (20 and 20 mL) were mixed with the dried ground algae to extract oil. Then the mixture was kept for 24h for settling. Then the biomass was collected after filtration and weighted.



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**ANTIBACTERIAL ACTIVITY OF EICHHORNIA CRASSIPES,  
BATHI LAKE, DAVANAGERE, KARNATAKA**

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**Abstract:**

Water hyacinth (*Eichhornia crassipes*) is an aquatic weed infesting rivers, dams, lakes and irrigation channels. The plant has affected the marine environment with billions of shillings being lost yearly in controlling it and also in economic losses. The plant is causing severe hindrances to the individual nation's developmental activities. It clogs waterways making boating, fishing and all other water activities impossible. The plant spreads via the waves from the bay to bay blocking waterways and affecting aquatic life as it takes up oxygen from the water. Owing to its tremendous growth, it has threatened the diversity of local native plants alongside the physical and chemical composition of the aquatic environment. It grows very fast and spreads widely across the water body. However, despite this problem the plant has the potential to be used as a medicinal plant. The primary objective of antibacterial properties of the plant against selected strains of bacteria and determine whether it can be exploited for therapeutic purposes. The plant material for use in the study was obtained from Lake Bathi and identified at Botany Department, Sahyadri Science College, Kuvempu University, Shivamogga. The crude extract of *Eichhornia crassipes* obtained by using hot extraction method. The crude extract was then subjected to antibacterial assay against bacterial isolates such as *Salmonella typhimurium*, *Staphylococcus aureus*, and *Escherichia coli*. The crude extract of the plant portrayed potential antibacterial activities against some bacterial isolates. *Escherichia coli* showed some level of sensitivity to the crude extract of *Eichhornia crassipes*. However, there was no activity against *Staphylococcus aureus* and *Salmonella typhimurium*.

**Key Words:** *Eichhornia crassipes*, Aquatic Macrophytes, Bathi Lake & Antibacterial

**Introduction:**

*Eichhornia crassipes*, an aquatic plant belonging to the family Pontederaceae, is listed as one of the most productive plants on earth and is considered the world's worst aquatic weed<sup>[1]</sup>. The plant has affected the marine environment with billions of shillings being lost yearly in controlling it and also in economic losses. The plant is causing severe hindrances to the individual nation's developmental activities. It clogs waterways making boating, fishing and all other water activities impossible. Its dense mat covers lakes and rivers, blocking waterways and eventually interfering with the water transport of agriculture products, tourism activities and irrigation of the agricultural fields. The plant can grow fast consuming vast quantities of nutrients that promote its growth over other aquatic species. It has also been uncovered that when the plant dies and decomposes, it releases nutrients in water bodies leading to deterioration of water quality, becoming a threat to human health. It has been shown by the high prevalence of waterborne diseases in regions that have been affected by the plant especially Lake Bathi. It is this challenge that has led to an increased interest in determining whether the plant can be used for economic gains. The medicinal actions of plants are unique to particular plant species or groups are consistent with this concept as the combinations of secondary products in a particular plant are often taxonomically distinct<sup>[14]</sup>. The chemical components present in the plant have a positive effect on the body in the event of an infection. In this study, the antibacterial activity of *Eichhornia crassipes* obtained from Lake Bathi was determined.

**Study Area and Location:**

Bathi Lake is situated in the Davanagere district of Karnataka, India. Bathi Lake covers a geographical area of 26.3 Hectars. About 35 percent of lake is occupied by aquatic macrophytes.


**Materials and Methods:**

**Sample Collection and Preparation:**

Fresh water hyacinths were collected from Lake Bathi with the help of local people and the identification done at the Department of Botany, Sahyadri Science College at Shivamogga. The root portion was removed and the plant washed thoroughly to free any debris, washed several times with tap, distilled and sterilized water then air dried. The raised leaves were dried in an oven at a temperature of 160°C for 1 hour and shade dried. The dried leaves of each plant were ground, using a mortar and pestle, to obtain a powdered form. The powdered form of these plants were stored in airtight glass containers and protected from sunlight until required for analysis.

**Preparation of Crude Extract:**

100gms of the air dried and coarsely powdered plant material was exhaustively extracted for about 40 cycles (18 Hrs) petroleum ether in Soxhlet apparatus. The petroleum ether extract was separated and evaporated

  
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### BIODIESEL PRODUCTION: FRESHWATER ALGAE AS A RENEWABLE SOURCE OF ENERGY

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Cite This Article: Y. Ranjith & T. Parameswara Naik, "Biodiesel Production: Freshwater Algae as a Renewable Source of Energy", International Journal of Applied and Advanced Scientific Research, Volume 3, Issue 1, Page Number 199-200, 2018.

**Abstract:**

All algae contain proteins, carbohydrates, lipids and nucleic acids in varying proportions. Algae have the potential to produce more oil per acre than any other feedstock being used to make biodiesel. Biodiesel is a nontoxic and biodegradable alternative fuel that is obtained by the transesterification of triglyceride oil with monohydric alcohols. In this study three naturally occurring algal samples were collected from different areas of Shivamogga. Algae were identified in the Botany lab as *Spirogyra spp.* and *Zygnemaspp* was extracted from the dried algal samples. These results indicate that biodiesel can be produced from *Spirogyra spp.*  
Key Words: Algal Oil, Biodiesel, Transesterification, Glycerine & Biomass.

**Introduction:**

The microalgae are microscopic photosynthetic microorganisms that use light energy and carbon dioxide, with a higher photosynthetic efficiency than plants for the production of biomass (Spolanore *et al.*, 2006).

Biodiesel from oil crops, waste cooking oil and animal fat cannot realistically satisfy even a small fraction of the existing demand for transport fuels. Recent researchers involved not only the existing renewable sources available from land plants, but also those coming from aquatic systems. Algae (macro and micro) have been taken in consideration as a residual biomass ready to be used for energy purposes. Algae, especially micro algae, were found to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels (Chisti 2007 and 2008).

The idea of using algae as a source of fuel is not new, but it is now being taken seriously because of the increasing price of petroleum and more significantly, the emerging concern about global warming that is associated with burning fossil fuels (Chisti 2005).

The current study was conducted to assess the biodiesel production efficiency of various species of algae. A comparison was made to find out the algal species with high oil contents and biodiesel production efficiency.

**Materials and Methods:**

**Algal Samples:**

The Algal samples were collected from the Santhekadur pond, Shivamogga. The algal biomass was collected from freshwater bodies by mesh net, after collection the samples were brought to the laboratory, Department of Botany, Sahyadri Science College (Autonomous), Shivamogga. And they were identified as *Spirogyra spp.* and *Zygnemaspp.*

**Oil Extraction:**

Algae were ground with motor and pestle as much as possible. The ground algae were dried for 20 min at 80°C in an incubator for releasing water. Hexane and ether solution (20 and 20 mL) were mixed with the dried ground algae to extract oil. Then the mixture was kept for 24h for settling. Then the biomass was collected after filtration and weighted.

**Evaporation:**

The extracted oil was evaporated in vacuum to release hexane and ether solutions using rotary evaporator, and 0.25g NaOH was mixed with 24ml methanol and stirred properly for 20 min.

**Biodiesel Production:**

The mixture of catalyst and methanol was poured into the algal oil in a conical flask. The following reaction and steps were followed.


**Transesterification:**

The conical flask containing solution was shaken for 3h by rotatory shaker at 300rpm. After shaking the solution was kept for 16h to settle the biodiesel and sediment layers clearly. The biodiesel was separated from sedimentation by flask separator carefully. Quantity sediment (glycerin, pigments, etc.) was measured. Biodiesel was washed by 5% water until it was become clean. Biodiesel was dried by using dryer and finally kept under the running fan for 12h, and measured by using measuring cylinder.

**Results and Discussion:**

Samples	Fresh Weight	Dry Weight	Oil Percentage
<i>Spirogyra spp</i>	32 g	16.11 g	14.68%
<i>Zygnema spp</i>	32 g	17.01 g	7.44%



  
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# DIVERSITY OF BLUE-GREEN ALGAE OF PADDY FIELD, HASSAN, KARNATAKA

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### Abstract

Cyanobacteria (blue green algae) are present abundantly in rice fields and are important in maintaining the rice field fertility through nitrogen fixation. Occurrence of Blue-green algae in local paddy fields of Hassan district has been under taken for the first time in this area. In the present investigation, rich diversity of Blue-green algae was recorded. This study reveals that comparatively lesser number of Blue-green algae were growing in summers as comparison to rainy season. The unicellular forms were abundant during summer while number of filamentous increased during rainy season.

**Key words:** Blue-green algae, Hassan district, Diversity, Paddy fields

### Introduction

Blue green algae have an important role in the nitrogen fixation, particularly in rice fields. They have one of the main components of the microbiota in rice fields and play an important role in the maintenance of soil fertility, consequently increasing rice production. The rice fields are agronomically managed ecosystem, well known for the rich diversity of cyanobacteria. Rice fields constitute one of the favorable ecologies for the growth and proliferation of cyanobacteria meeting their requirements for light, water and higher temperature. Cyanobacteria in return, provide a large amount of nutrients, such as nitrogen and phosphorus needed for rice cultivation. Most rice fields have a natural population of cyanobacteria which provides a potential source of nitrogen fixation. Species of *Nostoc*, *Anabaena*, *Scytonema*, *Wasmannopsis* and several other genera are widespread in Indian rice field soils and are known to contribute significantly to their fertility. These nitrogen fixing organisms have attributed to the natural fertility of tropical rice fields. Rice fields are ideal habitats for blue green algae. Research on cyanobacterial flora from rice fields were also carried out in different parts of India.


Soil samples were collected from four local paddy fields of Hassan district of Karnataka, namely, Channarayappattana, Helenarasipura, Arakalagud and Alhar. Soil samples were collected at one month interval during morning to noon from the pre-sowing treatment stage of the crop to throughout cropping and cutting season from May 2015 to October 2015. Representative, randomized and composite soil surface samples collected from 8-10 spots of upper 0.5 cm soil crust from study areas. The sites were selected on the basis of different texture of soils and different water resources by which they irrigated, so that diverse and maximum number of Blue-green algal species can be observed in 4 different sites of Hassan.


### Isolation and Identification of samples

Soil samples were mixed well, dried, sieved and 100g representative samples from each field were stored in sterilized polythene bags. BG 11 utilized as enrichment medium for isolation of strains. 1 g soil sample was inoculated in 50 mL sterilized BG-11 medium and then flasks were incubated for 30 days at 25 ± 20 C with cool white fluorescent light tubes under a 16:8 h light. The isolation of Blue-green strains was carried out by dilution and pour plate method. And they were identified.

### Materials and methods

#### Collection of samples

  
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### FLORISTIC SURVEY FOR THE TREATMENT OF GASTROINTESTINAL DISORDERS IN SHIVAMOGGA DISTRICT, KARNATAKA

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**Abstract:**

The present study showed the diversity and importance of plants used to treat gastrointestinal disorders in Shivamogga district of Karnataka. We documented a total of 36 species belonging to 25 families and 33 genera used to treat gastrointestinal disorders in Shivamogga area. Among the plant parts used for gastrointestinal disorder leaf used the highest number (12), followed by fruit (7), rhizome (4), whole plant (4), root (3), seed (2), bark (1), vegetative bud (1), stem/bark (1) and fruit/twigs (1).

Further, the existing information on traditional uses of medicinal plants are declining rapidly because of the lack of interest of young people to learn the traditional knowledge from the old medical practitioner. So the documentation and conservation of the information is essential.

**Key Words:** Ailments, Diversity, Plants, Gastrointestinal Disorders & Shivamogga District

**Introduction:**

The plants extracts have been used as therapeutic agents. Many medicines presently prescribed by physicians are either directly isolated from plants or are artificially modified versions of natural products (Wang et al., 2007). These medicines are safe and environment friendly. As per the WHO about 80% of the world's population relies on traditional medicine for their primary health concern (Behera 2006). Herbalists and indigenous healers have used botanical medicines traditionally worldwide for the prevention and treatment of different pathologies. Clinical research has confirmed the efficacy of several plants for the treatment of gastro duodenal problems and their therapeutic effects (Kanner and Lapidot 2001; Gurbuz et al., 2000; Devi Prasad et al., 2013). The main objective of this study is to record the different types of plants used for the treatment of gastrointestinal disorders for the first time in Shivamogga district, Karnataka. As a result, new traditional therapies for digestive system diseases were recorded.

**Materials and Methods:**

**Study Area:**

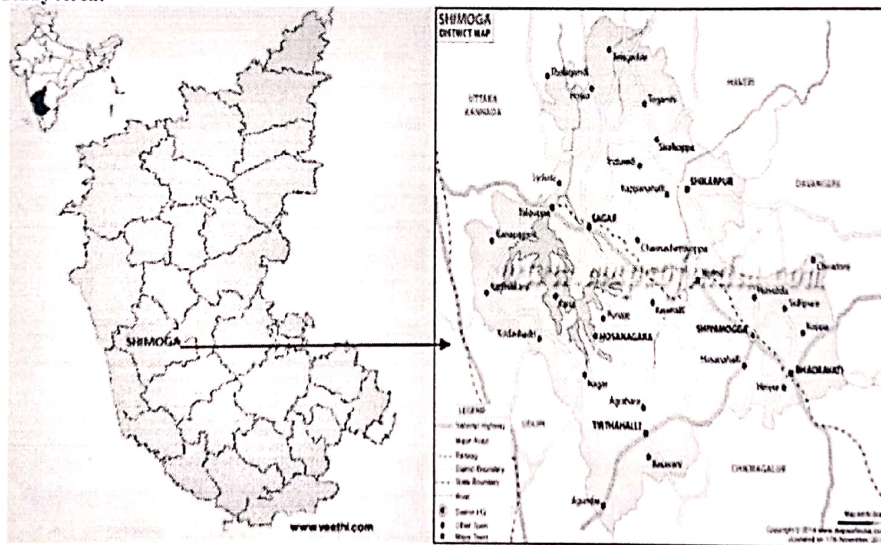




Figure 1: Study area map (Source: www.veethi.com; www.mapsof india.com)

Shivamogga district is situated in Karnataka state of India (Figure 1). A major part of Shivamogga district lies in the Malnad region of the Western Ghats. Shivamogga city is its administrative centre. Shivamogga district is a part of the malnad region of Karnataka and is also known as the 'Gateway to Malnad' or

  
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## Diversity of Phytoplankton and Pollution Tolerant Species of Navule Pond, Shivamogga, Karnataka

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### Abstract

The present study deals with phytoplankton population of Navule pond in Shivamogga during September 2014 to August 2015. Blue-greens constituted the major group (41.75%) followed by Chlorococcales (36.68%), Diatoms (13.36%), euglenoids (7.35%) and Desmids (0.86%). The phytoplankton community was composed of 11 species of Blue-greens, 20 species of Chlorococcales, 18 species of Diatoms, 11 species of Euglenoids and 06 species of Desmids. Each group of phytoplankton showed different peak periods, the summer season produces relatively more phytoplankton than rainy and winter season. The variations in physico-chemical parameters are responsible for the fluctuation of quantity of phytoplankton. The dominant genera recorded on the pond were *Anabaenopsis* sp., *Oscillatoria* sp., *Euglena* sp., and *Phacus*. Some of the pollution tolerant species identified during the present


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# A Review on Anti Diabetic Plants and their Chemical Constituents

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## ARTICLE DETAILS

**Article History**  
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**Keywords**  
Diabetes, Chemical constituents, Medicinal plant, Herbal medicine, *Diabetes insipidus* and *Diabetes mellitus*

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## ABSTRACT

Diabetes is one of the common metabolic disorders due to insulin deficiency. It is estimated that 1 in 5 may be diabetic by the year 2025. The most active plants are *Allium sativum*, *Azadirachtha indica*, *Momordica charantia* and *Ficus bengalensis*. The antidiabetic plants contains the compounds showing antidiabetic activity. The compounds are inorganic ions, coumarins, lipids, flavonoids, steroids, peptides, amines, terpenoides, glycopeptides, alkaloids, complex carbohydrates and others which decreases glucose level in blood. This review paper also discusses the chemical constituents of few antidiabetic plants.

## 1. Introduction

Human being has been interested to control diseases. As the world's population is nearing 5 billion, with this rate of growth, 75% of the world's population cannot afford the products of Western pharmaceutical industries. Plants are an important source of herbal medicines which find applications in pharmaceutical industry (Seetharami Reddi *et.al.*, 2005). In *Matena medica*, 42 medicinal plants have been recorded in the treatment of diabetes in India (Nadkarni, 1954). It is evident that herbal cure is gaining world wide acceptance and has emphasised on modern scientific exploration, extraction and evaluation of folk medicines from plants (Seetharami Reddi *et.al.*, 2005).

As per WHO, plant derived medicines constitute the mainstay of nearly 80% of the population for their primary

health care. Plant based medicines are either used directly extracted from plants or modified through further synthesis (Cox & Ballick, 1994). Human habits, adulteration, climatic factors either man made or natural have certainly led to decrease in the resistance capacity of mankind against chronic diseases like diabetes.

Diabetes was known to Indian Ayurveda since about 3000 years as a disease with some persons whose urine was sweet enough to attract insects and flies. It was "sushruta" the great Indian physician, who diagnosed diabetes during 1000 BC. Diabetes is a chronic disease and it is estimated that by 2025, there will be nearly 80 million diabetics in South East Asian region, the highest among all the WHO regions.

Table 1: Characteristics of Insulin dependent and Non-Insulin dependent diabetes (Source: Rizwana Mubeen *et.al.*, 1995)

	Insulin dependant	Non-insulin dependent
Age of onset	Usually during youth, but can occur at any age	Usually during adulthood, more common in older people
How noticed	Usually appears abruptly and progress rapidly	Gradual in onset, the disease may go unnoticed for years
Family background	Diabetes not always present in other family members	Diabetes present in other members of the family
Treatment	Insulin injection, diet, exercise and emotional control are necessary	Insulin injections are not always necessary, oral medications recommended, diet, exercise are necessary
Complications	Affecting blood vessels, eyes, kidneys and nerves at any age	Problems affecting blood vessels, eyes, kidneys and nerves at any age
Linked to obesity	Not necessarily	80% of all patients are overweight at time of diagnosis

## Symptoms of Diabetes

- > Frequent urination
- > Increased thirst and hunger
- > Very tired without any particular reason
- > Blurred vision
- > No healing of wounds, cuts, boils and sores
- > Continuous ache, pain in legs and feet
- > Skin infections, Weight loss

Table 2: Symptoms of Insulin dependent and non-insulin dependent diabetes as per American Diabetic Association

Insulin dependent Type -I	Non-insulin dependent Type -II
Nausea and vomiting	Itching
Frequent urination	Excess weight

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# Aromatic Medicinal Plant Resources of Shivamogga District, Karnataka

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### Abstract

The present study deals with the documentation of aromatic plant resources in Shivamogga district of Karnataka. The peoples of this area have a very good knowledge about the usage of these plants. Elder peoples of this area have common knowledge and easy cure for many common ailments and prepare different types of medicines from different plant parts. India is rich in medicinal and aromatic plants and play an important role in the country's agricultural sector due to quantitative and qualitative advantages. These plants can help small-scale farmers to strengthen their livelihoods and capacity to build successful and sustainable activities. A total of 40 aromatic plant species belonging to 33 genera and distributed over 22 families were recorded in the present study area.

**Keywords:** Aromatic plant diversity, Medicinal value, Shivamogga district, Traditional Knowledge.

### 1. Introduction

The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani and Siddha. In India it is reported that traditional healers use 2500 plant species and 100 species of plants serve as regular sources of medicine (Pei, 2001). In recent years, there has been a tremendous range of interest in the medicinal plants especially those used in traditional systems of medicines. Drugs obtained from plant are believed to be much safer and exhibit a remarkable efficacy in the treatment of various ailments (Siddiqui, et.al. 1995). The folk medicinal traditions play a reflecting and prominent role in human and environment interaction (Chopra and Nayar,1956). It is estimated that 70 to 80% of the people

worldwide rely chiefly on traditional health care system and largely on herbal medicines (Farnsworth et.al. 1985, 1991, Shengii 2002, Shanley and Luz, 2003; Hiremath et al.,2010).

About 1000 years ago healers in the Aztec and Maya Indian cultures of Mexico and Central America were experimenting with natural curing substances and exploited at least 132 medicinal herbs for the treatment of specific ailments (Evans, 2004; Berdan, 2005; Ashish Kumar and Jnanesha , 2016).


### 2. Essential Oils


Essential oils are isolated from Aromatic plant materials by various distillation process. Whereas, other volatile isolates are obtained by solvent extraction. Aromatic plants contain odorous, volatile, hydrophobic and highly concentrated compounds called essential oils. These are obtained from several organs of the plant such as flowers, buds, seeds, leaves, twigs, bark, wood, fruits and roots (Brenes & Roura, 2010; Ashish Kumar and Jnanesha , 2016). The essential oils are complicated mixtures of secondary metabolites consisting of low-boiling-point phenylpropenes and terpenes (Greathead, 2003 ; Ashish Kumar and Jnanesha , 2016). Essential oils are used for consumer goods viz., detergents, soaps, toilet products, cosmetics, pharmaceuticals, perfumes, confectionery food products, soft drinks, beverages and insecticides.

### 3. Materials and Methods

The present study is an attempt to know the diversity of aromatic plants in Shivamogga district (Figure 1) of Karnataka. Periodic field survey were carried out during July 2017 to December 2017. Standard

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## Study of Physico-Chemical Parameters of Water in a Polluted Pond of Shivamogga City, Karnataka

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### ARTICLE DETAILS

#### Article History

Published Online: 05 July 2018

#### Keywords

Physico-chemical parameters, Purle pond, Water quality, non-potable

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### ABSTRACT

Water samples were collected for physico-chemical analysis from different sites in the polluted pond (Purle water body), Shivamogga city (Karnataka). The water samples were analysed for various parameters such as water temperature, pH, total alkalinity, total dissolved solids, suspended solids, total solids, chloride, phosphate, calcium and magnesium hardness, total hardness and dissolved oxygen. By comparing the results against drinking water quality standards laid by WHO, it is observed that water samples from this pond were non-potable for human consumption due to high levels of physico-chemical parameters.

### 1. Introduction

Due to rapid growth of human population the per capita water needs are increased tremendously. The water resources situated near human habitats are polluted gradually. The quality of water present in the lentic water bodies has deteriorated rapidly resulting in wide variations in the type of vegetation in different water bodies. It is necessary to study some of the water quality parameters to understand the ecology of water bodies with periodic intervals.

Water is most essential solvent for human consumption and is one of the most important renewable resources, which must be prevented from deterioration in quality. Various physico-chemical parameters like pH, alkalinity, total hardness, total dissolved solid, calcium, magnesium, nitrate, sulphate have a significant role in determining the potability of drinking water. The resulting degradation of water quality in water body creates a condition so that water cannot be used for intended beneficial uses including bathing, recreation and as a source of raw water supply (Khan et al., 2004). A perusal of available literature has revealed that there is little scientific study was carried out with respect to ecological characteristics of this pond.

### 2. Materials and Methods

### Study Area

Polluted pond is situated near Purle village of Shivamogga district. It serves as an accumulation of all types of pollution i.e., cloth washing, cattle drinking, domestic waste and agricultural runoff. Purle pond is a perennial water body as it receives the water from Tunga canal and waste water from Shivamogga township. The total area of the pond is 55 hectares of which water spreads over an area of 43 hectares with average depth of 5-6 feet. This pond water is used for domestic purposes and also for fish culture.

The present study was carried out from January to December 2017. Monthly water samples were collected from three sites of the water body (Purle pond). Water analysis was made for water temperature, pH, DO, total alkalinity, TDS, total solids, calcium hardness, magnesium hardness, total hardness, Chloride and BOD. Water temperature was recorded with the help of mercury thermometer and pH with pH pen. Both the parameters were recorded at the sampling spot itself. But dissolved oxygen (DO) and biochemical oxygen demand (BOD) were fixed for estimation at the site as per the methods described by Trivedi and Goel (1986) and APHA (1998).

Table 1 depicts the methods for determination of water quality parameters and Table 2 shows the Indian standards for drinking water quality.

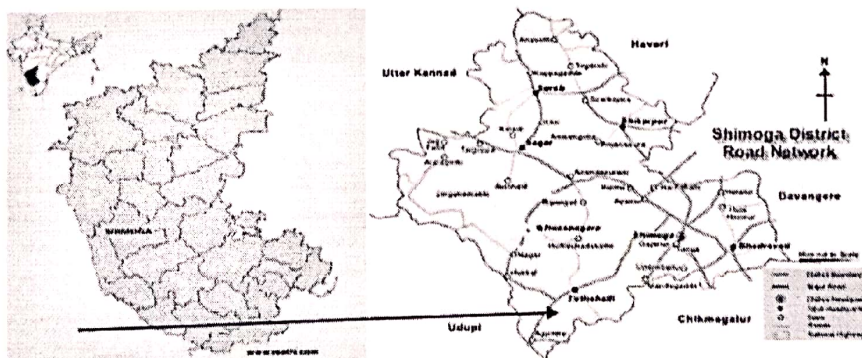




Figure 1 : Study area map (Source: www.veethi.com; en.wikipedia.org)

  
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## DIVERSITY OF AQUATIC MACROPHYTES OF BATHI LAKE, DAVANAGERE

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Cite This Article: Nafeesa Begum & Y. Ranjith, "Diversity of Aquatic Macrophytes of Bathi Lake, Davanagere", International Journal of Applied and Advanced Scientific Research, Volume 2, Issue 1, Page Number 193-198, 2018

### Abstract:

Aquatic macrophytes comprises a diverse group of organisms including angiosperms, ferns, mosses, liverworts and some macroalgae that occur in seasonally or permanently wet environments. Among other implications, aquatic macrophytes are highly productive and with an important structuring role on aquatic environments. Ecological studies involving aquatic plants substantially increased in the last years. However, a precise view of researches devoted to aquatic macrophytes in Bathi Lake is necessary to reach a reliable evaluation of the scientific production. In the current study, we collected and identified aquatic Macrophytes of Bathi Lake. In addition, researchers aiming to describe unknown species are still necessary. This is essential to support conservation efforts and to subsidize further investigation.

**Key Words:** diversity, aquatic macrophytes, bathi lake.

### Introduction:

The term 'aquatic macrophytes' refers to a diverse group of aquatic photosynthetic organisms, all large enough to see with the naked eye. It includes macroalgae of the divisions Chlorophyta, Xanthophyta, Rhodophyta and the "blue-green algae", Bryophyta, Pteridophyta and Spermatophyta, the vegetative parts of which actively grow either permanently or periodically submerged below, floating on, or growing up through the water surface. The aquatic plant macrophytes comprises a diverse group of macrophytic organisms including angiosperms, ferns, mosses, liverworts and some freshwater macroalgae that occur in seasonally or permanently wet environments. Commonly, four morphotypes (or life forms) are used to classify aquatic macrophytes: submerged, floating-leaved, emergent and free-floating. These plants are capable of colonizing several kinds of aquatic environments (e.g. lakes, lagoons, wetlands, rivers, reservoirs, waterfalls and even bromeliad tanks) with a wide range of limnological features, presenting high plasticity and adaptation ability. In fact, when growing in suitable habitats several species are considered aquatic weeds due to massive colonization and negative effects upon aquatic diversity and ecosystem functioning. Among other implications, aquatic macrophytes are known as highly productive and with an important structuring role on aquatic environments. This is extremely relevant, since aquatic biodiversity has been related to spatial heterogeneity. Thus, ecological studies carried in aquatic environments must consider the aquatic macrophyte community as an essential component for ecosystem functioning and aquatic biodiversity conservation.

### Study Area:

Bathi Lake is situated in the Davanagere district of Karnataka, India. Bathi Lake covers a geographical area of 26.3 Hectors. About 35 percent of lake is occupied by aquatic macrophytes.

### Materials and Methods:

The study area was explored thoroughly and detailed observation on the vegetation. Macrophytes were collected and preserved according to herbarium techniques. Collected material were identified with the help of standard literatures and confirmed in the herbarium of Botanical Survey of India.


### Results and Discussion:

The result shows the diversity of aquatic macrophytes of Bathi Lake was recorded in Table I.

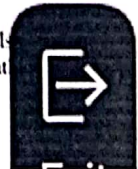
Family	Identified species
Pontederiaceae	Eichhornia crassipes
Araceae	Pistia stratiotes
Convolvulaceae	Ipomoea aquatica
Onagraceae	Ludwigia spp.
Poaceae	Polygonum lanigerum
Salviniaceae	Azolla spp.
Salviniaceae	Salvinia spp.
Araceae	Lemna spp.

Aquatic macrophytes identified in the study area.

In this present study, Eichhornia was enormously distributed in Bathi Lake and the others species were also found. In this Lake heavy metal pollutants were discharged from milk dairy which is situated near the Bathi Lake.

  
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## DOCUMENTATION OF FORAGE YIELDING PLANTS OF SHIVAMOGGA TALUK, KARNATAKA

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### ABSTRACT

An ethnobotanical survey was conducted in order to document the forage plants in and around Shivamogga taluk of Karnataka from January to December 2016. A total of 38 plant species belonging to 17 families were reported from the study area which are sources of fodder to the livestock. Among 17 families Fabaceae is dominant with 11 species. Agriculture and animal husbandry are the main occupation in this study area. The diversity of forage plants is a proportion of the enormous biodiversity occurring in this region. The present findings suggest a high scope of the utilization of these natural and cultivated/uncultivated plants for supporting livestock-based livelihood in the studied area.

### KEY WORDS

Forage Plants, Ethno Botany, Live Stock, Shivamogga Taluk

### INTRODUCTION

Plants provide a supplement of green feed when grasses and other herbaceous material is dry, and they provide the only source of protein and energy during drought when all other feed is absent (Lefroy et al., 1992). At the same time trees and shrubs have several disadvantages as sources of feed. They are often inaccessible to grazing animals. They are slow to establish requiring isolation from stock. Their foliage generally has higher fibre and lignin content than grasses (Wilson, 1969).

The occupation in this region is agriculture and animal husbandry, that acts as a main source of income to farmers and local people. Some household invariably keeps cows, buffalo, sheep and goats for their daily requirements of milk, butter, wool, meat and manure. Although the peoples generally depend upon the resources of forests and cultivated fodder plants and fulfill their fodder requirement from these resources. The present study deals with the preliminary


documentation on forage plants in and around Shivamogga taluk, Karnataka that's being used by these local farmers and peoples.

### MATERIALS AND METHODS

#### Study Area

Shivamogga district covers an area of 8477.84 sq. km and lies in the western part of the Karnataka state between 130 27' to 140 14'39" north latitude and 740 38'to 750 45' east longitudes. The district is surrounded by Uttara-Kannada & Dharwad districts in the north, Udupi & Chikmagalur districts in the south and Davanagere district in the east (Figure 1).

The area enjoys tropical climate throughout the year. Generally, the weather is hot and humid in the eastern part and very pleasant in the remaining parts of the area. The relative humidity ranges from 27 to 88%, the wind speed recorded is between 4 and 7km/hr. The evapo-transpiration is normally high in ghat section as

  
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## DOCUMENTATION OF PLANTS USED FOR PILES TREATMENT IN SHIVAMOGGA DISTRICT, KARNATAKA

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University, Shankaraghatta, Karnataka, India.

### ABSTRACT


The present study deals with the documentation of plants used for piles treatment in Shivamogga district of Karnataka. The peoples of this area have a very good knowledge about the treatment of various diseases and piles. Piles is commonly occurring ailment and the peoples treat piles successfully with the help of different plant species found within their area. Every elder peoples of this area have common knowledge and easy cure for many common ailments and prepare different types of medicines from different plant parts. A total of 56 plant species belonging to 54 genera and distributed over 36 families were found to be used by the peoples in the treatment of piles.


### KEYWORDS:

Plant diversity, Shivamogga district, Piles, Traditional Knowledge.

### INTRODUCTION

The information of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani and Siddha. In India it is reported that conventional healers use 2500 plant species and 100 species of plants serve as regular sources of medicine (Pei, 2001). In recent years, there has been a remarkable range of interest in the medicinal plants especially those used in traditional systems of medicines. Medicines obtained from the plant are believed to be much safer and exhibit a remarkable efficacy in the treatment of various ailments (Siddiqui, et.al. 1995). The folk medicinal traditions play a reflecting and prominent role in human and environment interaction (Chopra, et.al.1956). It is estimated that 70 to 80% of the people worldwide depends chiefly on traditional health care system and

  
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SHIVAMOGGA, KARNATAKA

KAVAKA 50: 78-79(2018)

**Poronia pileiformis (Berk.) Fr.-A new report to Karnataka**

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(Submitted on January 12, 2017; Accepted on March 20, 2018)

**ABSTRACT**

A study was conducted in the forest regions of Chikmagalur district of Karnataka, India, to explore the diversity of macrofungi in Balehonnur forest regions. The rich canopy of forest favours the luxuriant growth of macro fungi. In the present investigation an interesting coprophilous ascomycetes belonging to Xylariaceae was noticed. Sporocarps were collected from elephant dung, analysed and characterized on the basis of morphological and microscopic characters.

Keywords: Ascomycota, diversity, coprophilous, Xylariaceae.

**INTRODUCTION**

The Xylariaceae are considered as one of the largest and relatively well known ascomycetous fungi with worldwide distribution (Pelaez *et al.*, 2008; Hande and Hiwarale, 2013; Li *et al.*, 2015). Xylariaceous members are characterised by their typical morphology, variation in their colour, size and shape (Lee *et al.*, 2002.; Kujawa and Karasinski, 2007). Most of the members are saprophytic on wooden logs, litter and other dead twigs of angiospermic plants. Some of them are typically coprophilous and few of them are found associated with insect nests (Ming and Rogers, 2001; Fournier *et al.*, 2011). During frequent field visits for the exploration of macro fungal communities in Maduguni forest regions of Chikmagalur district, Karnataka, some of the samples were collected on elephant dung. In the laboratory these samples were subsequently investigated, characterized and identified as *Poronia pileiformis* (Berk.)Fr.

**MATERIALS AND METHODS**

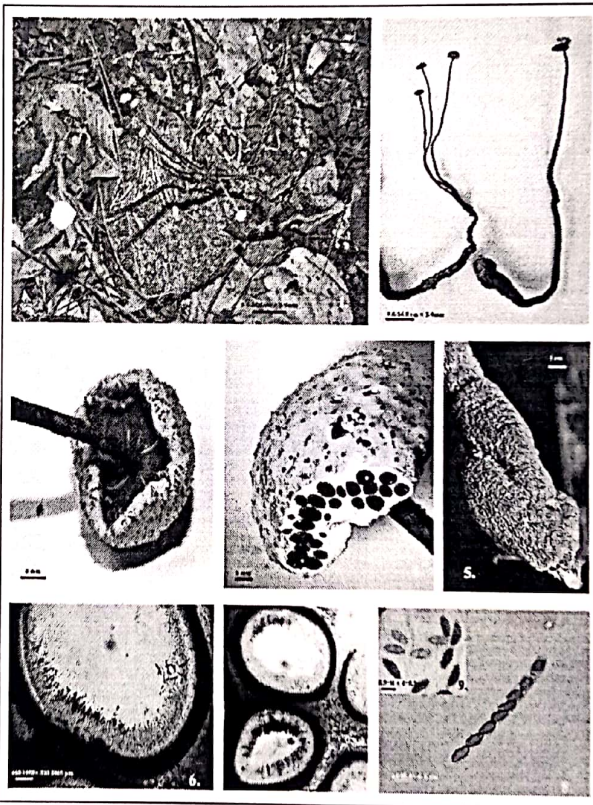
Frequent field surveys were conducted to semi evergreen forest of Chikmagalur, Maduguni forest locality (13°21'04.9" N . 75°28'32.1" E) during August to October 2017. The semi evergreen forest consists of diverse flora representing species of *Terminalia*, *Tectona*, *Bambusa*, *Wrightia*, *Ficus*, etc. which accounts for the major floral diversity in the area. This forest region is a part of Western Ghats where the annual rainfall ranges between 4000-6000 mm and relative humidity remains around 55% during summer and 99% during monsoon season (Aruna *et al.*, 2013). The field notes on the fungal stroma gathered from the elephant dung with respect to morphology, size and colour of the stroma and nature of substratum were recorded. Photographs were also taken in their natural habitat. Specimens were carefully collected without affecting the stroma and substrate. Collected samples were brought to the laboratory carefully, hand sections were cut to study the anatomical characteristics and the size and shape of perithecia, asci, ascospores and number of ascospores per ascus. Classical taxonomic work of Pande (2008) was consulted for the characterization

and identification of the investigated species.

**TAXONOMIC DESCRIPTION**

*Poronia pileiformis* (Berk.) Fr., *Nova Acta R. Soc. Scient. Upsal.*, Ser. 3 1: 129 (1851) Figs-1-8.

Stromata long solitary, branched (sometimes), 9.8-24.8 cm × 2-9 mm; stalked stalk 8-23.2cm; fertile part consisting of 4-6



Figs.1-8 *Poronia pileiformis*: 1) Sporocarp in association with host; 2) Sporocarps; 3) Broad head with ostioles; 4) V.S. of fertile head; 5) Bulged stalk at the base; 6-7) Perithecia; 8) Ascospores.

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Research Article

Diversity of Xylariaceae Members in Sagara Taluk, Karnataka, India

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Abstract

A study was conducted in the forest regions of Sagara taluk of Karnataka, India to investigate the diversity of Xylariaceae members. The Xylaria specimens were collected from different parts of study area. The morphological and microscopic characters confirmed the presence of Xylaria carpophylla (Pers.) Fr., Xylaria hypoxylon (L.) Grev., Xylaria polymorpha (Pers.) Grev., Xylaria minuta Panwar, Xylaria mellisii (Berk.) Cooke., Xylaria tentaculata Berk & Broome., Xylaria grammica (Mont.) Mont., Xylaria mentecylanti Pande, Xylaria obovate (Berk.) Berk., Annulohypoxylon multiforme (Fr.) YM Ju, JD Rogers & HM Hsieh, Rhopalostroma africanum D Hawksw and Daldinia concentrica (Bolton) Ces. & De Not.

Key words : Ascomycetes, diversity, Xylariaceae

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The Xylariaceae of Ascomycota comprises of 85 genera and over 1300 species across the globe (Li et al 2015). Xylaria is the large and first described genus of family Xylariaceae, with well-developed black, carbonised stromata with embedded perithecia. Xylariaceae members are known to degrade lignin and cellulose in wood logs, in fallen branches, seed coat and litter. Xylaria is characterised by the presence of sac like perithecia, ascocarp and 8 ascospores (Hande and Hiwarale 2012). Ascus is characterised by an apical apparatus which stains blue with iodine and most of the species comprises brown to black coloured spores (Velmurugan et al 2013). The pigments produced by different species of Xylariaceae may help in the segregation of genus (Whalley et al 1998). Xylariaceae members play an important ecological role in carbon recycling in the natural ecosystem (Fournier et al 2010). The present investigation will limelight on the diversity of Xylariaceae members in Sagara taluk of Karnataka.

area of the taluk is 1940 km<sup>2</sup> and forest area covers 66,125 hectares. Sagara taluk receives 1800 mm of rain annually (Rajakumar and Shivanna 2010). Annual mean temperature is 17 to 20C in winter, 32 to

Materials and Methods

Study area. The study was conducted in Sagara taluk, Shivamogga district, Karnataka, India. during January 2015 to December 2015. It is part of Western Ghats and located in the centre of Shivamogga district, 13°.51' and 14°, 20' N latitude and between 74°.37' and 75°.17' E Longitude. The geographical

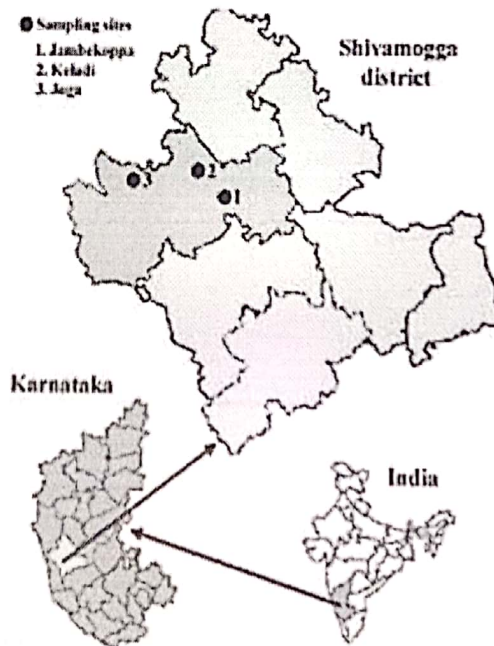


Figure 1. Map showing study area with sampling sites

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### ANTIMICROBIAL PROPERTY AND GC-MS ANALYSIS OF XYLARIA CARPOPHILA (Pers.) Fr.

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#### ABSTRACT

The sporocarps of *Xylaria carpophila* were collected from fruits of *Xylia xylocarpa*. Physicochemical were analysed and results revealed highest percentage of water soluble extractives followed by ash content. Alcohol soluble extractive were 10.76%, total moisture content (5.9%) and foreign matter (0.6 %). Extraction was done by Soxhlet apparatus using petroleum ether, chloroform and ethanol, the extract were subjected for qualitative phytochemicals analysis revealed the presence of alkaloids, tannins, flavonoids, sterols, glycosides, terpenoids and phenols. GC-MS analysis of ethanoic extract showed many bioactive compounds. Anti-microbial potentials were studied against pathogenic bacteria and fungal strains. Results revealed the extracts were effective against bacteria but failed to show inhibitory activity against the tested fungal strains.

**KEYWORDS:** *Xylariaceae, Physicochemical analysis, Phytochemicals, Extraction, Secondary metabolites.*



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## Original Article

# Synthesis, Characterization and Evaluation of Cytotoxic, antibacterial and Molecular Docking Studies of Fused Heterocyclic 6aH,13H benz[4',5']oxazole[2',3',:2,3][1,3]thiazino[6,5-b]quinolin-13-one derivatives

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ABSTRACT

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The novel heterocyclic compounds 6aH,13H-enz[4,5]oxazole[2,3,2,3][1,3]thiazino[6,5-b]quinolin-13-one derivatives 4-15 have been synthesized by conventional method. The various derivatives of 1,3-benzoxazole-2-thiol were on treating with 2-chloroquinoline-3-carbaldehyde derivatives in DMF yielded target novel molecules 4-15. The obtained products have been characterized by IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectral studies. The newly synthesized compounds were screened for their *in vitro* cytotoxic, antibacterial and molecular docking studies. The synthesized compounds 9-Chloro-10-nitro-6aH,13H benz [4',5']oxazole [2',3',:2,3] [1,3]thiazino[6,5b]quinolin-13 one 6, 2,10-dichloro-6aH, 13H benz [4',5'] oxazole [2',3',:2,3][1,3]thiazino[6,5-b]quinolin-13-one 9 and 2,8,10-Trichloro-6aH,13H benz [4',5'] oxazole[2',3',:2,3][1,3]thiazino[6,5-b]quinolin-13-one 15 exhibited potent cytotoxic activity towards Peripheral Blood Mononuclear Cells (PBMCs) with the influence of functional groups attached with central moiety. The cytotoxic results were further supported by molecular interaction by molecular docking studies with receptor PDB ID: 3FLY and showed a minimum binding energy and higher affinity towards the active pocket sites. The study also focused on screening of antibacterial activity and most of the compounds from the series exhibited considerable bacterial inhibition.

**Keywords:** Thiazino, quinolone, cytotoxic, Peripheral Blood Mononuclear Cells and molecular docking.

## 1. INTRODUCTION

Benzoxazoles are privileged class of organic compounds of medicinal significance due to their recognized biological chemotherapeutic activities<sup>1,2</sup>. Benzoxazole derivatives exhibit antimicrobial<sup>3-5</sup>, antiviral<sup>6,7</sup>, multi-drug resistance cancer cell<sup>8</sup> with inhibitory activity on eukaryotic

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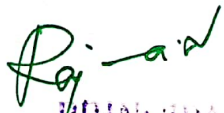
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## DIMENSIONAL STABILIZATION OF WOOD BY CHEMICAL MODIFICATION USING ISOPROPENYLACETATE

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### ABSTRACT

Chemical modification of wood with isopropenyl acetate (IPA) using iodine (I<sub>2</sub>) as catalyst has been carried out. Rubber wood (*Hevea brasiliensis*) specimens were reacted with IPA using iodine (I<sub>2</sub>) catalyst at 95°C up to 10 h under solvent free conditions. The effect of catalyst concentration and reaction time was studied. The extent of acetylation was measured by determining weight percent gain and the modified wood was characterized by FTIR-ATR and <sup>13</sup>C NMR spectroscopy. It was found that IPA in the presence of iodine is an excellent acylating reagent for wood. Modified wood exhibited high dimensional stability.

**Keywords:** Chemical modification, dimensional stability, iodine, isopropenyl acetate, rubberwood.

### INTRODUCTION

Wood is hygroscopic, dimensionally unstable especially in high humidity environment and prone to biological decay due to fungus and other microorganisms (Rowell 1983, 2013). All the major cell wall constituents of wood (lignin, cellulose and hemicelluloses) contain an abundance of free hydroxyl groups. These free hydroxyl groups absorb and release water upon changes in the climatic conditions resulting in dimensional movements of wood. The dimensional stability and biological resistance of wood can be improved considerably by chemical modification by converting hydrophilic -OH groups of cell wall components into larger more hydrophobic groups by forming covalent bonds (Rowell 1983, 2013, Matsuda 1996, Hill 2006). Modification with thermosetting resins improves compression strength and performance against marine borers (Lopes *et al.* 2014, 2015). Treatment with tall oils also reduced water absorption (Can and Sivrikaya 2016). Modified wood has outstanding dimensional stability, improved durability towards insects and micro-organisms.

Chemical modification of grounded wood has been carried out by transesterification with vinyl esters (Jebrane *et al.* 2009). Giridhar and Pandey (2016) reported chemical modification of wood by transesterification using IPA in presence of AlCl<sub>3</sub> as catalyst and examined dimensional stability and UV resistance of modified wood. In this work, chemical modification of wood with isopropenyl acetate (IPA) in presence of iodine (I<sub>2</sub>) catalyst was carried out. The reaction of wood with IPA forms acetone as byproduct (Figure 1) which can be easily removed from modified wood.

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SYNTHESIS, CHARACTERIZATION AND EVALUATION OF *IN VITRO* CYTOTOXIC, ANTIBACTERIAL, ANTIOXIDANT ACTIVITY AND MOLECULAR DOCKING STUDIES OF NITRO SUBSTITUTED BENZOXAZOLE LINKED THIAZOLIDINE DERIVATIVES

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#### ABSTRACT

The 3-[(6-nitro-1,3-benzoxazol-2-yl)amino]-2-phenyl-1,3-thiazolidin-4-one derivatives 6(a-j) have been synthesized by reacting compounds 2-[2-benzylidenehydrazinyl]-6-nitro-1,3-benzoxazole derivatives 5(a-j) with thioacetic acid in dioxane using ZnCl<sub>2</sub> as catalyst. The chemical structures of the compounds were elucidated by IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectral studies. The organisms such as *Escherichia coli* (ATTC-8739), *Staphylococcus aureus* (ATTC-6538), *Vibrio cholera* (ATTC-9027), *Bacillus subtilis* (ATTC-6633), *Staphylococcus epidermidis* (ATTC-12228) and *Salmonella typhimurium* (ATTC-23564) have been used to study the antimicrobial activity of synthesized compounds. MIC was done with effective result, the

selected synthesized derivatives showed potent cytotoxic activity against Peripheral Blood Mononuclear cancer Cells. The antioxidant activity has been carried out to know the scavenging effect of targeted molecules and the results were supported by the *in silico* molecular docking studies.

**KEYWORDS:** Benzoxazole, Schiff base, thioacetic acid, thiozolidinine, Peripheral Blood Mononuclear Cells.

**SYNTHESIS OF *N'*-(CHLOROACETYL)NAPHTHO[2,1-*B*]FURAN-2-CARBOHYDRAZIDE AND *N'*-(ARYLAMINOACETYL)NAPHTHO [2,1-*B*]FURAN-2-CARBOHYDRAZIDE DERIVATIVES AND THEIR ANTIMICROBIAL ACTIVITIES**

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**ABSTRACT**

The reaction of naphtho[2,1-*b*]furan-2-carbohydrazide 4 on treatment with chloroacetyl chloride in acid media afforded *N'*-(chloroacetyl)naphtho[2,1-*b*]furan-2-carbohydrazide 5. This on treatment with various aryl amines in DMF produced *N'*-(arylaminoacetyl)naphtho[2,1-*b*]furan-2-carbohydrazides 6a-f. The structures of 5 and 6a-f have been established by spectral studies. In addition the synthesised compounds have been screened for antimicrobial activities.

**Keywords:** naphtho[2,1-*b*]furan, *N'*-(chloroacetyl)naphtho[2,1-*b*]furan-2-carbohydrazide.

**INTRODUCTION**


Naphtho[2,1-*b*]furan derivatives both natural and synthesised were known to show various biological<sup>1-5</sup> and pharmacological activities. Survey of literature revealed that, the parent and newly constructed nucleus were exhibited potent biological activities such as antimicrobial<sup>6</sup>, analgesic<sup>7</sup> etc. Hence it was thought to synthesize new derivatives of naphtho[2,1-*b*]furan derivatives by simple method and screened them for antimicrobial activities.

2-Naphthol 1 is subjected to Reimer-Tiemann reaction to get 2-hydroxy-1-naphthaldehyde 2. This on condensation with chloroethylacetate yielded ethyl naphtho[2,1-*b*]furan-2-carboxylate 3. The formed ester on condensation with hydrazine hydrate gave naphtho[2,1-*b*]furan-2-carbohydrazide 4. This on treatment with chloroacetylchloride gave *N'*-(

(chloroacetyl)naphtho[2,1-*b*]furan-2-carbohydrazide 5, which on treatment with various aromatic primary amines produced a series of compounds 6a-f.

**MATERIALS AND METHODS**

All the chemical used were of AR grade. Melting points were recorded in open capillaries and are uncorrected. IR spectra was recorded in Nicolet 5700 FT-IR instrument (Nicolet, Madison, WI, USA) as using KBr pellets. The <sup>1</sup>H NMR and <sup>13</sup>C NMR spectra are recorded on VNMR5-400 Agilent-NMR instrument using TMS as internal reference. Chemical shifts are reported in  $\delta$  (ppm). Mass spectra were recorded using Water's SYNAPT G2 QTOF LCMS instrument. Purity of the compounds was checked by TLC.

  
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## SYNTHESIS, *IN VITRO* CYTOTOXIC, ANTIBACTERIAL AND ANTIOXIDANT EVALUATION OF 2-(1,3-BENZOXAZOL-2-YL)-2,3-DIHYDROPHthalazine-1,4-DIONE DERIVATIVES

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### ABSTRACT

The *in vitro* cytotoxic activity of the selected chloro and nitro substituted benzoxazole derivatives 5,6,7,8-tetrabromo-2-(1,3-benzoxazol-2-yl)-2,3,5,6-tetrahydrophthalazine-1,4-dione **7(a-b)**, 2-(1,3-benzoxazol-2-yl)-2,3-dihydrobenzophthalazine-1,4-dione **8a**, 3-(1,3-benzoxazol-2-yl)-3,4-dihydro-1H-1,3,4-benzotriazepine-2,5-dione **9(a-b)** and 7-chloro-3-(1,3-benzoxazol-2-yl)-3,4-dihydro-1H-1,3,4-benzotriazepine-2,5-dione **10(a-b)** shows more than 70% of cell viability, followed by the antibacterial, MIC and antioxidant activity. The target derivatives were synthesized by using intermediate chloro and nitro substituted 2-hydrazinyl-1,3-benzoxazole with different anhydrides. Obtained products have been characterized by IR, <sup>1</sup>H NMR Mass spectral studies, and evaluated their biological activity.

**Keywords:** Benzoxazole, pyridazine, PBMCs, anhydrides.

### 1 INTRODUCTION

The benzoxazole framework represents a privileged structural motif of important value in biologically active natural products and pharmaceutical compounds. The benzoxazole core structure is found in a variety of cytotoxic natural products, such as the antimycobacterial pseudopteroxazole,<sup>1</sup> UK-1,<sup>2</sup> AJI9561,<sup>3</sup> and salvianen.<sup>4</sup> Recent medicinal chemistry applications<sup>5</sup> of benzoxazoles include the cathepsin S inhibitor **1**,<sup>6</sup> 5-HT<sub>3</sub> receptor agonist **2**,<sup>7</sup> HIV reverse transcriptase inhibitor L-697, 661,<sup>8</sup> estrogen receptor\_ agonist ERB-041,<sup>9</sup> selective peroxisome proliferator-activated receptor  $\gamma$  antagonist JTP- 426467,<sup>10</sup> anticancer agent NSC-693638,<sup>11</sup> and orexin-1 receptor antagonist SB-334867.<sup>12</sup> Other applications of benzoxazoles include their use as herbicides, such as Fenoxaprop and as fluorescent whitening agent dyes such as bisbenzoxazolyl ethylenes and arenes.<sup>13</sup>

Nitrogen-containing heterocyclic compounds are one of the most fruitful and extensively developing fields of heterocyclic chemistry. These compounds exhibit various kinds of biological activities. During the past decades increasing interest in the synthesis and biological activities of pyridazine derivatives has been observed.<sup>14-16</sup> Pyridazine compounds have been reported to possess varied biological activities such as antimicrobial,<sup>17</sup> antihypertensive,<sup>18</sup> anticancer,<sup>19</sup> anti-inflammatory<sup>20</sup> and antifungal activities.<sup>21</sup> These facts have prompted us to synthesize some novel pyridazine derivatives. Recently, pyridazinone nucleus has been extensively studied in the search for new and selective medicinal agents as drugs acting on the cardiovascular system.<sup>22</sup> Furthermore, a number of thienopyridazines have been claimed to possess interesting biological and pharmacological activities such as,

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# Synthesis, XRD, thermal, spectroscopic studies and biological evaluation of Co(II), Ni(II) Cu(II) metal complexes derived from 2-benzimidazole

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## 1. Introduction

The metal complexes with benzimidazole motifs are useful compounds of bioinorganic interest [1,2]. Since the imidazole ring is a structural fragment of histidine that provides an essential metal binding site in metalloproteins (one or more benzimidazole units are bound to metal ions in almost all copper and zinc metalloproteins or, e.g., in nickel-containing urease) and thus has intense effects on their biological actions [3,4]. It is also well known that amino group acts as the primary anchor site for metal ions and, as such, is able to promote stepwise deprotonation and subsequent coordination of other successive binding sites, leading to the formation of hydrolytically stable, fused, five-membered chelate rings with M–N bonds. Thus, complexes formed between metal ions and different types of bio-ligands, namely heteroaromatic nitrogen bases, may be considered as models for substrate–metal ion–enzyme interactions and other metal ion-mediated biochemical interactions [5,6]. Newly, benzimidazole-derived drugs have received much consideration owing to the fact that benzimidazole

residue is a constituent of vitamin B<sub>12</sub>, which supports their potential use as therapeutics [7–10].

In this research article, we describe the synthesis and characterization ligand 4-((1Z)-1-[2-(1H-benzimidazol-2-ylmethyl)hydrazinylidene]ethyl)phenol (LB) and their metal complexes and characterization by various spectral methods along with XRD and thermal analysis. The cytotoxic studies and molecular docking interactions have been carried out with protein enzyme receptor.

## 2. Experimental


### 2.1. Materials

The chemicals 4-hydroxyacetophenone, Hydrazine hydrate, was Sigma-Aldrich Co. The chlorides of Co (II), Ni (II) and Cu (II) were of S.R.L. grade. All other reagents and solvents were purchased from commercial sources and were of analytical grade.

### 2.2. Physical measurements

Melting points had been recorded on an electro-thermal melting factor apparatus and are uncorrected. <sup>1</sup>H NMR spectra were recorded on Bruker four hundred MHz spectrometer at IISc, Bangalore, Karnataka, India. The chemical shifts have been given in δ values (ppm) with tetramethylsilane (TMS) as an internal standard. LC-MS changed into acquired the usage of a C-18 column on Shimadzu, LCMS 2010A, Japan. The FT-IR spectra of the compounds were taken as KBr pellet (a hundred mg) the usage of Shimadzu Fourier Transform Infrared (FTIR) spectrometer. Magnetic susceptibility have been measured at 35 °C through the Gouy technique. Silica gel GF254 thin plates from Merck were used for TLC and spots were positioned either by UV or dipping in potassium permanganate solution. The powder X-ray studies was carried out by using Rigaku Mini Flex Instrument with Cu-K<sub>α</sub> radiation (wavelength 0.154 nm). The thermal gravimetric analysis of all metal complexes were taken by the Diamond TG/DT Analyzer (TG/DTA) at room temperature of 700 °C below heating pace of 20 °C min<sup>-1</sup>.

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## Mixed ligand Co(II) Complexes: Synthesis, Characterization, DNA binding and Photocleavage Studies

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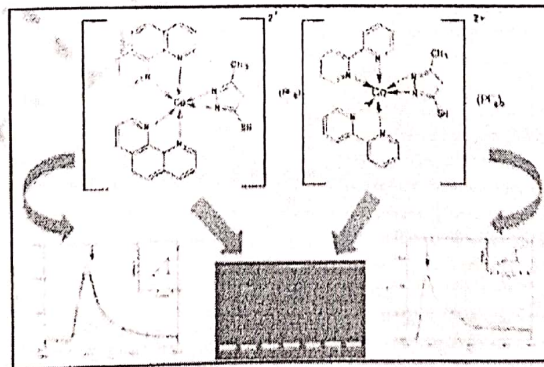
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### ABSTRACT

A new cobalt complex of the  $[M(L1)_2(L2)]^{2+}$  where M is a Cobalt metal ion and L1= phenanthroline/bipyridine, L2= 5-methyl-1,3,4-thiadiazole-thiole, have been synthesized and characterized by elemental analysis(CHN), FT-IR and UV-visible(UV-Vis) spectroscopic techniques. The DNA-binding property of the complexes has been investigated employing absorption spectroscopy, viscosity measurements and thermal denaturation study. The DNA cleavage experiments were carried out by gel electrophoresis method using pUC19 DNA. The experimental results show that both complexes can bind to DNA in an intercalation mode.

### Graphical Abstract



Keywords: Thiadiazole, Elemental analysis, Electrophoresis, Intercalation

  
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# Synthesis, characterization and tumor inhibitory activity of a novel Pd(II) complex derived from methanethiol-bridged (2-((1*H*-benzo[d]imidazol-2-yl)methylthio)-1*H*-benzo[d]imidazol-6-yl)(phenyl)methanone

Sunil Kumar N.,<sup>a</sup> Krishnamurthy G.,<sup>a</sup> Yadav D. Bodke,<sup>b</sup> Vikas H. Malojirao,<sup>c</sup> Ravikumar Naik T. R.,<sup>d</sup> Shivananda Kandagalla<sup>e</sup> and Prabhakar B. T.<sup>c</sup>

In this study, we designed a therapeutic active Pd(II) complex with the new (2-((1*H*-benzo[d]imidazol-2-yl)methylthio)-1*H*-benzo[d]imidazol-5-yl)(phenyl)methanone ligand in good yield. The structure of the ligand and its Pd(II) complex was characterized via IR, UV-visible, <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, mass spectroscopy, TGA and powder XRD techniques. The spectral data of the Pd(II) complex indicated the bidentate bonding mode for bis-benzimidazole and suggested a tetrahedral geometry for the metal complex. The *in vitro* antiproliferative effect of the BIPM ligand and Pd(II) complex were tested against the MCF7, A549, Ehrlich ascites carcinoma (EAC) and Daltons lymphoma ascites (DLA) carcinoma cell lines. The metal complex exhibited excellent antiproliferative potency with a significant IC<sub>50</sub> value of ~10 μM against the EAC cell line compared to the ligand alone with a value of ~17 μM. Further, the *in vivo* antitumor effect study on the Pd(II) complex against a murine EAC tumor model system showed obvious extended survivability. The tumor inhibitory mechanism of the Pd(II) complex is due to its antiangiogenic effect and promotion of apoptosis, as verified by DNA condensation and FACS analysis. The potential photo-induced binding mode on double-stranded calf thymus DNA and protein cleavage activity study on pBR322 DNA of the complex confirmed its apoptotic characteristics. The significant hypochromic shift due to the strong π-π stacking interaction between the metal complex and the base pairs of DNA was clearly shown by the intrinsic DNA binding constant, *k*<sub>b</sub>. The molecular docking study on the Pd(II) complex interaction with DNA further confirmed its inhibition ability. The experimental results and drug-likeness properties of the Pd(II) complex suggest its potential applications, which can be developed as a potent anticancer drug in the near future.

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## 1. Introduction

Cancer is the uncontrolled, rapid and pathological proliferation of abnormal cells, which is one of the most formidable afflictions worldwide.<sup>1</sup> Cancer causes about 550 000 deaths a year and is the

second leading cause of death after heart diseases.<sup>2</sup> Molecular events leading to the establishment of cancer is classified in to 6 major hallmarks (Hanahan 2011). The events are more or less interdependent, which regulates the progression of the disease. Evading angiogenesis and resistance to apoptosis are considered as prime hallmarks. Neoangiogenesis contributes the progressive destruction through enhanced microvessel density (MVD), which is an important surrogate marker.<sup>3</sup> Tumor tissue displays an enormous neovasculature, which is the recruitment of new blood vessels from the existing vasculature. Moreover, it is a key factor in the development of metastatic carcinoma and a requisite for the invasive nature of tumors.<sup>4</sup> Simultaneously, tumor cells become more resistant to cell death, which is a normal phenomenon in eliminating malfunctional cells, leading to establishment of the tumor.

Current therapies suffer from the major limitation of side effects and drug resistance; therefore, the continuous search for

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Research articles


# Sustainable synthesis of magnetically separable $\text{SiO}_2/\text{Co}@\text{Fe}_2\text{O}_4$ nanocomposite and its catalytic applications for the benzimidazole synthesis

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## Abstract

The Co(II) and Fe(III) centres magnetically separable two new mesoporous nanocatalyst were synthesised *via* chemical synthesis method. The transmission electron microscopic studies (TEM) show that, the particles are spherical shape with mean size of 20 nm. The Raman spectroscopy and X-ray photoelectron spectroscopy (XPS) reveals that  $\text{SiO}_2$  is coating on the surface of the cobalt ferrate nanoparticle ( $\text{CoFe}_2\text{O}_4$ ). The  $\text{SiO}_2$  coating is efficiently preventing the aggregated collision of nanoparticles. Magnetic measurements show that diamagnetic character of the  $\text{SiO}_2$  is unaffected to the coercivity of  $\text{SiO}_2$  coated  $\text{CoFe}_2\text{O}_4$  particles. In addition, these nanoparticles are used as nanocatalyst for high yielding, facile and expeditious synthesis of various functionalized 2-arylbenzimidazoles *via* one-pot condensation. The cascade including imine formation, cyclization, condensation, and aromatization occurs, without addition of any reducing or

  
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## Synthesis, Characterization, XRD Studies, Molecular Docking and Biological Screening of N-phenyl-2-(pyridin-4-ylcarbonyl) Hydrazine Carboxamide and their 3d Metal Ion Complexes

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### ABSTRACT

A synthesis of semicarbazide derivative like N-phenyl-2-(pyridin-4-ylcarbonyl) hydrazine carboxamide by the reaction of isoniazid and phenyl isocyanate has been done, using this ligand and their 3d metal ions such as Ni<sup>II</sup>, Co<sup>II</sup>, Cu<sup>II</sup>, Zn<sup>II</sup> and Mn<sup>II</sup> complexes were synthesized. The ligand and their metal complexes have been characterized by different analytical techniques, such as elemental analyses, molar conductivity measurements, UV-Visible, Fourier Transform Infra-Red (FTIR), Proton Nuclear Magnetic Resonance (<sup>1</sup>H-NMR), Carbon-13 Nuclear Magnetic Resonance (<sup>13</sup>C-NMR), Liquid Chromatography–Mass Spectrometry (LCMS), Powder X-ray Diffraction (PXRD) and Thermo Gravimetric Analysis (TGA) studies. The antioxidant, antimicrobial and antifungal activity of these compounds reported agreeable results against bacterial strains and fungal strains. The molecular docking studies for synthesized complexes exhibited excellent binding energy interaction with protein enzymes.

**Keywords:** Semicarbazone derivative, Thermal analysis, Microbial activity, XRD, Molecular docking

### INTRODUCTION

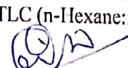
The most common traditional method for the synthesis of the semicarbazone derivatives is obtained by reaction of R-CO-NH-NH<sub>2</sub> and R-NCO. Most complexes of semicarbazone derivatives behave as bidentate ligands because they can bind to metals through oxygen and the hydrazine nitrogen atoms, although in some cases they behave as unidentate ligands by binding through an only nitrogen atom [1,2]. Semicarbazone plays a main key role in organic and biological chemistry. The semicarbazone linkage is an important functional group due to its extensive presence in natural products, pharmaceutical compounds and synthetic polymers. Transition metal ions are playing an important role in biological processes in the human body. For example, nickel(II), copper(II) and zinc(II) ions are the most abundant transition metals in humans [3-5]. Recent years, more number of studies devoted to search derivatives of semicarbazides and studied their chemical and structural properties and potential biological activities such as antimicrobial, antioxidant, anticancer, antitubercular, antimalarial, antitumor, sodium channel blocker, antiviral and antifungal activities [6-8]. Moreover, semicarbazone derivatives have found their way into almost every branch of chemistry; commercially they are used as dyes, photographic films, plastic and in the textile industry [9,10]. The semicarbazone linkage is an important functional group due to its extensive presence in natural products, pharmaceutical compounds, and synthetic polymers [11]. The above properties of semicarbazone derivative and their complexes led us to synthesize some new compounds of such type and investigate their properties in greater detail. Also, all the synthesized complexes were investigated for molecular docking and the *in vitro* antioxidant activity.

### MATERIALS AND METHODS

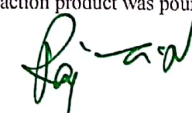
The chemicals isoniazid, phenyl isocyanate, CH<sub>3</sub>COOH and acetone were purchased from the Sigma-Aldrich, Laboratory chemicals, Bangalore, Karnataka, India. Nickel(II) chloride hexahydrate, cobalt(II) chloride hexahydrate, copper(II) chloride dehydrate, anhydrous zinc(II) chloride and manganese(II) chloride were purchased from Merck. The metal chlorides were used in their hydrated form. The ethanol, methanol and acetone were distilled and dried by following the reported method [12].

#### Synthesis of N-phenyl-2-(pyridin-4-ylcarbonyl) hydrazine carboxamide (IP)

The calculated amount of isoniazid (2.05 g, 0.015 mol) and phenyl isocyanate (1.43 g, 0.012 mol) were dissolved in 20 ml dry acetone with one drop of acetic acid. The resulting mixture was stirred on a magnetic stirrer at about 500 rpm for 12 h at 60°C. The progress of a reaction was monitored by TLC (n-Hexane:Ethyl acetate in the ratio 0.7:0.3). After the reaction, the reaction product was poured into ice cold water when the

  
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## Synthesis of (4-Bromo-3-Fluorophenyl)(Pyrimidin-5-yl)Methanol and their Transition Metal Complexes, Spectral, X-ray Powder Diffraction, Cytotoxicity, Molecular Docking, and Biological Evaluation

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### ABSTRACT

The article deals with a study of a new series of transition metal complexes such as Co<sup>(II)</sup>, Ni<sup>(II)</sup>, Cu<sup>(II)</sup>, and Zn<sup>(II)</sup> with pyrimidine-based ligand (4-bromo-3-fluorophenyl)(pyrimidin-5-yl)methanol; the novel ligand has been synthesized through Barbier-type reaction and structurally characterized by <sup>1</sup>H nuclear magnetic resonance, infrared, ultraviolet-visible, and powder X-ray powder diffraction (XRD) spectral techniques. The powder XRD studies reveal that all complexes are in crystalline nature. The cytotoxic activity of the complexes and the uncoordinated ligand against human breast cancer (MCF-7) and chronic myelogenous leukemia cell line (K-562) exhibits good viability in the range of 52.11-66.23% at the concentration >100-110 µg/mL as compared to the inhibition in the untreated cells. The result of antibacterial activity revealed that the complexes of cobalt and copper are active against the studied bacteria and fungi, and the cytotoxicity studies are correlated with the computational docking analysis.

**Key words:** Barbier reaction, Lithium metal, Sonochemistry.

### 1. INTRODUCTION


Philippe Barbier reported a coupling reaction between a ketone (6-methyl-5-hepten-2-one) and an alkyl halide (CH<sub>3</sub>I) in the presence of a stoichiometric quantity of magnesium metal, thus establishing the basis for the one-step C-C bond forming process is known as the Barbier reaction. The Barbier reaction is an organic reaction between an alkyl halide and the carbonyl group as an electrophilic substrate in the presence of magnesium, aluminum, zinc, indium, tin, or its salts. The reaction product is a primary, secondary, or tertiary alcohol.

Barbier type reaction can be carried out using mixed Mg/Li amides TMPMgCl·LiCl and TMP<sub>2</sub>MgCl·LiCl [1-3]. A mixture of zinc [4], aluminum and indium metal [5], bismuth-mediated [6], titanium [7], antimony [8], scandium [9], cobalt [10], cerium [11], silver [12], ionic liquids [13], and tin nano-particles in water [14] developed a new approach for synthesizing homoallyl alcohol.

Pyrimidines are six-membered unsaturated ring compounds composed of carbon and nitrogen, and they are found throughout nature in various form with nitrogen atoms at positions 1 and 3. Pyrimidines are also known as diazine, or 1,3-diazine can be regarded as cyclic amine [15]; pyrimidine, being an integral part of DNA and RNA, has imparted diverse pharmacological properties as an effective bactericide, fungicide [16], anti-inflammatory [17], antioxidant [18], antihypertensive [19], and anticancer [20]. They are back bone in several natural compounds with potent biological activity such as antineoplastic (uramustine, tegafur, and floxuridine), antibacterial (trimethoprim, piromidic acid, and metioprim), antifungal (flucytosine), antivirals (broxuridine and idoxuridine) anthelmintic (pyrantel embonate), vasodilators (dipyridamole and trapidil), parkinsonism (piribedil), liposaccharides, and antibiotics [21]. In addition, they play a vital role in the production of several drugs for thyroid, leukemia [22], herbicides [23], pyrimidine derivatives with docking

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Shafeeulla R, Krishnamurthy, Bhojyanaik, Manjuraj, JOTCSA. 2017; 4(3): 787-810. RESEARCH ARTICLE



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## Synthesis, Cytotoxicity, and Molecular Docking Study of Complexes Containing Thiazole Moiety

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**Abstract:** The ligand 5-methyl-2-phenyl-4-[(E)-1,3-thiazol-2-yl-diazenyl]-2,4-dihydro-3H-pyrazol-3-one (Dy) has been synthesized by diazo coupling reactions of 5-methyl-2-phenyl-2,4-dihydro-3H-pyrazol-3-one with 2-aminothiazole and ferric hydrogen sulfate (FHS), as a catalyst, under solvent-free conditions. A series of complexes of the ligand with Co(II), Ni(II), Cu(II), and Zn(II) ions are synthesized and structurally characterized by <sup>1</sup>H NMR, FTIR, and UV-Visible spectral techniques. The cytotoxic activity of the complexes and the uncoordinated ligand against human breast cancer (MCF-7) and chronic myelogenous leukemia cell line (human erythroleukemia) (K-562) cell lines exhibits good viability in the range of 50.16–55.16% at a concentration of >100–110 µg/mL as compared to the inhibition in the untreated cells. Further, the metal complexes and ligand were screened against antibacterial strains of *S. typhi*, *S. aureus*, and *E. coli*. Both the cytotoxicity and antioxidant studies are correlated with computational docking analysis and powder XRD studies reveals that all complexes are in crystalline nature.

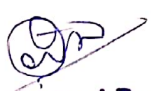
**Keywords:** Azo dye, solvent-free, Fe(HSO<sub>4</sub>)<sub>3</sub>, powder X-ray diffraction.


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**ANTIDIABETIC ACTIVITY OF ETHANOL EXTRACT OF *FICUS RACEMOSA*. LINN,  
BARK**

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**ABSTRACT**

The ethanolic extract of the plant *Ficus racemosa* was investigated for its antidiabetic activity. Type-2 diabetes mellitus was induced with standardised doses of alloxan monohydrate. Graded doses of the ethanolic extract was administered to normal and experimental diabetic rats for 12 days. Fasting plasma glucose levels evaluated in diabetic rats. The diabetic groups treated with the ethanolic extract were compared with standard insulin. The findings showed the significant antidiabetic potential of the extract in ameliorating the diabetic conditions in diabetic rats. No significant effects were found in the normal rats.

**KEYWORDS:** *Ficus racemosa*, antidiabetic effect, alloxan induced diabetes.

**INTRODUCTION**

Diabetes mellitus is a metabolic disease as old as humankind and its prevalence is considered to be high (4-5%) all over the world.<sup>[1]</sup> In spite of the introduction of hypoglycemic agents, diabetes and related issue continue to be a significant medical problem. Since long standing, patients with non-insulin requiring diabetes have been treated orally in folk medicine with a diversity of plant extracts. In India a number of plants are declare in ancient literature (Ayurveda) for the cure of diabetic conditions known as 'madhumeha' and some of them have been experimentally evaluated and the active principles isolated.<sup>[2-7]</sup> *Ficus racemosa* Linn. (Hindi: *Gular*, Sanskrit: *Udambara*) belongs to the family Moraceae. It is an evergreen spreading tree for average to large size, found in every part of India in moist localities. It is also found on rocky slopes, sometimes almost gregariously. It is often cultivated around villages for its consumable fruit. The bark of the tree is used in the native systems of medicine for a variety of purposes. The bark is astringent and an infusion of it is employed as a mouth wash for spongy gum condition. The bark is antiseptic, antipyretic, vermifugal and a decoction of the bark is used in treating various skin diseases and ulcers. It is used as a medical plaster in inflammatory swellings and boils. It is described to be effective in the treatment of piles, dysentery, asthma, gonorrhoea, gleet, menorrhagia, leucorrhoea, haemoptysis and urinary diseases.<sup>[8,10]</sup> In this study we have attempted to investigate the anti-diabetic activity of ethanolic extract of *Ficus racemosa* bark.

**MATERIALS AND METHODS**

**Plant material**

The bark of the plant *Ficus racemosa* were collected from Vidyannagar (Shimoga, Karnataka, India). The plant was authenticated by Professor Kamalakar, Department of Botany, Sahyadri Science College (Shimoga, Karnataka, India). A voucher specimen has been deposited in the Department of Botany, Sahyadri Science College (Shimoga, Karnataka, India).

**Preliminary phytochemical screening**

Opening phytochemical investigation was conducted by the following standard procedures.<sup>[11,12]</sup>

**Preparation of extract**

The powdered plant material (350 g) was successively extracted in a 2000 mL round bottomed flask with 1500 mL solvents of increasing polarity starting with petroleum ether, chloroform, ethanol and double distilled water. The reflux time for each solvent was 40 cycles. The extracts were cooled at room temperature, filtered and evaporated to dryness under reduced pressure in a rotatory evaporator (Buchí Rotavapor).

**Animals**

Male wistar albino rats (160-200 g) were used in the experiment. Animals maintained under standard environmental conditions, were fed with a standard diet (Hindustan Lever, India) and water *ad libitum*. The animals were fasted for 18hr before experimentation but allowed free access to water.

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Research Article

**Now Approach for the Synthesis of N-(4-oxo-3-substituted-2-Sulfanylidene Imidazolidin-1-yl)Naphtho[2,1-b]Furan-2-Carboxamide Derivatives and Their Antimicrobial Activity**

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**ABSTRACT**

The reaction of naphtho[2,1-b]furan-2-carbohydrazide 4 on treatment with various aromatic phenyl isothiocyanates in glacial acetic acid affords 2-(naphtho[2,1-b]furan-2-carbonyl)-N-(substituted)hydrazine-1-carboxamides 5a-f. This on heating with chloroacetyl chloride in DMF produces N-(4-oxo-3-substituted-2-sulfanylidene imidazolidin-1-yl)naphtho[2,1-b]furan-2-carboxamides 6a-f. The structures of 6a-f have been established by spectral studies. In addition they have been screened for antimicrobial activities.

**Key words:** naphtho[2,1-b]furan-2-carbohydrazide and antimicrobial activities.

**INTRODUCTION**

Imidazolones are important heterocycles found in many biologically active compounds. Imidazolines are biologically active pharmacophores and synthetic intermediates in medicinal chemistry. Imidazolones exhibit high range of biological activities<sup>1-3</sup> including anti-inflammatory, antitumor activities<sup>4</sup>, anticancer<sup>5</sup>, anti-proliferative<sup>6</sup>, antihypertensive<sup>7</sup>, antihyperuricemic<sup>8</sup>, anticancer<sup>9</sup> and antilice<sup>10</sup> activities. Naphtho[2,1-b]furan derivatives were known to show various biological<sup>11-14</sup> and pharmacological activities. Naphtho[2,1-b]furan derivatives with amidazolidone ring is not synthesised so far. Hence it was thought to synthesize new derivatives of naphtho[2,1-b]furan derivatives with imidazolidone ring by simple method and screened them for antimicrobial activities.


**MATERIALS AND METHODS**

All the chemicals were of A. R. grade and used with further purification. Melting points were determined with the open capillary and are uncorrected. IR spectra was recorded in Nicolet 5700 FT-IR instrument (Nicolet,

Madison, WI, USA) by using KBr pellets. The <sup>1</sup>H NMR spectra are recorded on VNMRS-400 Agilent-NMR instrument using TMS as internal reference. Chemical shifts are reported in δ (ppm). Mass spectra were recorded using Water's SYNAPT G2 QTOF LCMS instrument. Purity of the compounds was checked by TLC.

**EXPERIMENTAL**

2-Naphthol is subjected to Reimer-Tiemann reaction to get 2-hydroxy-1-naphthaldehyde 2. This on reaction with ethyl chloroacetate gives ethyl naphtho[2,1-b]furan-2-carboxylate 3. The ester 3 on condensation with hydrazine hydrate in ethanol gave naphtho[2,1-b]furan-2-carbohydrazide 4. This on treatment with various isothiocyanates yielded 2-(naphtho[2,1-b]furan-2-carbonyl)-N-(substituted)hydrazine-1-carboxamide. These compounds on condensation with chloroacetyl chloride in DMF gave the title compounds N-(4-oxo-3-substituted-2-sulfanylideneimidazolidin-1-yl)naphtho[2,1-b]furan-2-carboxamide derivatives 6a-f.

  
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## Electrochemical Reduction of Nitroanisaldehyde at Zinc Cathode with Surface Morphology and Biological Activity

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Crystalline and sphere like morphologies of smaller molecules have many applications. Particle size determination is essentially and important while working with nanomaterials. The information on many physical properties including the size, morphology, surface texture, roughness and chemical composition of materials is the important area of research. Moreover, advanced manipulation of the samples during the SEM experiments can provide key information about the morphology of the crystals at the micro and nanometer scale. The electrochemical reduction of nitro aromatic compound to its amine derivative is of great importance in studying the conductivity and the surface morphology of the cathode. The measurement of the variation of current and electrode potential with time during the electrolysis is also the important area of research. The particle size variation in the reduction product of a nitro aromatic compound increases the biological activity may be due to their particle size. The study of biological activity of the organic molecule before and after electrolysis is an interesting subject in the pharmaceutical industry.

**Keywords:** Cathode surface, Electrochemical reduction, Surface morphology.

### INTRODUCTION

Crystalline, sphere like morphologies of small molecular organic compounds have applications in many fields. The experimental approach opens a new route for exciting applications of small molecular organic compounds in optical coatings, textured surfaces with controlled wettability, pharmaceutical and food substance printing and others, where thick organic films and particles with high surface area are needed [1].

As in the last several decades, chemists have shown their interest in the electrochemical reduction of organic compounds. These molecules are brought into contact with a cathode, wherein the cathode comprises a support made of an electrically conductive material [2].


The electrochemical reduction of nitro organic compounds has been used for the cathode dimerization of acrylonitrile, but yields were too low, hydrogen was being formed, selectivities with a view to a number of possible reduction steps were too low, the special catalytically active cathodes were not sufficiently available on a technical scale. At present more information is required on electrochemical behaviour for electrochemical reduction on cathodes to be utilized industrially [3].

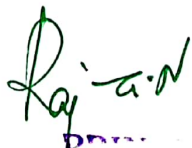
It is also known, from literature in preparative organic electro chemistry that anodes and cathodes used in preparative electro chemistry must have special electrochemical characteristics. Such electrodes are often used for metal organic frameworks represent a class of hybrid materials comprised of ordering networks formed *via* combining metal ions with organic ligands. Metal organic frameworks have been used as efficient electrodes in fuel cell systems [4].

The electrodes and electrolytes are crucial in electro catalysis and different electrodes and electrolytes can induce different products. Modifying the surface of electrodes to provide some control over how the electrode interacts with its environment has been one of the most active areas of research interest in electro chemistry during the last 30 years [5-11].

The absorption of the drugs is especially affected by particle size because the bioavailability is, in most of the cases, dissolution rate controlled. In the pharmaceutical industry several conventional techniques have been utilized for particle size reduction, such as spray drying, freeze drying and liquid antisolvent precipitation [12].

A drawback of these established fabrication methods is that the electrodes, after inactivation of the catalytically active layer, often have to be removed from the electrolytic apparatus and subjected to external regeneration, so that the short catalyst

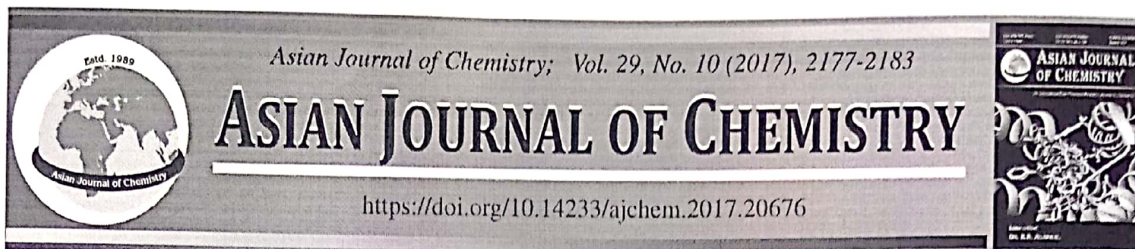
  
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## Synthesis, Characterization, Molecular Docking, Thermal Degradation Studies and Biological Screening of N-[[2-(Pyridin-4-ylcarbonyl)hydrazinyl]carbonothioyl]furan-2-carboxamide and its Mn(II), Ni(II), Co(II), Cu(II) and Zn(II) Complexes

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N-[[2-(Pyridin-4-ylcarbonyl)hydrazinyl]carbonothioyl]furan-2-carboxamide and its complexes with Ni(II), Co(II), Cu(II), Zn(II) and Mn(II) ions have been synthesized. The structure of the synthesized compounds was elucidated by elemental analysis, conductivity measurements, UV-visible, FT-IR, <sup>1</sup>H NMR, powder XRD and thermal analysis studies. Most of metal complexes have exhibit thermal degradation between 80-750 °C and the powder X-rays diffraction data suggest that all the synthesized metal complexes were in nano crystalline phase. The computational molecular docking has been studied using Hex molecular modeling package version 8.2. The three dimensional structure of *E. coli* MurBenzyme (PDB code 2MBR) was used in microbial activity. The metal complexes showed comparable E total values with the standard drug tetracycline. The antioxidant and antimicrobial activity of prepared compounds indicate agreeable results versus bacterial strains three Gram-positive bacteria; *S. aureus*, *S. pyogenes* and *P. acnes* and three Gram-negative bacteria; *E. coli*, *K. terrigena* and *K. pneumonia*. The antifungal activity gave good results against fungal strains *C. albicans*, *C. neoformans* and *Trichosporon*.

**Keywords:** Thiosemicarbazone, Transition metal(II) complexes, Antioxidant, Molecular docking.

### INTRODUCTION


Thiosemicarbazone derivatives are of wide interest because of their diverse biological activity and clinical applications. For some time, semi-and thiosemicarbazones have been a subject of interest in different profiles, *i.e.*, they form complexes with many metal ions which would exhibit a diverse chemical, physical and structural properties [1]. Many of these compounds and their metal complexes have shown a wide spectrum of biological activity [2]. Therefore the design and synthesis of thiosemicarbazone derivatives and their metal complexes are of particular interest to have increased drug activity and to decrease their toxicity of metal ions. Thus these compounds used for a variety applications including clinical biology, analytical and in industries [3,4]. Thiosemicarbazone derivatives complexes have also been used as anticancer, antitubercular, antibacterial, antifungal, hypertensive and hypothermic reagents [5,6]. It has been suggested that thiosemicarbazone drugs may act to inhibit viruses by binding to copper ions, which are the constituents of the virus [7-9]. In addition, thiosemicarbazone derivatives exhibits enhanced thermodynamic and kinetic stabilities due to their modied complexation properties

relative to the corresponding simple molecular precursor [10]. These properties of thiosemicarbazones and their metal complexes have become a subject of intense research. Based on the above advantages, we report the synthesis and characterization of thiosemicarbazone and their metal complexes. Also, all the synthesized complexes were investigated for molecular docking and the *in vitro* antioxidant activity.

### EXPERIMENTAL

Elemental analyses was obtained from Perkin-Elmer 2400 II CHNS/O rapid analyzer and metal analyses were carried out by standard methods. The elemental analysis (C, H, N, S) was performed using Perkin-Elmer 2400 II CHNS/O Elemental analyzer. Melting point of the ligand and their metal complexes was measured by using melting point apparatus model code NAMPA/045 and are uncorrected. UV-visible spectra were measured in DMSO on an ocean optics USB 4000USA spectrophotometer, using 1 cm path length cuvette at room temperature. Infrared spectra were recorded using FT-IR 8400s Shimadzu spectrometer with KBr pellets in the range of 4000-400 cm<sup>-1</sup>. The molar conductance data was measured using

  
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## Metal Complexes of S-(5-chloro-1,3-benzoxazol-2-yl)thiophene-2-carbothioate: Spectral, XRD, Thermal, Molecular Docking and Biological Evaluation

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### ABSTRACT


The Co(II), Ni(II) and Cu(II) metal complexes of S-(5-chloro-1,3-benzoxazol-2-yl)thiophene-2-carbothioate ligand (BT) was synthesized and characterized by <sup>1</sup>H-NMR, LC-mass, IR, UV-Visible and XRD studies. The measured molar conductance values in DMF indicate that the complexes are non-electrolytic in nature. All the complexes have been screened for their cytotoxicity activity on MCF-7 (estrogen receptor-positive human breast cancer cells) and HepG2 (liver hepatocellular carcinoma) cell lines. The in vitro DPPH free radical scavenging activity has been carried out, which show promising results, and it is correlated with computational in silico molecular docking using human antioxidant enzyme in complexes with the competitive inhibitor DTT (PDB: 3MNG). Further the antibacterial activity with three different bacterial strains has been reported.

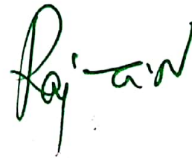
**Keywords:** 5-chloro-2-mercaptobenzoxazole, 2-thiophencarboxylchloride, metal complexes, cytotoxicity, XRD, molecular docking and antioxidant studies.

### INTRODUCTION

The coordination versatility of benzoxazole compounds and their metallic complexes is reported to be effective complexing agents with various transition metal ions via nitrogen donor atoms has greatly helped the development of their chemistry. However the benzoxazoles

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DESIGN, SYNTHESIS OF BIOLOGICALLY ACTIVE HETEROCYCLES CONTAINING  
INDOL- THIAZOLYL- THIAZOLIDINONE DERIVATIVES

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ABSTRACT

**Objective:** The present study envisage a novel series of thiazole, indole and thiazolidine derivatives, namely, *N*-[(5-substituted-2-phenyl-1*H*-indol-3-yl)methylene]-1,5,6,7-tetrahydro-5,7-dimethylbenzo [d]thiazole-2-amine (4a-c), 2-[(5-substituted-2-phenyl-1*H*-indol-3-yl)-3-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)-thiazolidin-4-one (5a-c) and 5-benzylidene-2-[(5-substituted-2-phenyl-1*H*-indol-3-yl)-3-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl) thiazolidin-4-one (6a-c).

**Methods:** All the newly synthesized compounds were characterized by infrared, <sup>1</sup>H, <sup>13</sup>C nuclear magnetic resonance and mass spectral data and elemental analysis and evaluated for *in vitro* antimicrobial activity.

**Results:** Novel compounds *N*-[(5-substituted-2-phenyl-1*H*-indol-3-yl)methylene]-1,5,6,7-tetrahydro-5,7-dimethylbenzo [d]thiazole-2-amine (4a-c), 2-[(5-substituted-2-phenyl-1*H*-indol-3-yl)-3-(4,5,6,7-trimethylbenzo[d]thiazol-2-yl)-thiazolidin-4-one (5a-c) and 5-benzylidene-2-[(5-substituted-2-phenyl-1*H*-indol-3-yl)-3-(4,5,6,7-trimethyl benzo[d]thiazol-2-yl)thiazolidin-4-one (6a-c) have been made and characterized using spectral and analytical data. The results of antibacterial and antifungal activities showed that some of the synthesized compounds exhibited promising activities.

**Conclusion:** All the newly synthesized compounds were carried out by the broth microdilution method (NCCLS, 2002) in a DMF concentration of 500, 250, 125, and 62.5 µg/ml. Gentamycin and fluconazole are used as reference standards for antibacterial and antifungal activity, respectively. The final results revealed that compounds 4b, 5b, and 6b exhibited potent antimicrobial activity when compared to the standard drugs.

**Keywords:** Indole, Thiazole, Thiazolidin-4-one, Antibacterial, Antifungal activities.

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INTRODUCTION

Heterocyclic compounds have occupied a unique place in the chemistry, and these compounds displayed a wide range of biological activities, such as antibacterial and antifungal activities [1-6]. Further, the treatment of infectious diseases is illness caused still remains an important and challenging problem for researchers due to their combination factors increase the number of multidrug-resistant in microbial pathogens developed. In despite a large number of antibiotics and chemotherapeutic drugs available for medicinal use in the market, at the same time, the prominence of old and new antibiotic resistance was developed in the past decades, medicinal properties substances need for new classes of antimicrobial agents. There is a real need for the discovery of new substances which provide with potent antimicrobial activity. However, by the high frequency of renal toxicity and several adverse effects [7] through the various synthesized molecules and for the above aim and to reduce the adverse effects [8,9].

It was demonstrated that thiazoles a unique heterocycle containing sulfur and nitrogen atoms, occupies an important place in medicinal chemistry in terms of decreased toxicity after oral or intravenous administration and are often utilized in the treatment of fungal infections. Therefore, the derivative of thiazole could be considered as possible antimicrobial agents [9]. Further, the thiazole nucleus frequently appears in various natural products and biologically active compounds. Similarly, there has been a keen interest in the chemistry of thiazolidin-4-one ring system, which is a core structure in various synthetic pharmaceuticals displaying a wide range of biological activities [10]. Thiazolidinone ring also occurs

in nature, thus actithiazic acid isolated from *Streptomyces* strains exhibit slightly specific *in vitro* activity against *Mycobacterium tuberculosis* [11]. Thiazolidinone derivatives are also known to exhibit diverse bioactivities such as anticonvulsant [12], antiarrhythmic [13], anti-platelet activating factor (PAF) [14], antihistaminic [15], antidiabetic [16], cyclooxygenase inhibitory [17], Ca<sup>2+</sup>-channel blocker [18], PAF antagonist [19], cardioprotective [20], anti-ischemic [21], anticancer [22], tumor necrosis factor-α antagonist [23], and nematocidal activities [24]. The synthesis of heterocycles containing multi-structure in a molecule has received much attention in recent years [25].

It is well known that heterocyclic compounds containing nitrogen and sulfur are of great interest to researchers due to their diverse biological activities. The literature data show that 4-thiazolidinone scaffold is very versatile and has featured in a number of clinically used drugs in the market. They have exhibited as antibacterial, antifungal and antimycobacterial activity [26], antithyroid [27], amoebicidal [28], anticancer [29], and antidiabetic [30] activities. However, based on the wide spectrum of biological profile of indole, thiazole, and thiazolidin-4-one and their derivatives increasing importance in the pharmaceutical and biological field. Hence, linked heterocycles containing indole, thiazole, and thiazolidinone have been synthesized and in continuation of our ongoing research on biologically active heterocycles [31-38], these observations encourage us to design drug strategy to synthesize several indole derivative possessing thiazole and thiazolidin-4-one moieties at 3-position of indole ring in a single molecular framework with potential antimicrobial activity.

  
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# Rapid adsorption of malachite green dye using eco-friendly Fe (III) - montmorillonite: Effective clay mineral for dye effluents containing

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## Abstract

Herein we reported the malachite green dye removal by Fe(III)-Mt through adsorption process under ambient conditions. The amount of MG dye removal by Fe(III)-Montmorillonite(Fe(III)-Mt) was estimated from its optical density at  $\lambda_{max} = 617$  nm using UV-Vis spectrophotometer. The MG dye removal was found to be rapid at basic pH and increased further with temperature up to 50°C. At pH 7 & 8, a complete reduction (100%) was observed within 5 min and 7 min, whereas at pH 4 & 5, it took 10 min & 15 min respectively. The time taken for complete reduction at 0°C, RT (30°C) and 50°C were 10, 7 and 5 min respectively. The removal followed by adsorption of dye molecules on the spent clay mineral was evident from FESEM/EDX analysis. More importantly, Fe(III)-Mt could be separated and retrieved easily after the reaction by centrifugation from the degraded MG dye solution. The experimental results of MG dye removal from Fe(III)-Mt follows the pseudo first order kinetics. We believe that Fe(III)-Mt could be the efficient and suitable material to augment the real filed applications. This study provides a new avenue to gain in-depth insight to the applications of Fe(III)-Mt as an effective clay mineral for remediation of dye effluents. Overall Fe(III)-Mt bears the capability for environmental remediation in relation to the dye pollution. Copyright © 2016 VBRI Press.


**Keywords:** Fe(III)-montmorillonite, malachite green, remediation, adsorption.

## Introduction

Dye effluents which are released from textile dye industries, which impair the environment and human beings continuously through contamination of water reservoirs, soil etc. Dyes can be classified into three types such as cationic, anionic and nonionic dyes. Cationic dyes are basic dyes, while anionic dyes include direct, acid and reactive dyes [1]. There are plenty of synthetic dyes used in pharmaceutical, textile, cosmetics, paper and pulp industries. Among these dyes some of them have highly intense color that pollutes the water bodies in the environment. Moreover, many of them are not degradable under normal environmental conditions, while these show mutagenic and carcinogenic behavior towards the human beings as well as environment [2].

Malachite green (MG) is a cationic triphenylmethane dye as shown in Fig. 1(a). It is widely used as colouring agent, food additive, medical disinfectant, fungicide, parasiticide and disinfectant agent in aquaculture industries. It is also used for wool, dyeing silk, jute, leather, ceramics, cotton and also a biological staining agent [3]. Even though used extensively worldwide, it exhibits carcinogenic and mutagenic properties were noticed against mammalian

cells, aquatic life and many other. For instance, it affects the human health especially the immune system and reproductive system in a short period [4]. In order to reduce the damage caused by these noxious dyes to human beings as well as environment many methods were proposed and implemented to remove dye effluents from waste water. Such as biological treatment, degradation, incineration, sedimentation and gravity separation that have been adopted for water treatment. Furthermore, different techniques such as filtration, centrifugation, micro- and ultra filtration, crystallization, precipitation, coagulation, oxidation, solvent extraction, evaporation, distillation, reverse osmosis, ion exchange, electro dialysis, electrolysis and adsorption [5, 6]. Among all of these methods adsorption is considered as a most efficient technique for the removal of noxious dyes from polluted aquatic source, since it is ease of operation, non-destructive, and easy to adopt quickly in short manner as compared with reported methods [7]. On contrary the remaining methods have some limitations such as, requires more treatment time, production of sludge after the reaction and involves the generation of toxic volatile compounds [8].

  
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5th International Conference of Materials Processing and Characterization (ICMPC 2016)

## Enhanced removal of methylene blue dye in aqueous solution using eco-friendly Fe(III)–montmorillonite

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### Abstract

We have explored the highly efficient and environmentally benign clay mineral, Fe(III)–montmorillonite (Fe(III)–Mt), for methylene blue (MB) dye removal in aqueous solution. The Fe(III)–Mt was interacted with MB dye solution at different pH, temperature and solid-to-liquid ratio. The concentration of MB dye removal was estimated from its optical density at  $\lambda_{max} = 665$  nm using UV-Vis spectrophotometer. The MB dye molecules removal was rapid at basic pH and increases with temperature up to 40 °C. A complete reduction (100%) was occurred in about 7 min at pH 7 & 10 while at pH 3 in about 10 min. The time taken for complete reduction at 0 °C, RT (30 °C), and 40 °C are 10, 7 and 5 min respectively. The removal followed by adsorption of dye molecules on the spent clay mineral was evident from FESEM/EDX analysis. More importantly, Fe(III)–Mt could be separated and retrieved easily after the reaction by centrifugation from the degraded MB dye solution. This study reveals that Fe(III)–Mt has the potential to be used as reductant/adsorbent to remove cationic dye molecules effectively and rapidly from drinking water and large scale of industrial wastewater.

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Selection and peer-review under responsibility of Conference Committee Members of 5th International Conference of Materials Processing and Characterization (ICMPC 2016).


**Keywords:** Fe(III)–montmorillonite; Methylene blue; Remediation; Adsorption

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Full Paper

**Tungsten oxide (WO<sub>3</sub>) Modified Carbon Paste Electrode  
for Electrochemical Investigation of Dopamine in Presence  
of Uric Acid and Folic Acid**

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**Abstract-** Present work describes the synthesized and characterization of tungsten oxide nanoparticles (WO<sub>3</sub>NPs) was prepared by using tungsten carbide (WC). The prepared material was characterized by using X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscope (TEM) and infrared spectroscopy (IR). The prepared WO<sub>3</sub>NPs was used as the modifier for the preparation of carbon past electrode (WO<sub>3</sub>NPs/MCPE). The fabricated WO<sub>3</sub>NPs/MCPE exhibits an excellent electrocatalytic activity towards the dopamine (DA) in the presence of uric acid (UA) and folic acid (FA) in 0.2M phosphate buffer solution (PBS) of pH 7.4 by cyclic voltammetric (CV) and differential pulse voltammetric techniques (DPV). From the effect of scan rate, concentration and pH of the electrode phenomenon was confirmed to be adsorption-controlled process. The lower detection limit of dopamine was 0.58 μM and the simultaneous analysis shows a good result with peak to peak separation between dopamine and other two analytes uric acid and folic acid by DPV techniques.

**Keywords-** Tungsten oxide, Dopamine, Uric acid, Folic acid, Carbon paste electrode, Electrocatalytic activity

  
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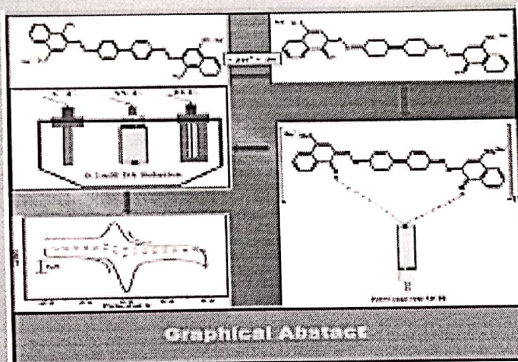
## Electropolymerized Congo Red Film based Sensor for Dopamine: A Voltammetric Study

Chethan M Kuskur<sup>1</sup>, Kumara Swamy BE<sup>1\*</sup>, Jayadevappa H<sup>2</sup> and Shrivakumar K<sup>3</sup>

### Abstract

The polymerization film of Congo red was prepared on the surface of carbon paste electrode by electropolymerization using cyclic voltammetric method. The higher catalytic activity was obtained for electrocatalytic oxidation of Dopamine, with drastic enhancement of the reversibility and peak current in 0.2 phosphate buffer solution of pH 7.0 at the sweep rate 100 mV/s. The variation of sweep rate and pH were investigated. The limit of detection of Dopamine was found to be 0.06  $\mu$ M. The effect of interference studies was done by differential pulse voltammetric technique. In the simultaneous look at, Dopamine and Uric acid were well separated by cyclic voltammetric technique. The proposed method showed good sensitivity, selectivity, and reproducibility.

**Keywords:** Dopamine; Uric acid; Congo red; Cyclic voltammetry; Electropolymerization; Carbon paste electrode



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INFLUENCE OF WATER QUALITY CHANGES ON THE DISTRIBUTION AND DIVERSITY OF AQUATIC MACROPHYTES IN CERTAIN WETLANDS OF CHIKKAMAGALUR DISTRICT.


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**ABSTRACT:** The present study was carried out to assess the water quality changes and the distribution of aquatic plants, also influenced on the nutrient condition of the water bodies. In this context, water samples were collected at different selected points in chikmagalur district during the year (October 2015- September 2016) at different seasons. Water samples were collected every season for physico-chemical analysis and analyzed by following standard procedures.(APHA,1995). Simultaneously aquatic plants were collected in each study sites and identified with the help of published manuals (C.D.K Cook, 1996). In the study sites, wide-range of aquatic macrophytes were recorded such as *Salvinia adnata* Desv, *Ludwigia adscendens* (L.) Hara, *Polygonum* sp, *Trapa natans* var. *bispinosa* (Roxb.) Makino, *Nelumbo nucifera* Gaertn., *Nymphoides indica* (L.) Kuntze, *Utricularia stellaris* L.f, *Ottelia alismoides* (L.) Pers, and *Hydrilla verticillata* (L.f.) Royle. The physico-chemical analysis values indicate the seasonal variations in each sampling points. Water quality values indicates slightly high BOD in S1 (10.43mg/l) compared to other sites, (0.42mg/l) in S9 respectively. Calcium values shows high (225.46 mg/l) in S1 compared to other stations. Among the study sites, Doddakere lake receives city runoff water and enriched with nutrients. Hence it is converted into eutrophic nature.

**Key words:** Water quality, aquatic plants, nutrient, physic-chemical parameters.

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**INTRODUCTION**

Wetlands are transition areas between land and water bodies, characterized by shallow water overlying waterlogged soil as well as interspersed submerged, emergent or floating vegetation. Water quality in wetlands is subjected to the natural degradation, processes of eutrophication and the impacts of human activities. These aquatic habitats exposed with multiple constraints due to their great abiotic variability, but this offers to species with particular adaptations many opportunities to succeed [1].

The larger aquatic plants growing in wetlands are usually called macrophytes. These include aquatic vascular plants, aquatic mosses and some larger algae. The presence or absence of aquatic macrophytes is one of the characteristics used to define wetlands [2]. Also macrophytes are common biological component of an aquatic ecosystem. The occurrence of aquatic plant species in lakes is closely related to water chemistry [3].

Accumulation of nutrients in an aquatic ecosystem leads to eutrophication resulting into massive growth of the macrophytes and weeds [4]. The quality of the water in wetlands is subjected to the natural degradation and also to the impact of manmade activities. Human disturbances cause a notable catastrophic change in structural and functional components of the water body. Point and non-point sources contribute variety of pollutants. Whichever be the pollutant sources, they will finally support macrophytes in the name of nutrients. Most of the macrophytes are naturally occurring and well adapted for their ecological surroundings. Apart from those naturally occurred macrophytes, some other exotic species may enter to that particular aquatic body whose nutrient load severely increased due manmade activities. Depending upon nutrient availability, newly entered species sustain, regenerate and can even distribute exponentially.

Aquatic macrophytes absorb nutrient mineral ions from water column and influence metal retention indirectly by acting as traps for particulate matter, by slowing the water current and favouring sedimentation of suspended particles [5].

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## MULBERRY CULTIVATION PRACTICES AND DISEASES: AN OVERVIEW

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### Abstract

Mulberry plant belonging to the family Moraceae and genus *Morus*. It is the main food for silkworm *Bombyx mori* L. Mulberry plant is perennial, various pathogens like fungi, bacteria, viruses and nematodes cause diseases in mulberry. To manage or control these diseases and pests a number of management strategies are followed which include physical, chemical and biological methods. So there is a need to think of ecofriendly safe methods for managing pests and diseases. In this review paper an attempt has been made to discuss in brief about cultivation practices, various disease and pests of mulberry and their management techniques and highlighting the importance of eco-friendly management strategies, their advantages and demerits. This review article will describes the research conducted on cultivation techniques, disease and pests and their management strategies in mulberry for better leaf quality production.

**Key words:** Mulberry, Cultivation, diseases, pests

### INTRODUCTION

Mulberry is derived from Latin word *Morus* and the cultivation of mulberry leaves of rearing of silk worms is called as *Moriculture*. Mulberry is grown as shrub in tropical countries and trees in temperate countries like Japan. It belongs to order *Urticales*, the family *Moraceae* and genus *Morus*. There is an estimated about 68 species of the genus *Morus* with the majority of them occurring in Asia and in China there are over 1000 varieties under cultivation. The most


common species are *M.alba*, the white mulberry, *M.nigra*, the black mulberry and *M.rubra*, the red mulberry.

Mulberry cultivation is the agriculture part of sericulture which constitutes not only the rearing of silk worms but also silk reeling. Cultivation of mulberry plays a significant role in determine the production cost of cocoons and silk as it is estimated that 60-70% of the cost of cocoons goes to mulberry. It is the chief food for *Bombyx mori*. Mulberry leaves protein is the source for silk worm to biosynthesize the silk, which is made up of two proteins i.e., fibroin and sericin and its leaf and cell wall together contains with structural carbohydrates and which is highly digestible. So mulberry is the main food source for silk worms.

One hectare of fertile land can produce about 15-40 tones of mulberry leaves over a 12 month period. This increase in the production of mulberry and reducing the cost of production. Attention has been paid to intensive cultural operations including application of economic dosage of fertilizer and adoption of suitable irrigation schedules furthermore, research conducted on breeding of mulberry as resulted in evolving over 200 varieties of mulberry. Distribution of mulberry cultivation on a global survey of sericulture industries reveals that there are at least 29 countries cultivation of mulberry plant is not only for silk rearing, but so many applications are used. Mulberry are widely distributed because of berries, some of the berries are very sweet tasting as honey, these syrupy sweet mulberries are used in ice cream, jams, jellies and beverages.

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# PHYSICO-CHEMICAL AND TRACE METAL PROFILE OF PURLE TANK, SHIVAMOGGA DISTRICT, KARNATAKA

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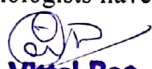
## ABSTRACT

The present investigation is aimed to know the concentration of trace metals (Iron, Zinc, Copper, Nickel, Chromium, Lead and Cadmium) in the sediment and water samples of Purle tank of Shivamogga district, Karnataka during the year 2017-18. The study revealed that the Purle tank is contaminated by few trace metals. The order of sequence of the levels of trace metals in the tank water for 5 sites was  $Pb > Zn > Cu > Cr > Cd > Fe$ , for sediment samples was  $Fe > Pb > Cr > Zn > Cd > Cu$ . The geoaccumulation index for trace metals show that the tank is extremely polluted. The present analysis reveals that sediment and water of the tank needs some degree of treatment in order to protect from future contamination.

Key words: Purle tank, trace metals, water quality, pollution, Shivamogga.

## INTRODUCTION

Tanks are the dynamic lentic aquatic system that supports a unique biological integrity. Tanks are degrading due to anthropogenic activities. Biodiversity of tanks are threatened due to over utilization of resources and undesirable activities. It is noted that species rich water bodies are capable of self maintaining (Abida Begum *et.al.*, 2008). Several limnologists have studied the limno-biotic factors of certain tanks and rivers showed

  
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ಆಲಕ್ಷಿತ ವಚನ ಕಾರ್ತಿಯರ ನಾಮಾಜಕ ಸಾಂಸ್ಕೃತಿಕ ಅನುಭವ

ಡಾ. ಜಿ.ಕೆ. ಪ್ರೇಮ

ಕನ್ನಡ ಅಧ್ಯಾಪಕಿ, ನಹ್ಯಾದ್ರಿ ವಿಜ್ಞಾನ ಕಾಲೇಜು (ಸ್ವಾಯತ್ತ), ಶಿವಮೊಗ್ಗ ಜಿಲ್ಲೆ, ಕರ್ನಾಟಕ.

೨೦ ನೇ ಶತಮಾನದ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಶೋಧ ಮರುಶೋಧಗಳೆಲ್ಲ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಂಪರೆಯ ಹಲವಾರು ಹೊಸ ಕೊಂಡಿಗಳು ಅನಾವರಣಗೊಂಡಿದೆ. ಪ್ರಭುತ್ವ ಕೇಂದ್ರಿತ ಪರಿಸರದಿಂದ ಹೊರ ಬಂದ ಕನ್ನಡ ಸಾಹಿತ್ಯವು ಜನನಾಮಾನ್ಯರ ಬದುಕು ಬವಣೆಗಳೊಂದಿಗೆ ಮೊದಲ ಬಾರಿಗೆ ಮುಖಾ ಮುಖವಾದುದು ಶರಣಯುಗದಲ್ಲ / ವಚನ ಚಳುವಳಿಯಲ್ಲ. ಶರಣರು ಸಕಲ ಜೀವಾತ್ಮರಿಗೆ ಲೇಸನೇ ಬಯಸುವ ಉದಾತ್ತ ಆಶಯವುಳ್ಳವರಾಗಿದ್ದರು. ಹಾಗಾಗಿ ಶಕ್ತ ರಾಜಕರಣ, ಅಂಗ ಅಸಮಾನತೆ ಪಕ್ಷಪಾತ ನೀತಿ ಜೀವವಿರೋಧಿ ನಿಲುವುಗಳಿಂದ ಕಲುಶಿತಗೊಂಡಿದ್ದ ಈ ಮನುಷ್ಯ ಸ್ವರಬಂಧಗಳನ್ನು ಬಂಧುತ್ವ ಸಮಾನತೆ ನೆಲೆಯಲ್ಲಿ ಮರುರೂಪಿಸಲ್ಪಟ್ಟದ್ದು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಮತ್ತು ಚರಿತ್ರೆ, ಸಂಸ್ಕೃತಿಯಲ್ಲಿ ಚಾರಿತ್ರಿಕ ಪಲ್ಲಡಿಗಳನ್ನು ಉಂಟುಮಾಡಿತು. ಭಾರತೀಯ ಸಂಸ್ಕೃತಿಯ ವೈದಿಕ ಪ್ರಣೀತವಾದ ಅಂಗ-ಜಾತಿ ಮರುಷ ಪ್ರಧಾನತೆಯನ್ನು ಜಡಗೊಂಡಿದ್ದನ್ನು ಶರಣರು ಬದಲಿಸಿದರು.

ಭಾರತೀಯ ಮಹಿಳೆಗೆ ಪರಮಾರ್ಥಿಕ ಮತ್ತು ಪ್ರಾಪಂಚಿಕ ನೆಲೆಗಳೆಲ್ಲ ತಿರಸ್ಕಾರ (ಮನುಶಾಸ್ತ್ರವೇ ಅಂತಿಮ), ಇತಿಹಾಸದುದ್ದಕ್ಕೂ ಸ್ತ್ರೀ-ವಿರೋಧಿ ನಂಬಿಕೆಗಳೇ ಕಠಿಣವಾಗಿ ಭಾರತೀಯ ಮಹಿಳೆ ಅವಹೇಳನಕ್ಕೆ ಗುರಿಯಾಗಿದ್ದಾಳೆ. (ಇಂದಿಗೂ ಇದರ ಸಿಲುಕುಗಳು ಹೋಗಿಲ್ಲ). ಬುದ್ಧನ ಕಾಲದಲ್ಲೇ ಸಮಾನತೆಯ ಆಶಯಗಳನ್ನು ಕಾಣಬಹುದು. ಈ ಸಮಯದಲ್ಲೇ ಬಂದ ಅಕ್ಕನನ್ನು ಮೊದಲುಗೊಂಡಂತೆ ಗಂಗೆಾಬಕೆ, ನೀಲಾಂಬಿಕೆ, ಬೊಂತಾವೇವಿ, ಅಮುಗೆ ರಾಯಮ್ಮ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ, ಗೊಗ್ಗವೆ, ಸೂಳೆ ಸಂಕವ್ವ, ಕದಿರೆ ರೆಮ್ಮವ್ವ, ದುಗ್ಗಲೆ, ವೇದ ಕಂಚುಕಿ, ಸೌಂದರಿದೇವಿ, ಕಾಳವ್ವ, ಕನ್ನಡಿ ಕಾಯಕದ ರೇಮಮ್ಮ, ಕಾಲಕಣ್ಣಿಯ ಕಾಮಮ್ಮ, ಕೊಟ್ಟಣದ ಸೋಮವ್ವ, ಕೋಲದೇವಿ, ಮನಣಮ್ಮ ಇಂಥ ಅನೇಕ ಜನ ವಚನಕಾರ್ತಿಯರೇ ನಿದರ್ಶನ.

ಶೋಷಿತರ ಉದ್ಧಾರ ಮತ್ತು ಸಮಾನ ಸಂಸ್ಕೃತಿಯ ನಿರ್ಮಾಣಕ್ಕಾಗಿ ನಡೆದ ಶರಣರ ಆಂದೋಲನದಲ್ಲೇ ಸಹಜವಾಗಿಯೇ ಮಹಿಳೆಯರ ಪಾಲುಗಾರಿಕೆಗೆ ಪ್ರಾಶಸ್ತ್ಯ ದೊರೆಯಿತು. ಬ್ರಾಹ್ಮಣಿಕವಾಗಿರುವ ಸ್ತ್ರೀ ಮರುಷರ ಜೈವಿಕ ಭಿನ್ನತೆಗಳನ್ನು ತರತಮವನ್ನಾಗಿಸಿ ಸ್ತ್ರೀತ್ವವನ್ನು ಗೌಣವಾಗಿಸಿದ ವೈದಿಕ ಚಿಂತನಾಕ್ರಮವನ್ನು ನಿರಾಕರಿಸಿದರು. 'ಆತ್ಮ' ತತ್ವದ ಮೂಲಕ ಸ್ತ್ರೀ- ಮರುಷರ ಸಮಾನತೆಯನ್ನು ಮರಸ್ಥರಿಸಿದ ಬೇಡರದಾಸಿಯನ್ನು ಹೇಗೇಳುತ್ತಾರೆ

ಮಲೆ ಮೂಡಿ ಬಂದಡೆ ಹೆಣ್ಣಂಬರು  
ಮೀಸೆಕಾಸೆ ಬಂದಡೆ ಗಂಧೆಂಬರು  
ನಡುವೆ ಸುಖವ ಆತ್ಮನು

ಹೆಣ್ಣು ಅಲ್ಲ ಗಂಡೂ ಅಲ್ಲ ಕಾಣಾ ರಾಮನಾಥ  
ಇಲ್ಲಿ ಆತ್ಮತತ್ವದ ಅನನ್ಯತೆ ಇದೆ. ಭೋಗದ ಸಾಧನವಾಗಿದ್ದ ಸ್ತ್ರೀ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಚೈತನ್ಯ ರೂಪಿಯಾದ ಆತ್ಮದ ನೆಲೆಯಲ್ಲಿ ವ್ಯಾಖ್ಯಾನಿಸಿ ಮಹಿಳೆಯ ಪಾಲಿಗೆ ನಿಜವೆನಿಸಿದ್ದ ಧಾರ್ಮಿಕ ಕ್ಷೇತ್ರದಲ್ಲೇ ಮರುಷ ಸಮಾನ ಸ್ಥಾನಮಾನಗಳನ್ನು ನೀಡಿ ಮಹಿಳೆಯ ಸತ್ಯ ಸಾಮರ್ಥ್ಯ, ಆಧ್ಯಾತ್ಮಿಕ ಉನ್ನತಿಯನ್ನು ಒಪ್ಪಿದುದು ವಚನ ಚಳುವಳಿಯ ಚಾರಿತ್ರಿಕ ಸಾಧನೆ.

ಸ್ತ್ರೀಯನ್ನು ಮಾಯೆ ಎಂದರು 'ಮಿಥ್ಯ' ಎಂಬುದು ಮನಸ್ಸಿನ ವಿಕೃತ ಸ್ಥಿತಿಯನ್ನು ಶರಣರು ಅಲ್ಲಗೆಳೆದರು. ಮಾಯೆ ಅಲೌಕಿಕ ನೆಲೆಯದ್ದೆ ವಿನಹ ಲೌಕಿಕ ನೆಲೆ ಅಲ್ಲ.

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ಸ. ಉಷಾ ಅವರ ಕಾವ್ಯ ಚಿಂತನೆ

ಡಾ. ಜಿ.ಕೆ. ಪ್ರೇಮ

ಕನ್ನಡ ಅಧ್ಯಾಪಕಿ, ಸಹ್ಯಾದ್ರಿ ವಿಜ್ಞಾನ ಕಾಲೇಜು (ಸ್ವಾಯತ್ತ), ಶಿವಮೊಗ್ಗ ಜಿಲ್ಲೆ, ಕರ್ನಾಟಕ.

ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯಲ್ಲಿ ಮಹಿಳಾ ಬರಹಗಾರರ ಪ್ರಾತಿನಿಧ್ಯವನ್ನು ೧೨ನೇ ಶತಮಾನದ ವಚನ ಚಳವಳಿಯ ಕಾಲಕ್ಕೇನ ಗುರುತಿಸಬಹುದು. ಅಕ್ಕಮಹಾದೇವಿ ಮತ್ತು ನಂತ್ರೇಬಂದ ಸಂಚೋದನೆಯು ಇಬ್ಬರೂ ಹೊಸಗನ್ನಡದ ಕವಿಯತ್ರಿಯರಿಗೆ ಎರಡು ಭಿನ್ನ ಮಾದರಿಗಳು ಭಾರತೀಯ ಸಾಂಪ್ರದಾಯಿಕ ಸ್ವರಿಸಾರಿಕ ಚೌಕಟ್ಟಿನಲ್ಲಿ ಯಾವುದೇ ಬದಲಾವಣೆಯನ್ನು ಆತಿಸದೇ ಗೃಹಸ್ಥಧರ್ಮವನ್ನು ಪ್ರತಿಪಾದಿಸಿದ ಸಂಚೋದನೆಯು ನಿಗಿಂತ ಭಿನ್ನವಾದ ಆಲೋಚನಾಕ್ರಮ ಮತ್ತು ಸತ್ಯಪ್ರಧಾನ ಸಂಸ್ಕೃತಿಯ ವಿರುದ್ಧ ಸಿದ್ಧವಿದ್ದ ದಿಟ್ಟತನವನ್ನು ಪ್ರದರ್ಶಿಸಿದ ಮಾದರಿ ಪ್ರಕೃತಿಪ್ರವೇಶವಾದ ನವೋದಯ ಸಂದರ್ಭದಲ್ಲಿ ಬರೆದ ಅನೇಕ ಲೇಖಕಿಯರು ಸಂಚೋದನೆಯನ್ನೇ ಅನುಸರಿಸಿದ್ದಾರೆ. ಆದರೆ ೧೯೭೦ ರ ದಶಕದಲ್ಲಿ ಬಂದ ಬಹುತೇಕ ಬರಹಗಾರರು ನವ್ಯ ಸಾಹಿತ್ಯದ ಪ್ರಭಾವಕ್ಕೆ ಸಿಕ್ಕಿದವರು ಆದರೂ ನವ್ಯದ ಪುರುಷ ಲೇಖಕರಿಗಿಂತ ಭಿನ್ನವಾಗಿ ಮಹಿಳಾ ಮಾದರಿಗಳನ್ನು ನಿಲುವುಗಳನ್ನು ಕಟ್ಟಿಕೊಡುವಾಗ ಆಕೃತನ ಮಾದರಿಯನ್ನು ಅನುಸರಿಸಿರುವುದು ಗಮನಾರ್ಹ.

ಈ ಹನ್ನೆಲೆಯಲ್ಲಿ ಸ. ಉಷಾ ಅವರು ೨೦ ರ ದಶಕದಲ್ಲಿ ಗಂಭೀರವಾಗಿ ಕಾವ್ಯ ಪ್ರಕಾರದಲ್ಲಿ ತೊಡಗಿಸಿಕೊಂಡ ಕವಿಯತ್ರಿಯರಲ್ಲಿ ಪ್ರಮುಖರು ಕಾವ್ಯ ಸಂಕಲನ ಮತ್ತು ಸುಲಭದಲ್ಲಿ ಲಂಕೇಶ್ ಅವರು ಹೇಳುವ ಹಾಗೇ ಕಾವ್ಯ ಎಂದರೆ ಅದು "ಗುಬ್ಬಿಟ್ಟು ಗೂಡು" ವಿನಂತದ್ದು ಅದು ಏಕಾಂತಿಕ ಸೃಷ್ಟಿ ವಿಪತ್ತರ ದಶಕದ ಆರಂಭದಲ್ಲಿ ಬಂದ ತ್ರಿವೇಣಿ ಅನೂಪಮಾ ಆರ್ಯಾಂಬ ಪಟ್ಟಾಭಿ ಮುಂತಾದವರು ಮೌಲಿಕವಾದ ಕಥೆ ಕಾದಂಬರಿಗಳನ್ನು ಬರೆಯುತ್ತಿದ್ದರು. ಕವಿತೆ ಆಯ್ದುಕೊಂಡವರು ಕಡಿಮೆ ಬರೆದರೆ ಅಂದಿನ ಸನ್ನಿವೇಶದಲ್ಲಿ ಕವಿತೆ ಬರೆಯ ಹೊರಟ ಸಂವೇದನಾಶೀಲ ಯುವತಿಯರಿಗೆ ಸವೋದಯ ನವ್ಯಗಳ ನಡುವಿನ ಸಮತೂಕದ ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳುವ ಸವಾಲು ಇತ್ತು. ಅಲ್ಲದೆ ಕುಟುಂಬದ ಹಿರಿಯರೂ ಮುಳ್ಳು ಬೇಲಗಳಾಗಿ ಕಾಣಿಸಿದ ಕಾಲ ಆಗ ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯದಲ್ಲಿ ಕನ್ನಡ ಮತ್ತು ಇಂಗ್ಲೀಷ್ ಪ್ರಾಧ್ಯಾಪಕರು ಅನೇಕರು ನವ್ಯದ ಬರಹಗಾರರಾಗಿದ್ದರು ಇಂತಹ ಸಂಕೀರ್ಣ ಸಂದರ್ಭದಲ್ಲಿ ಅಲ್ಲೆಯೇ ಎಂ. ಎ ಪದವಿ ಪಡೆದಿದ್ದ ಸ. ಉಷಾ ಅವರಿಗೆ ಗುರುಗಳಾದ ಎಚ್. ಎಂ ಚನ್ನಯ್ಯ ಮತ್ತು ಗೋಪಾಲ ಕೃಷ್ಣ ಅಡಿಗರಂತ ನವ್ಯದ ಮುಖ್ಯ ಲೇಖಕರು ಅವರಿಗೆ ಸವಾಲಾಗಿ ಕಂಡಿದ್ದರು. ಈ ಸವಾಲನ್ನು ಸಮರ್ಥವಾಗಿ ನಿಭಾಯಿಸಿದ್ದು ನವ್ಯದ ಪ್ರಮುಖ ಆಶಯಗಳ ವಿರುದ್ಧವೇ ದಂಗೆಯೇಳುವ ಮೂಲಕ ನವ್ಯ ಸಾಹಿತ್ಯದಿಂದಲೇ ಪ್ರಭಾವಿತರಾಗಿದ್ದ ಸ. ಉಷಾ ಮತ್ತು ಸಮಕಾಲೀನರಾದ ಪ್ರತಿಭಾ ನಾಗಭೂಷಣ್, ಸವಿತ ನಾಗಭೂಷಣ್, ವೀಣಾ ಶಾಂ, ಚ. ಸರ್ವಮಂಗಳ ಇವರಿಗೆ ಕೊನೆಗೆ ಅವರನ್ನೇ ನಿರಾಕರಿಸಬೇಕಾಗಿ ಒಳ ಬಂಡಾಯ ಮಾಡಿದವರು ಬಹು ಮುಖ್ಯವಾಗಿ ಅಡಿಗರಂತೂ ತಾವೂ ಎದುರಿಸಲೇ ಬೇಕಾದ ಪಿತೃಪ್ರಧಾನ ಸಂಸ್ಕೃತಿಯ ಶಸ್ತ್ರಯುತವಾದ ಪ್ರತಿನಿಧಿಯಾಗಿ ಇವರಿಗೆ ಕಾಣಿಸಿದ್ದಾರೆ ಅದರ ಇವರು ತಮ್ಮ ಬರವಣಿಗೆಯ ಮೂಲಕ ಅಧಿಕೃತವಾದ ಮಹಿಳಾ ಸಾಹಿತ್ಯವನ್ನು ಸೃಷ್ಟಿಸಿದರೆಂಬುದು ಬಹುಮುಖ್ಯ ಸಂಗತಿಯಾಗಿದೆ. ಸ. ಉಷಾ ಅವರು ಈ ವರೆಗೆ ಬರೆದಿರುವ ೨೨ ಕವಿತೆಗಳು ಕವಿತೆಗಳು ಮೂರು ಸಂಕಲನಗಳಲ್ಲಿ ಪ್ರಕಟವಾಗಿವೆ ಎರಡು ಅಪ್ರಕಟಿತ ಕವನಗಳು, ಆರು ಅನುವಾದಿತ ಕವಿತೆಗಳು ಇವೆ.

- ೧) ತೋಗಲು ಗೊಂಬೆಯ ಆತ್ಮಕತೆ
- ೨) ಈ ನೆಲದ ಹಾದು
- ೩) ಹವಳ ಹಾರಿದ ಹೊತ್ತು

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# Influence of Nonlinear Thermal Radiation and Magnetic Field on Three-Dimensional Flow of a Maxwell Nanofluid

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A steady three-dimensional flow and heat transfer characteristics of Maxwell fluid with suspended nano particles over a bidirectional stretching surface under the influence of non-linear radiation and magnetic field is investigated. Suitable similarity transformations are applied to the governing partial differential equations to obtain a set of nonlinear ordinary differential equations. The reduced equations are then solved numerically using Runge-Kutta-Fehlberg fourth-fifth order method with shooting technique. The influence of several emerging physical parameters are studied and analyzed through graphs and tables. Based on these, a detailed discussion regarding the effect of flow parameters on velocity and temperature profiles are provided. It was found that, influence of nonlinear thermal radiation, nanoparticle suspension and uniform heat source/sink enhances the rate of heat transfer while, presence of magnetic field decreases the velocity of the fluid.

**KEYWORDS:** Maxwell Nanofluid, Nonlinear Thermal Radiation, Magnetic Field, Numerical Solution.

ARTICLE

## 1. INTRODUCTION

Boundary layer flow of nanofluid over a stretching sheet is an important type of flow due to its wide range of applications such as polymer engineering, melt spinning processes, aerodynamic extrusion of plastic sheets, applied thermal engineering, structure and characterization of polymers, processing of polymers and description of major polymers, petrochemical industry etc. The use of solid particles as an additive, suspended into the base fluid is a technique for the heat transfer enhancement. The properties and behavior of nanofluid much depend on the properties of the base liquid and particle concentration. Conventional fluids, such as water, engine oil and ethylene glycol are commonly used as heat transfer fluids. The model used for the nanofluid incorporates the cause of Brownian motion and thermophoresis. Also, it is interesting to note that the Brownian motion of nanoparticles at molecular and nanoscale levels is a key nanoscale process governing their thermal behaviors. Choi<sup>1</sup> was the first who introduced the term nanofluid indicating engineered

colloids constituting of nanoparticles which are dispersed in a base fluid. Buongiorno<sup>2</sup> has made a comprehensive survey of transmission of convection in nanofluids and proposed an alternative description for the increase of abnormal heat transfer coefficient. Rashidi et al.<sup>3</sup> have applied second law of thermodynamics to the nanofluid flow over a porous rotating disk and derived the equation of entropy generation as a function of velocity and temperature gradient. Tongkratoke et al.<sup>4</sup> have used different theoretical models to study the enhancement of heat transfer in nanofluids. Oblique MHD flow of Walter-B type nanofluid has been examined by Nadeem et al.<sup>5</sup> using numerical method and they have demonstrated thermophoresis and Brownian diffusion effects on the local heat and mass flux rate. Sheikholeslami et al.<sup>6</sup> utilized the control volume based finite element method to inspect the effects of magnetic field dependent viscosity on nanofluid.

The flow of an electrically conducting fluid in the existence of a magnetic field is of importance in different areas of engineering and technology such as MHD power generation, MHD pumps, MHD flow meters, etc. The study of MHD boundary layer flow on a continuous stretching sheet has pulled attention during the last few decades because of its various appliances in industrial manufacturing techniques. In particular, the metallurgical processes such as

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## CHLORPYRIFOS DEGRADATION BY ACTINOMYCETES ISOLATED FROM COFFEE PLANTATION SOIL AND RESIDUAL ANALYSIS BY GC-MS

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### ABSTRACT

Microorganisms are an important biological component of the soil ecosystem and play an vital roles in soil fertility through their roles in nutrient cycling and organic matter decomposition. Soil borne bacteria and fungi by their degradative capacity play an important role in the formation and enrichment of humus. Soil actinomycetes are prokaryotes with extremely various metabolic possibilities. Actinomycetes are gram positive filamentous bacteria, characterized by the formation of aerial mycelium and spores on solid media with DNA high in G+C content of 60-70%. Actinomycetes have considerable potential for the biotransformation and biodegradation of pesticides. Hundreds of pesticides in different chemical moieties are widely used for agricultural purpose. Chlorpyrifos is a broad spectrum organophosphate pesticide widely used to control pest. Exposure to this moderately hazardous pesticide creates health problems due to choline esterase inhibition, immunological effects, psychological and neurotoxicity. Intensive use of chlorpyrifos has resulted in its ubiquitous presence as a contaminant in soil and surface water streams. Thus, it is critically important to develop bioremediation methods to degrade and break down the pollutant from environment. The present investigation focused on isolation of actinomycetes from coffee plantation soil, degradation of chlorpyrifos and their residual analysis by GC-MS. Total 29 isolates were recovered and subjected for morphological and biochemical characterization studies, isolates are belonging to Streptomyces species. Biodegradation of pesticides were detected by using chlorpyrifos as sole source of carbon in different concentrations and further bulk cultured with potent isolates to detect residues by GC-MS.

### KEY WORDS

Biodegradation, Soil microorganisms, Streptomyces, pesticide, Chlorpyrifos, GC-MS.

### I. INTRODUCTION

Hundreds of pesticides in different chemical moieties are widely used for agricultural purpose, terrestrial ecosystem, water and soil receive large amount of it even from handling, direct application or else which lead to occasional contamination besides accumulation lead to many health hazards associated with it [1]. Environmental pollution caused by pesticides and their degradation products is a major ecological problem. It has been documented that organophosphorus pesticides (OP) constitute the largest group of highly

toxic agricultural chemicals widely used for plant protection [2, 3]. Chlorpyrifos [O, O diethyl-O-(3,5,6-trichloro-2-pyridyl) phosphorothioate], a phosphorothioate insecticide, has been commercially used since the 1960s. Globally, chlorpyrifos ranks first among the conventional pesticide active ingredients in the agricultural sector with the production of 3.64-4.99 million kg during 2007. In India, chlorpyrifos was the second most used agricultural insecticide in 2013 to 2014 with the production of 9540 tons. Used particularly for the control of broad-spectrum insect

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**RESEARCH ARTICLE**

**Phosphate solubilizing endophytic actinomycetes from mangrove plants *Rhizophora mucronata* and *Sonneratia caseolaris* and its effect on Seedling vigour**

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**ABSTRACT:**

The aim of the present study was to isolate phosphate solubilizing endophytic actinomycetes from two mangrove plants *Rhizophora mucronata* and *Sonneratia caseolaris*, to estimate phosphate solubilization quantitatively and to check its efficiency on Seedling vigour. The plant parts were surface sterilized and were plated on Oat meal agar supplemented with 10% sea water and a total of 11 endophytic actinomycetes were isolated. The isolates were screened for Phosphate solubilization using Pikovskaya's agar medium. The potent isolates were subjected for fermentation and the broth culture was subjected for quantitative estimation of phosphate solubilization by Johnson and Koenig method. The effect of extracts of endophytic actinomycetes was also evaluated by seed germination and seedling vigour test. Of the total 11 isolates, Isolate RO 4, RO 7, RO 9, RO 10 and RO 11 demonstrated Phosphate solubilizing activity in the form of halo zone around the colonies and were selected for further studies. The broth cultures showed high amount of phosphate release compared to the standard. Highest amount of phosphate was recorded for Isolate RO 11 about 1410µg/ml. Isolate RO 7 and RO 11 showed the highest effect on Seedling vigour index. The results of the present study reveal that phosphate solubilizing endophytic actinomycetes can be used as a source of biofertilizer.

**KEYWORDS:** Phosphate, endophytic actinomycetes, Pikovskayas media, Johnson and Koenig, Seedling vigour test.

**INTRODUCTION:**

Endophytic actinomycetes are the microbes that reside in healthy tissues of living plants, without causing clinically detectable symptoms of disease, without having any negative impact on host plant [1,2,3]. Actinomycetes are the filamentous gram positive microbes with high G+C content primarily saprophytic and contribute in breakdown of complex biopolymers such as hemicelluloses, pectin, lignocelluloses, keratin and chitin [4].

The association of actinomycetes with plants is found to confer many advantages such as the production of growth promoting metabolites, insect and pest repellents, anti-microbials, extracellular enzymes, phytohormones and siderophores protectors in stress conditions and many more. They also help in phosphate solubilization and plant protection against abiotic and biotic stresses [5,6]. Endophytic actinomycetes are considered to be potential biocontrol agents as they can colonize the interior of the host plant avoiding competition by other microbes in the soil [7, 8].

Phosphorus is the second important key element after nitrogen as a mineral nutrient in terms of quantitative plant requirements [9,10]. Although abundant in soils, in both organic and inorganic forms, it's availability is restricted as it occurs mostly in insoluble forms. It plays significant role in increasing root ramification and strength thereby imparting vitality and disease resistance

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## ANTIBACTERIAL POTENTIAL OF BIOLOGICALLY REDUCED SILVER NANOPARTICLES FROM *STREPTOMYCES* sp. SO-01

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### ABSTRACT

The syntheses of metallic nanoparticles were gaining importance because of their budding applications in the field of nanotechnology, microbial biotechnology, delivery of drug etc. To procure this, use of natural sources like biological systems becomes cost-effective, reliable and eco-friendly. In the current investigated, we have reported extracellular biological reduction of silver nanoparticles from  $10^{-3}$  M silver nitrate using *Streptomyces* sp SO-01 isolated from Western Ghats. Biosynthesized silver nanoparticles were confirmed by UV-Visible spectroscopy and the spectra showed a maximum absorption at 430 to 440 nm corresponding to the Surface Plasmon Resonance. The silver nanoparticles were analyzed for their antibacterial potential on human pathogens Gram positive bacteria (*Bacillus subtilis*, *Bacillus cereus*, *Streptococcus pyogenes*, *Staphylococcus epidermidis*, *Staphylococcus aureus*) and gram-negative bacteria (*Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Vibrio cholerae*). The maximum zones of inhibition of 15mm were observed against gram positive bacteria (*Bacillus subtilis* and *Streptococcus pyogenes*) and 18mm in gram negative (*Vibrio cholerae* and *Salmonella typhi*). This research gives a novel approach to developing new formulation based on metallic nanoparticles with antibacterial properties to reach the pharmaceutical companies searching for current uncustomary antibacterial agents.

### KEY WORDS

Silver Nanoparticles, *Streptomyces* sp., UV-visible spectroscopy, Antibacterial potential.

### INTRODUCTION

Nanoparticles serve as the radical building blocks for diverse nanotechnology applications [1]. Nanotechnology and alongside nanostructured materials play an increasing role in science, research and development, as well as also in day today's life, as more products based on nanostructure materials are introduced to the global market [2]. Nanotechnology assign with materials with dimensions of nanometres. Nanoparticles fall into two categories: organic and inorganic nanoparticles (like gold and silver) [3]. Silver nanoparticles reveal a rare combination of valuable properties including, unique optical properties

associated with the surface Plasmon resonance (SPR), well-developed surfaces, catalytic activity, high electrical double layer capacitance etc. Since use glass windows with tiny colour metal particles of silver which furnish glassy yellow colours [4].

Silver is worn as a catalyst for the oxidation of methanol to formaldehyde and ethylene to ethylene oxide. Biologically reduction methods have been enhancing the performance of nanoparticles, properties with the aim to have a better control over particles size, distribution, morphology, purity, quantity and quality, by employing as environment friendly economical

Subbaraju. A and R. Onkarappa\*

# Comparative evaluation of anticariogenic activity of commercially available herbal dentifrices

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## ABSTRACT

**Background and Aim:** Regular use of a potent antiplaque compound, especially formulated in toothpaste, can be beneficial in dental plaque control. Many herbal toothpastes are claiming to have anticariogenic property but they are not evident and not substantiated by the dental professionals. It is important that clinical trials should verify the efficacy of any new product, instead of simply accepting them. Hence, the present work was designed to evaluate and compare the antibacterial activity of commercially available herbal toothpastes against the clinically isolated human *Streptococcus mutans*. **Materials and Methods:** The known clinical samples from caries-positive patients were collected, and *S. mutans* bacteria was isolated and identified by morphology, biochemical profiling, and 16s rDNA sequencing method. The antibacterial efficacy of six herbal toothpastes against *S. mutans* clinical isolate was evaluated by standard agar well diffusion method. **Results:** Danthakanthi, among all the tested toothpastes, was found to be more effective with zone of inhibition  $27.50 \pm 0.51$  mm, compared to standard and other tested pastes followed by Miswak and Colgate herbal. Vicco was found to be least effective with zone of inhibition  $18.90 \pm 0.18$  mm against the tested bacteria. **Conclusion:** Herbal toothpastes have the prospect of becoming safer and effective alternative and provide an ideal home care anticariogenic regime. Toothpaste with multiple herbal ingredients is more efficient than the toothpastes with fewer herbal ingredients in an anticariogenic property.

**Key words:** Dental plaque, dentifrices, *Streptococcus mutans*

## INTRODUCTION

Dental caries is the most common form of a multifactorial oral disease known to man, characterized by demineralization of the inorganic portion and destruction of organic substance of the tooth which often leads to cavitations. The Latin

meaning of caries is rot or decay. The burden of dental caries is still a major health problem in most industrialized countries as it affects 60%–90% of school aged children and the vast majority of adult. This is largely due to the increasing consumption of sugar and inadequate exposure to fluorides.<sup>[1]</sup> Many of the factors such as socioeconomic, sociobehavioral, environmental, poor education, unemployment, and low social classes have greater impact on dental caries prevalence.<sup>[2]</sup>

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# DOCUMENTATION OF FOLK REMEDIES TO TREAT SKIN DISEASES AND WOUNDS IN NR PURA TALUK OF CHIKKAMAGALURU DISTRICT, KARNATAKA

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## Abstract

The objective of present study was to document the folk remedies of NR Pura taluk for skin diseases such as scabies, eczema, boils, leprosy, herpes, ringworm, dandruff, pimple/acne, alopecia, carbuncle, cellulitis and wounds. Data accumulated through formal discussions with traditional healers and interviews were conducted through a semi-structured questionnaire. 40 plant species belonging to 28 families were documented and tabulated with parts used, type of formulation used, mode of administration and time length of treatment against skin diseases and wound. The present study also emphasized on the trade potentiality and mode of propagation of the ethnobotanicals for their sustained use to treat skin diseases and wounds.

## Introduction

Ethnobotanical practices to cure clinical symptoms and conditions was documented since time immemorial, it is very familiar and still in practice in the Indian subcontinent (Gopakumar *et al.*, 1991). This is due to the contributions from the Saints and Sages like Charaka, Susruta and Vaghbata. They have put the strong pavement in terms of a knowledge base to the field of the indigenous traditional system of medicine called Ayurveda (Sreena *et*

*al.*, 2011). India is well known for its rich floristic wealth. Ethnomedicines have gained a lot of scope and attention of researchers all across the world. Traditional medicine system makes use of its knowledge base, skills, and practices based on the theories, experience and beliefs of indigenous culture for the betterment of health (Yoganarasimha, 1996). Most of the modern medicines chemical as well as functional backbones were derived from the medicinal plants (Siddamallayya *et al.*, 2010).

As the time passes on, the system starts to lose its charm and acceptability because of the invasion of modernized therapeutics in the Indian drug market, this modernized medicines were found to be very effective at the earlier stages but it has its own lacunae by means of profound side effects in the subjects who used (Novotyn *et al.*, 1999). For example, antibiotics are found to be very efficient in earlier days but now the pathogenic microbes have developed tremendous antibiotic drug resistance against most of the antibiotics and being regarded as "Multi-Drug Resistance"(MDR) pathogens, capable enough to cause dreadful nosocomial infections (Novotyn *et al.*, 1999). If, we looked at this point: a first thing which strikes us "Why is it so?" In short, this is due to the indiscriminate and over the use of antibiotics. Meanwhile,

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# COPULATORY ACTIVITY OF THE INDIAN FLYING FOX PTEROPUS GIGANTEUS IN THIRTHAHALLI REGION OF KARNATAKA

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### Abstract

This paper deals with study of copulatory behaviour of fruit eating bat *Pteropus giganteus* in Thirthahalli area of Karnataka. A total of 76 copulations were observed during July to November 2014 in Thirthahalli roosting area. This colony consists of more than 2500 individuals of both the sexes of *P. giganteus*. During day they take rest in roosting trees. Roosts provide sites for mating, hibernation and rearing young ones. Individuals of *P.giganteus* were actively involved in courtship display and copulation throughout the day, However, peak copulation was observed at 11.00 hrs. The male *P. giganteus* was very aggressive during copulation and produced long cry while the female tried to relay herself from the male using force and screams. After successful copulation they can produce single young one by the long period of gestation. The babies stay with their mother and after two months they can fly their own.

**Keyword:** Copulation, Thirthahalli, Humcha, *Pteropus giganteus*, Indian flying fox.

### INTRODUCTION

Bats live longer than other placental mammal, with respect to their body mass (Boutliere 1958, Austad and Fircher 1991; Wilkinson and South 2002). The longevity of bats is influenced by reproductive rate (Wilkinson and South 2002). Thus bat that either produce multiple pups per

year have shorter longevity, while those that produce a single pup per year live longest.

*Pteropus giganteus* belongs to family pteropodidae of order megachiroptera. Family pteropodidae consists of 43 genera and about 165 species which are distributed throughout the world. India has a rich diversity of bat fauna comprising approximately 119 species of bats, out of which 14 species are fruit-eating or megachiropteran (Pteropodidae) belongs to 8 genus and the remaining are insect-eating or microchiropteran bats (Bates and Harrison, 1997). *P. giganteus* is the largest fruit bat and the largest flying mammal in India. In general, *P. giganteus* is widely distributed and commonly seen bat species throughout the entire country (Srinivasulu and Srinivasulu, 2001; Kumar and Kanaujia, 2017).

They are highly susceptible to environmental disruption and they have declined drastically in response to human activity. Bats generally prefer to roost during daytime in diversified roosting habitats. Roosting site selection depends on their abundance, risk of predation, availability and distribution of food resources, body size and physical environment (Kunz, 1982; Jayaprabha, 2016).

Bats play a crucial role in pollination, seed dispersal and pest control, although fruit bats damage a small percentage of agricultural and horticultural crops. The giant fruit eating bat, *Pteropus giganteus* is a native of the tropics

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## ROOSTING TREES AND FOOD PLANTS OF PTEROPUS GIGANTEUS (INDIAN FLYING FOX) IN THIRTHAHALLI REGION OF SHIVAMOGGA DISTRICT, KARNATAKA

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### ABSTRACT

The present study deals with the various roosting trees and food plant species used by the Indian flying foxes *Pteropus giganteus* in Thirthahalli region of Shivamogga district. A total of 14 different roosting tree species and 26 types of food plants were found associated with the Indian flying foxes (*P. giganteus*) in the study area. They play an important role in the seed dispersal and pollination of plants. They chew the fruit to obtain the juice. Very soft fruits such as bananas are swallowed, but usually the bat spit out the fruit pulp and seeds once it has extracted all the juice. Bats travel 40-50 Km per day around the nesting area. During day time they were roost in various host plants such as *Bamboo vulgaris*, *Albizia saman*, *Ficus bengalensis*, *Ficus religiosa*, *Tectona grandis*, *Pongamia pinnata* etc. There is an urgent need to create awareness among common peoples to protect these useful animals to maintain ecological balance.

### KEYWORDS:

Roost trees, Food plants, *Pteropus giganteus*, Thirthahalli region.

### INTRODUCTION

The fruit eating bat *Pteropus giganteus* is a flying nocturnal mammal; primarily consume

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