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### **CRITERION-III**

**EVIDENCE(S), AS PER SOP**

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## Variation in Aeromycoflora of Raipur city with special reference to allergic diseases

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### Abstract

Raipur is a capital of Chhattisgarh and also an industrial and commercial hub of the state. Air pollution poses serious problems to human health in the city. More than 20- 30% of the world population is known to suffer from one or other allergic ailments such as allergic fungal sinusitis, allergic rhinitis, allergic asthma, eczema, atopic dermatitis, aspergillosis, mycosis etc. The main objective of the present study was to survey the diversity of aeromycoflora of Raipur city and to identify the important fungal spores or allergens responsible for various allergic diseases prevalent in Raipur city. In light of above facts aeromycological survey of some indoor sites and outdoor sites of Raipur city was conducted in monthly interval during the year 2013-2014. The fungal spores was studied by using Petri plate method. The results of the study indicated 67 fungal species in indoor sites while, a total of 82 fungal species in outdoor sites of Raipur city. The class wise respective number of fungal species in indoor sites was Zygomycotina 9, Ascomycotina 3, Anamorphic Fungi 54 and Mycellia sterillia type 1 while, in outdoor site number recorded was Zygomycotina 8, Ascomycotina 5, Anamorphic Fungi 67 and Mycellia sterillia 2. Survey on allergic diseases in Raipur city revealed that the allergic rhinitis and allergic asthma were dominant allergic diseases in Raipur city. Fungal spores of 11 species viz. *Cladosporium cladosporides*, *Aspergillus niger*, *Cladosporium oxysporium*, *Aspergillus versicolor*, *Penicillium chrysogenum*, *Curvularia tinata*, *Alternaria alternata*, *Aspergillus flavus*, *Fusarium monaliformis*, *Phoma exigua*, and *Rhizopus nigricans* were found to be the main cause of allergic diseases in Raipur city.

## Arsenic-induced metabolic disturbances and their mitigation mechanisms in crop plants: A review

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**Abstract:** Arsenic (As) is one of the highly toxic metalloids distributed ubiquitously in nature. Two inorganic forms of As are present abundantly: arsenite (As<sup>III</sup>) and arsenate (As<sup>V</sup>), former being 100 times more toxic than latter. Arsenic is a well known inducer of reactive oxygen species (ROS) in crop plants either directly during conversion of As<sup>V</sup> to As<sup>III</sup> or indirectly *via* inactivation of the antioxidants by binding to their thiol groups. Arsenic-mediated oxidative stress causes an array of metabolic dysfunctions in plants. Therefore, in recent years, demonstration of various mechanisms to improve crop productivity and/or alleviation of As toxicity has become a prime concern. Modulation of cellular thiol molecules for protection against ROS-induced damage has been used as a strategy against As. Accrual of proline, polyphenols and exogenous application of salicylic acid, nitric oxide, phosphate and potassium show protection against As-mediated injuries in crop plants. Proline, nitric oxide and salicylic acid display defensive functions by activating antioxidant machinery of crop plants whereas phosphate and potassium reduce As toxicity by controlling As-uptake or maintaining cellular protein and antioxidant enzymes in plants. Likewise, polyphenols serve as antioxidants and reduce activities of ROS synthesizing enzymes, thereby conferring As-stress tolerance. In this review we have attempted to collate recent advances on 1) mechanism(s) of As uptake by plants, 2) toxicity responses [physiological, biochemical and molecular] exerted by As, and 3) roles of varied molecules in amelioration of As effects in crop plants. Gaps in the existing knowledge and future research prospects have also been highlighted in this review.

**Key words:** arsenic toxicity; nitric oxide; oxidative stress; proline; reactive oxygen species; salicylic acid.

### Introduction

Arsenic (As), one of the non-essential metalloids, is extremely hazardous to all living beings including crop plants and animals (Zhao et al. 2009; Mirza et al. 2014) (Fig. 1). Earth's crust is the principal natural source of As. It is the 20<sup>th</sup> most abundant element on the Earth's crust with an average availability of 1 mg to 100 g kg<sup>-1</sup> (Mirza et al. 2014). By and large, the permissible limit of As is 20 mg kg<sup>-1</sup> soil in agricultural fields but for sensitive plants even 5 mg kg<sup>-1</sup> soil is injurious (Panda et al. 2010). High amounts of As in groundwater have been reported in Chile, China, Argentina, Hungary, Mexico, United States, Bangladesh, Italy and India (Pigna et al. 2009). Arsenic levels, almost 3 fold higher than the permissible concentration, have been estimated in the paddy growing soils of United States and Bangladesh (Panda et al. 2010). Arsenic is introduced into the nature through weathering and mineralization of the Earth's crust, mining activities, use of As-based wood preservatives, insecticides, herbicides and irrigation of crops with As-loaded groundwater (Mirza et al. 2014). Arsenic enters into food chain primarily through drink-

ing contaminated water or by consumption of food materials, such as seeds, fruits and vegetables grown on As affected fields (Finnegan & Chen 2012). In India and Bangladesh, consumption of As through contaminated dietary food accounts for about half of the total intake of As (Panda et al. 2010). Arsenic exists in four oxidation states, of which (+III) and (+V) are inorganic and more deadly forms whereas, (-III) and (0) are organic as well as less lethal (Panda et al. 2010; Finnegan & Chen 2012). Further, amongst the inorganic forms, arsenite (As<sup>III</sup>) is approximately 100-fold more soluble, mobile and cytotoxic in nature than arsenate (As<sup>V</sup>) (Nath et al. 2014).

Exposure of crop plants to As results in an array of adverse effects that includes several physiological disorders including reduced nodulation in legumes (Lafuente et al. 2010, 2015). Crop plants absorb As predominantly as As<sup>V</sup> (Garg & Singla 2011). Being an analogue of phosphate, As is also transported across the plasma membrane (PM) of root cells *via* phosphate transport system (Panda et al. 2010). Exposure of crop plants to inorganic As results in uncontrolled production of reactive oxygen species (ROS), such as super-

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## Modulation of antioxidant enzymes by salicylic acid in arsenic exposed *Glycine max* L.

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### Abstract

To investigate the physiological and metabolic attributes of arsenic (As) stress tolerance conferred by exogenous salicylic acid (SA), *Glycine max* L. (variety JS 335) seeds were aseptically germinated over filter paper moistened with SA (500  $\mu$ M) and/or 10 and 100  $\mu$ M As (Sodium arsenite was used). On 2<sup>nd</sup> and 5<sup>th</sup> days of germination, the growing radicles were harvested, and analyzed for growth and different metabolic attributes. Findings exemplified that As significantly decreased germination percentage, radicle length, dry mass and activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX), while stimulated the contents of As, reactive oxygen species (ROS), lipoxygenase (LOX), guaiacol peroxidase (POD) and proline. Additionally, isozymes of antioxidants were also scrutinized over Native-PAGE gels and were found to be altered considerably under As-stress. However, exogenous SA remarkably enhanced germination percentage, growth indices, activities of SOD, CAT and APX, and proline accumulation along with reduced As, ROS and LOX, and restoring POD in As-stressed seedlings. In conclusion, SA confers As-stress tolerance to *Glycine max* L. by regulating the antioxidant enzymes and proline accumulation thereby reduced As content and ROS production. Further study is intended, particularly at gene level, to understand precise mechanism(s) involved in SA-mediated As-stress tolerance.

**Keywords:** Antioxidant enzymes, arsenic toxicity, oxidative stress, reactive oxygen species, salicylic acid

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# Antibacterial properties of amino acid functionalized silver nanoparticles decorated on graphene oxide sheets

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## Highlights

- Synthesis of graphene oxide (GO) sheets decorated with amino acid L-cysteine functionalized silver nanoparticles (GO-L-cys-Ag).
- The antibacterial activities of GO-L-cys-Ag nanocomposite have been investigated.
- Effects of Ag-S interaction on antibacterial activities have been studied.
- The results have been compared with activity of GO-Ag and GO-L-cys-Ag nanocomposite.

## Abstract

Graphene oxide (GO) sheets decorated with amino acid L-cysteine (L-cys) functionalized silver nanoparticles (GO-L-cys-Ag) was synthesized by AgNO<sub>3</sub>, trisodium citrate, and NaBH<sub>4</sub>. GO-L-cys-Ag nanocomposite was characterized by transmission electron microscopy (TEM), Fourier transform infrared (FTIR) spectra, ultraviolet-visible (UV-vis) absorption spectra, which demonstrated that a diameter of L-cys-AgNPs compactly deposited on GO. Antibacterial activity tests of GO-L-cys-Ag nanocomposite were carried out using *Escherichia coli* MTCC 1687 and *Staphylococcus aureus* MTCC 3160 as model strains of Gram-negative and Gram-positive bacteria, respectively. The effect of bactericide dosage on antibacterial activity of GO-L-cys-Ag nanocomposite was examined by plate count, well diffusion and broth dilution methods. Morphological observation of bacterial cells by scanning electron microscope (SEM) showed that GO-L-cys-Ag nanocomposite was more destructive to cell membrane of *Escherichia coli* than that of *Staphylococcus aureus*. The above technique establish that the bactericidal property of GO-L-cys-Ag nanocomposite with wide range of applications in biomedical science.

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**Detailed Report  
of  
One Day Workshop  
on  
“Opportunities and Entrepreneurship in Biotechnology”  
held on  
Friday, March 31, 2017**

Last day of the financial year 2016-17 was wrapped up with a worthwhile payback in the form of a “One Day Workshop” graciously organized jointly by **School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur** and **Chhattisgarh Biotechnology Promotion Society, Government of Chhattisgarh, Raipur** on the most demanded and crowd pleasing issue “Opportunities and Entrepreneurship in Biotechnology”. The workshop was hosted by and scheduled at the School of Studies in Biotechnology on March 31, 2017. A total of 185 participants, mostly M Sc students and Research Scholars along with a few faculties, from various teaching departments of both colleges and universities of Raipur, Durg, Bhilai, Rajim, *etc.* regions attended this workshop and became the attestants of the successful event.



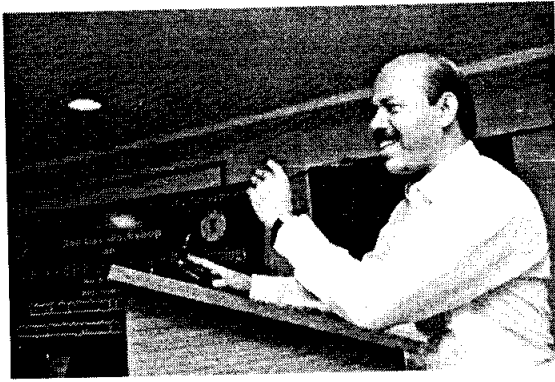
Honourable's guests on the dice, **Prof. S.K Pandey** (Vice Chancellor of Pt. Ravishankar Shukla University, Raipur), **Prof. Girish Chandel** (CEO, Chhattisgarh Biotechnology Promotion Society, Raipur), **Prof. K.L Tiwari** (Registrar, Pt. Deendayal Upadhyay Health and Ayush University, Raipur) were the Chief Guest, Special Guest and Guest of Honour respectively of the Inaugural Function of the event. The workshop was inaugurated by the dignitaries by lightening the lamp and taking the blessings of Goddess Saraswati.

Thereafter, honourable Prof. S. K. Pandey, Vice Chancellor of the University, commenced the program by sharing his advisory and motivating words with the faculties, young scholars and students of the arena of Biotechnology background. He addressed the gathering by being directive and showered his experiences that practical implementation of Biotechnology or any applied Sciences can only be built upon the strong pillars of basic and root sciences like physics, chemistry and biology. He suggested to be focused and determined towards the exchange and learning of technological advance



-ments and applying it for the betterment of mankind as well as for the economic growth of the state. He ended up his words with the positivity that this workshop will mould the attitude of the young and upcoming Biotechnologists and woven the dream for the great future of Chhattisgarh as well as India.

The workshop was moved forward in the direction and **Prof. Girish Chandel** (CEO, Chhattisgarh Biotechnology Promotion Society, Raipur) showed the right direction for the fulfilment of the dreams of an innovative individual. He beautifully and briefly explained about the purpose and plans hidden inside the title chosen for the workshop. He introduced that every technology user and provider needs a regulatory body. He pinpointed about the regulatory needs of any biotech industry approved by the Government of India. Prof. Chandel has familiarized every participant with the one year old grown Chhattisgarh Biotechnology Promotion Society. He said that the aim of this society is to merge biotechnology with the agricultural sciences and also to utilize the vast diversity of natural resources of the state. The assurance of this society is to create employment for the youth section and also to encourage the innovative ideas and business model. The society guarantees to provide Incubation Park, Incubation Centres and eco-friendly zone for the purposes. The society motivates the start-up projects and accepts more and more projects under this agenda. The principle of the society is to stand on Start-up India, Start-up Chhattisgarh thought and want to bring an industrial revolution and technological improvement in the state. He frequently emphasized on the development of great entrepreneur to make Chhattisgarh smart and scientifically, technologically and environmentally a rich state.



In continuation with the words of Prof. Chandel, **Ms. Medha Singh** (Manager, Chhattisgarh Infotech Promotion Society, Government of Chhattisgarh, Raipur) also elaborated the activities of Chhattisgarh Biotechnology Promotion Society. She added about the establishment of Incubation Park which would provide the platform for young researchers to submit their innovative proposals and utilize the facilities to produce the beneficial outcomes. Moving upon ahead, **Prof. K.L. Tiwari** (Registrar, Pt. Deendayal Upadhyay Health and Ayush University, Raipur) lightened on the role and importance of Biotechnology Department in every student's life. He also encouraged students to do good jobs in the field of Biotechnology and make the department grow day-by-day and also make it feel proud. With all these words, the Inaugural Function came to an end and simultaneously the two fruitful sessions has been started.

In the very first session, the participants heard and interacted with **Dr. Hemant Panigrahi** from Department of Horticulture, IGKV, Raipur. He very well demonstrated about the cropping pattern and its merits and de-merits. He introduced to everyone a classic and wonderful cultivation technology *i.e.* "Protective Farming" using polyhouse and shade-net technologies. He explained about the output of this technology, use in terms of improved crop quality and increased productivity. He detailed about every steps and pitfalls of the technology. He provided various practical proofs for many crops, fruits, exotic varieties and ornamental flowers. He emphasized especially towards varieties of Watermelon, Mastmelon and Gerbera. These technology grown fruits and flowers are being consistently and profitably used by the farmers. His words gave up an idea of adopting this technology and fulfilling the supply demand ratio. He boosted up the students to opt for this wonderful technology and move ahead in the business and market of Biotechnology. After his wonderful words and good interaction, the session moved further and the participants heard another leading scientist and speaker in the field of Biotechnology **Dr. Rakesh Kumar Meena**, Chief Scientist, Devleela Biotech, Raipur. Dr. Meena introduced the gathering towards various job opportunities and prospects after pursuing B. Sc., M. Sc. and Ph. D in the area of Biotechnology. He is a renowned scientist and gave several contributions in the area of plant tissue culture. He has successfully provided varieties of banana in the market. He briefly introduced the various requirements and steps involved in plant tissue culture. He produced an estimation regarding setting

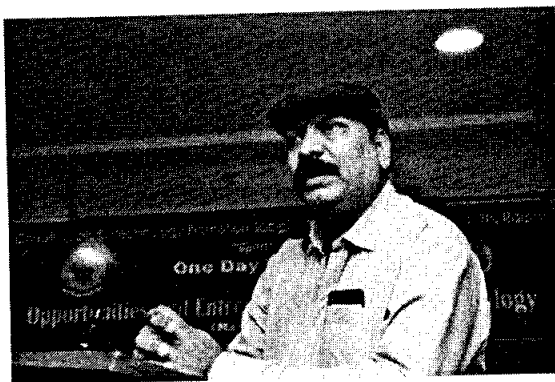


up of a plant tissue culture laboratory in the available area. He beautifully resolved the curiosity of the participants regarding quality of the tissue cultured raised fruit varieties. He showed at a glance the investments and returns involved with the tissue culture projects. Finally, Dr. Meena encouraged the skilled Biotechnologist to become a great entrepreneur and also suggested the options available in the area of seed multiplication, secondary hardening, Agri-clinic and many more to start-up.

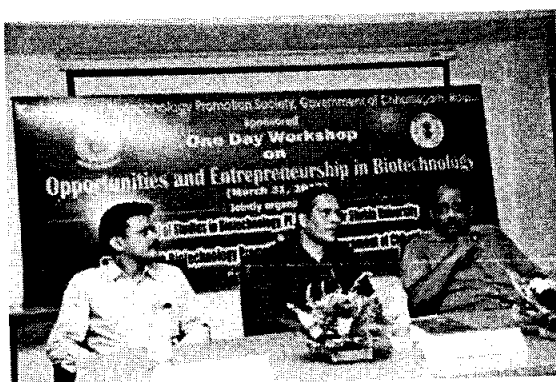


In the post lunch session, the attendees heard to **Dr. Ashok Mishra** (Director, Akash Laboratories, Raipur). A Great saying "The only source of knowledge is Experience", by Albert Einstein. He is absolutely the true picture of experience and knowledge. He took participants towards a voyage of his professional journey and encouraged them to be focused, determined and self confident. By various practical sharing he had sown a seed of entrepreneurship in minds of every attestant of the event. He emphasized the importance of food and farmer. He assured the importance of Biotechnologist in the coming future and encouraged to become independent, honest and hard working entrepreneur for the state. He has up-surged the skilled individual to contribute to start-up India, start-up Chhattisgarh and assured his full support and assistance.

With his influential words, the session moved to the next speaker **Mr. Abhijit Chakravarty** (Senior Consultant, SeMT, Chhattisgarh). Mr Chakravarty introduced the Chhattisgarh Infotech Promotion Society, Raipur, in his lecture. He emphasized on the rapidly expanding entrepreneurship and start-up projects and assured towards the leading to a great revolution in the area of Biotechnology. Mr. Chakravarty explained the aim and purpose of the Incubation Centre which will be going to set up in City Central Mall, Pandri, Raipur. The only aim and assurance of the Chhattisgarh Infotech Promotion Society is to provide space and other facilities as well as the investments for an innovative idea. He detailed every aspect of different policies provided by Government of Chhattisgarh like 36INC for the innovative minds as well as advancements and improvement in the technological section by putting some examples. He said that the agenda of the society is to bring into limelight the great discoveries which are based on the great innovations. He explained all the "Terms and Conditions" required to apply and encouraged the participants to come-up with innovative ideas individually or in a group and build the scientific future of the state.



Every session was accompanied with the exciting discussions between the speaker and the audience. Many questions were put forwards which were beautifully and satisfactorily resolved by the eminent speakers. After the mesmerizing, exciting and knowledge based sessions, the One Day Workshop came to an end with new scopes and new dreams in the eyes of participants. The Valedictory Function of the event was started around 05:00 p.m. Honorable **Shri Dharmesh Sahu** (IAS), Registrar, Pt. Ravishankar Shukla University, Raipur, was the Chief Guest for the function. He addressed the gathering to stand-up with the altitudes set up for them in the field of Biotechnology and make Chhattisgarh, a proud and beautiful state.



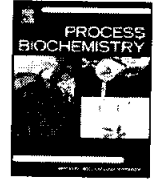
Everyone was pleased and expressed a heart-filled gratitude to the Registrar of the University, **Shri Dharmesh Sahu**, Convener of the workshop **Prof. S.K. Jadhav** (Head, School of Studies in Biotechnology) and Organizing Secretary, **Prof. Keshav Kant Sahu** (School of Studies in Biotechnology). Participants also expressed their thanks to the hospitality and opportunity provided by the Department of Biotechnology and Chhattisgarh Biotechnology Promotion Society. At the end, feedbacks were collected in which participants demanded to organize many more such sessions in coming future.

**(Keshav Kant Sahu)**  
Organizing Secretary



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## Parameter's optimization and kinetics study of $\alpha$ -amylase enzyme of *Bacillus* sp. MB6 isolated from vegetable waste

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 Magnesium sulphate (PubChem CID: 24083)  
 Starch (PubChem CID: 439341)  
 Calcium chloride (PubChem CID: 5284359)  
 Magnesium sulphate (PubChem CID: 24083)  
 Dipotassium hydrogen phosphate (PubChem CID: 24450)  
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### ABSTRACT

$\alpha$ -Amylase, a very critical enzyme for hydrolysis of starch into simple sugar and it has various applications in industrial settings. This study reports the identification of *Bacillus* sp. MB6 which produces increased amount of enzyme from less required resources. To optimize the yield of enzyme, we used various combinations of parameters. The most optimized conditions for production of amylase enzyme from the bacterium *Bacillus* sp. MB6 are pH of 6, temperature of 37 °C, and incubation period of 48 h. Condition of enzymatic activity were also examined and the results show that pH of 6, a temperature of 55 °C, and a reaction time of 30 min are the best available conditions for its activity. Purification of enzyme by 1.63 fold enhanced the specific activity of enzyme based upon its activity analysis as compared with unpurified enzyme. Enzyme kinetics studies show the Michaelis constant ( $K_m$ ) to be 5.45 mg/ml and maximum velocity of the reaction ( $V_{max}$ ) to be 24.15 mg/ml/min. In conclusion, we report enzyme production and purification methodology that exhibit better yield of alpha-amylase for commercial applications.

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### 1. Introduction

Amylase enzymes hydrolyze starch to simple sugar [1,2]. The  $\alpha$ -amylase (*endo*-1,4- $\alpha$ -D-glucan glucohydrolase (E.C.3.2.1.1)) acts on  $\alpha$ -1,4 glycosidic bonds of starch to form glucose, maltose, and a mixture of malto-oligosaccharides [3,4]. Microbial amylases have a myriad of applications in starch-based industries, especially textile, food, detergent, paper, leather, and pharmaceutical industries [5,6]. These enzymes account for ~30% of the global enzyme production [3,7,8]. Globally, the production of this enzyme is worth ~US\$ 2.7 billion with an annual increase of ~4% [9]. Bacteria that can pro-

duce the amylases are widely present in nature and can easily be screened and tested for the production of amylase [10,11]. Commercially used alpha-amylase is harvested mostly from different species of *Bacillus*. [8,10,12]. However, amylase enzymes are highly unstable and lose their property in various conditions including high temperature, extreme pH, and different chemicals used in the reaction. The enzyme exhibits its complete activity at particular optimum conditions of reaction such as pH, temperature, and incubation timing [9,13]. The aim of this study was to identify the optimum conditions for culture and alpha-amylase production for *Bacillus* sp. MB6 in order to obtain highly stable and large quantity of alpha amylase for commercial applications.

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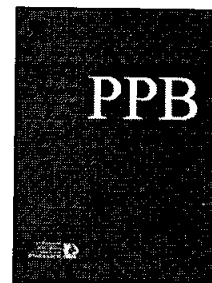
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## Accepted Manuscript

Arsenic-induced genotoxic responses and their amelioration by diphenylene iodonium, 24-epibrassinolide and proline in *Glycine max* L.

Vibhuti Chandrakar, Bhumika Yadu, Rakesh Kumar Meena, Amit Dubey, S. Keshavkant



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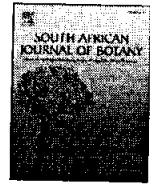
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# Glycinebetaine reduces oxidative injury and enhances fluoride stress tolerance via improving antioxidant enzymes, proline and genomic template stability in *Cajanus cajan* L.

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## ABSTRACT

Excess of fluoride (F) in irrigation water is a serious threat inducing variety of deleterious impacts in plants via over-production of active oxygen species (AOS), modifying antioxidant enzymes and nucleic acid. Present study was aimed to monitor protective functions of glycinebetaine (GB) against F-toxicity in *Cajanus cajan* L. GB is an osmolyte, serves as quencher of AOS and stabilizes membranes and proteins in stressed tissues. Seeds of *C. cajan* L. were exposed to F (75 ppm of NaF), and its combination with GB (50 μM), for five days. The results indicated that F caused inhibited growth, membrane stability index (MSI) and protein content, which were inversely related with the AOS levels and F sequestered. Moreover, few other stress markers viz.; malondialdehyde (MDA), 4-hydroxy-2-nonenal (4-HNE), lipoxygenase (LOX), and DNA polymorphism were found to be enhanced significantly, with a little of proline, in response to F. On the other hand, exogenous addition of GB exhibited improved growth, MSI, genomic template stability, protein and proline accumulations with lower levels of AOS, MDA, 4-HNE, LOX and DNA polymorphism in stressed tissue. Additionally, alterations in the activities/isofoms of superoxide dismutase, catalase, guaiacol peroxidase and ascorbate peroxidase were examined in F-stressed samples, and were found to be up-regulated by GB. This study concludes that GB counteracts F-toxicity strongly via restricting accumulation of F, AOS operated membrane deterioration and injury symptoms, and improving proline accumulation, defensive function and genomic template stability. Conducted study for the first time provides evidence that support the protective function of GB against F-toxicity.

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## 1. Introduction

Fluoride (F) is a highly toxic and persistent environmental poison for living organisms. It can be found in air, water and soil, and is readily absorbed by plants (Yadu et al., 2016). Therefore, with respect to agricultural crops growing in these contaminated sites, the sustentative consumption of high-F plant tissue constitutes a substantial threat to human health (Chakrabarti and Patra, 2013). Excessive availability of F inside the plant has been shown to influence the absorption, transportation and usage of both water and nutrients and causing toxicity symptoms including chlorosis, inhibited germination, growth and productivity, biomass accumulation, photosynthesis, activities of enzymes, protein synthesis and secretion, gene expression, etc. (Yadu et al., 2016). Although, precise mechanisms of F-induced injury symptoms are not worked out empirically, studies revealed that toxicity of it may contribute, at least in a part, oxidative stress condition (Agarwal and Khan, 2016).

Fluoride could cause the over production of active oxygen species (AOS) like; superoxide ( $O_2^{\bullet-}$ ), hydrogen peroxide ( $H_2O_2$ ), hydroxyl radical ( $OH^{\bullet}$ ), etc. (Yadu et al., 2016), which subsequently leads to membrane deterioration and cellular dysfunction through oxidation of lipids, proteins, and nucleic acids (Parkhey et al., 2014a; Chandra et al., 2015; Chandrakar et al., 2016a). In addition, lipids are also depleted enzymatically by lipoxygenase (LOX), releasing cytotoxic products like malondialdehyde (MDA), 4-hydroxy-2-nonenal (4-HNE), etc. in the stressed tissues (Chandrakar et al., 2016b). Over produced AOS could be eliminated by antioxidant enzymes viz. superoxide dismutase (SOD), catalase (CAT), guaiacol peroxidase (POD), ascorbate peroxidase (APX), and non-enzymatic antioxidants like ascorbic acid, glutathione,  $\alpha$ -tocopherol and flavonoids (Parkhey et al., 2014b). Besides these, plants are also able to synthesize certain compatible solutes such as proline (Pro), sorbitol, mannitol, glycinebetaine (GB), etc. to keep them prevented against abiotic stresses. Accumulation of these has been shown to confer stress resistance to the plants by serving as a membrane stabilizer, transient source of both carbon and nitrogen, and direct quencher of free radicals (Chandrakar et al., 2016a). However, in few of the instances natural amassment of antioxidants are not enough to

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# Spatio-temporal measurement of indoor particulate matter concentrations using a wireless network of low-cost sensors in households using solid fuels

Prayati L., Anandya Ranjeyan, Senthil Pervez<sup>a</sup>, Rajan K. Chakrabarty<sup>b</sup>, Pratim Biswas<sup>a, B, C</sup>

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## Abstract

Many households use solid fuels for cooking and heating purposes. There is currently a knowledge gap in our understanding of the variations in indoor air quality throughout the household as most of the studies focus on the areas in the close proximity of the cookstove. A low-cost wireless particulate matter (PM) sensor network was developed and deployed in households in Raipur, India to establish the spatio-temporal variation of PM concentrations. The data from multiple sensors were acquired in real-time with a wireless system. Data collected from the sensors agreed well ( $R^2 = 0.713$ ) with the reference data collected from a commercially available instrument. Low spatial variability was observed within the kitchen due to its small size and poor ventilation – a common feature of most rural Indian kitchens. Due to insufficient ventilation from open doors and windows, high PM concentrations similar to those found in the kitchen were also found in the adjoining rooms. The same household showed significantly different post-extinguished cookstove PM concentration decay rates ( $0.26 \text{ mg/m}^3\text{-min}$  and  $0.97 \text{ mg/m}^3\text{-min}$ ) on different days, owing to varying natural air exchange rates ( $17.68 \text{ m}^3/\text{min}$  and  $37.46 \text{ m}^3/\text{min}$ ).

## Introduction

Spatio-temporal monitoring of outdoor and indoor air quality provides critical information about emissions sources, air flow and ventilation, and subsequent personal exposure. For example, in highly polluted cities like Delhi, India, and Beijing, China (Cheng et al., 2016), measurements at a few locations cannot represent pollution levels in the whole city. Similarly, at a much smaller scale, household air pollution measurement near pollution sources such as a furnace or cookstove are insufficient to accurately estimate personal exposure in different parts of the household over different durations. Spatio-temporal pollutant level data provide a better model the effect of air circulation on pollutant dispersion and decay rate.

Proper characterization of indoor air pollution is critical because residents spend much more time indoors than they spend outdoors (Spengler and Sexton, 1983, Zhang and Smith, 2003, Zhou et al., 2015). The World Health Organization (WHO) reported that poor indoor air quality due to residential solid fuel combustion

Electronics  
8  
4

# **"OPTICAL PROPERTIES OF LITHIUM DOPED ZnO NANOCRYSTALS"**

**A DISSERTATION**  
*Submitted to*



School of Studies in Electronics and Photonics  
Pt. Ravishankar Shukla University  
Raipur (C.G.)

*In partial fulfillment for the award of the degree of*

**MASTER OF TECHNOLOGY**

*In*  
**(Optoelectronics and Laser Technology)**  
*Submitted by*

**PREETIKA MISHRA**  
*Under the guidance of*

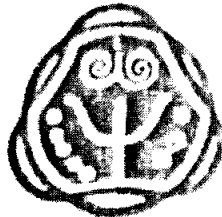
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**Dr. Sanjay Tiwari**  
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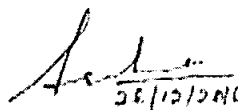
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December-2016



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CERTIFICATE

This is to certify that the dissertation work entitled, " OPTICAL PROPERTIES OF LITHIUM DOPED ZnO NANOSTRUCTURES" submitted by Preetika Mishra, is a credible work carried by her at Institute of Physics, Bhubaneswar. The work has been presented in a manner suitable to affirm acceptance towards the partial fulfillment of the requirement for the degree of Master of Technology in Opto-electronics and Laser Theory, Pt. Ravishankar Shukla University, Raipur (C.G.) is candidate's own work carried out by her under our supervision. Her dedication and sincerity are praiseworthy.



Signature of guide  
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7



Pt. RAVISHANKAR SHUKLA UNIVERSITY  
RAIPUR (C.G.)  
SCHOOL OF STUDIES IN ELECTRONICS AND PHOTONICS

CERTIFICATE

This is to certify that work contained in interim dissertation entitled, Study of Transport Characteristics and Optoelectronic Properties of Reduced Graphene work is being carried by SARBHJOT KAUR (153212) at NATIONAL PHYSICAL LABORATRY, NEW DELHI, during the period 18 July 2016 to 15 May 2017, for the requirement of partial fulfillment for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

✓  
The Thesis is satisfactory / ~~unsatisfactory~~

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Duration of Training – 18 July 2016 to 15 May 2017

Date: 18 May - 2017

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2

**Study of Interface Properties in  $\text{LaAlO}_3/\text{SrTiO}_3$   
Hetero-Structures Prepared by Pulsed Laser Deposition**

**DISSERTATION**

*Submitted in partial fulfillment of requirement for the award of the degree of*

**MASTER OF TECHNOLOGY**

In

**OPTOELECTRONIC & LASER TECHNOLOGY**

Submitted By

**VEENA DIYAWAR**

Enrolment No - UU/28230

Supervisor

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Session- May 2017



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Session - June 2017

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**The Influence of Early Transition Metals on the  
Structural and Mechanical Properties of  
FeCo (ETM) B Alloys; ETM=Nb,Zr,Mo.**

**A DISSERTATION**

**Submitted to**



**School of Studies in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)**

*In partial fulfillment for the award of the degree of*

**MASTER OF TECHNOLOGY**

**in**

**Opto-electronics and Laser Technology**

*Submitted by*

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*Under the guidance of*

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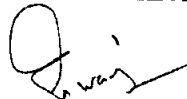
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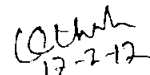
**CERTIFICATE**

This is to certify the dissertation work entitled; "The influence of early transition metals on the structural and mechanical properties of FeCo(ETM)B alloys; ETM=Nb,Zr,Mo" is carried out by MANISHA RATRE at RAJA RAMANNA CENTRE FOR ADVANCED TECHNOLOGY, INDORE (M.P.) during the period July 2016 to June 2017. This dissertation is accepted for the partial fulfillment of the requirement for the degree of **Master of Technology in Optoelectronics and Laser Technology**, Pt. Ravishankar Shukla University, Raipur (C.G.).



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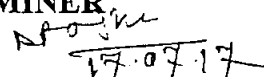


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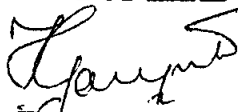
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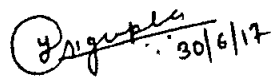
This is to certify that the dissertation work entitled "The influence of early transition metals on the structural and mechanical properties of FeCo (ETM)B alloys; ETM=Nb,Zr,Mo" is carried out by MANISHA RATRE at RAJA RAMANNA CENTRE FOR ADVANCED TECHNOLOGY, INDORE (M.P.) during the period July 2016 to June 2017, for the requirement of partial fulfillment for the award of the degree of Master of Technology in Optoelectronics & Laser Technology at Pt. Ravishankar Shukla University, Raipur (C.G.).

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## CERTIFICATE

This is to certify that the dissertation work entitled, "Measurement of Surface form error and Surface profiles of Optics for Lasers and X-rays" submitted by RUPA PATEL, is a credible work carried by her at Advanced Lasers and Optics Division, Raja Ramanna Centre for Advanced Technology, Indore. The work presented is candidate's own work carried out by her under our supervision in a manner suitable to affirm acceptance towards the partial fulfilment of the requirement for the degree of Master of Technology in Opto-electronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.). Her dedication and sincerity are praiseworthy.

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20

# Measurement of Surface form error and Surface profiles of Optics for Lasers and X-rays

*A Dissertation*

*Submitted by*

**RUPA PATEL.**

*In partial fulfilment of the project for the award of the degree of*

**MASTER OF TECHNOLOGY**

**IN**

**Opto-electronics and Laser Technology**

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**July 2017**

**STUDY ON EFFECT OF THERMAL LENSING ON  
PERFORMANCE OF CERAMIC Nd:YAG LASER**

A Dissertation

Submitted by

**SRISHTI CHANDRAKAR**

*In partial fulfillment for the award of the degree of*

**MASTER OF TECHNOLOGY**

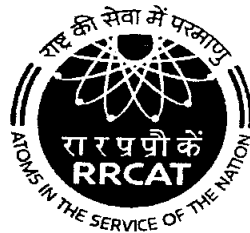
**IN**

**Opto-electronics and Laser Technology**

**Under the supervision of**

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**Solid State Laser Division**

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**School of Studies in Electronics and Photonics**

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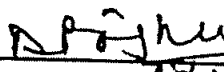
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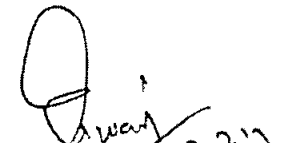
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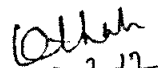
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**CERTIFICATE**

This is to certify that the dissertation work entitled, " Study on Effect of Thermal Lensing on Performance of ceramic Nd:YAG Laser" submitted by Ms. Srishti Chandrakar is a credible work carried by her at Advanced Lasers And Optics Division, Raja Ramanna Centre For Advanced Technology, Indore. The work has been presented in a manner suitable to affirm acceptance towards in the partial fulfillment of the requirement for the degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

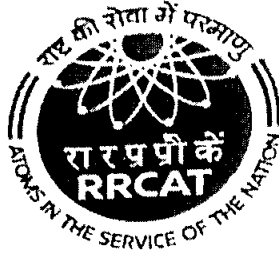
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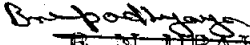
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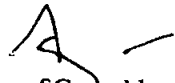


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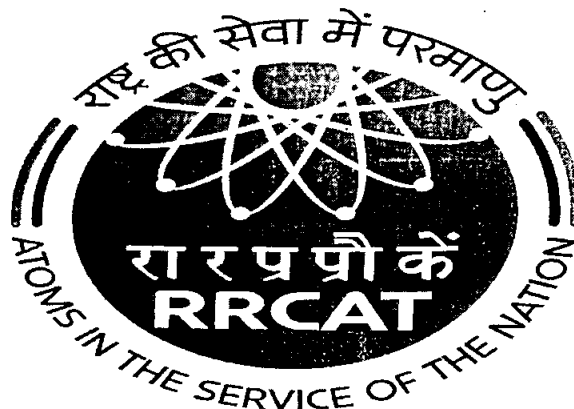
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CERTIFICATE

This is to certify that work contained in dissertation titled, "Soft X-ray Harmonics Analysis Using Multilayer Technique" is successfully completed by "Mr. Udit Kumar Dewangan" at Synchrotrons Utilization Section (SUS), Raja Ramanna Centre for Advanced Technology, Indore, (M.P), India during the period of July 2016 to June 2017.

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②

# *Soft X-ray Harmonics Analysis Using Multilayer Technique*

A DISSERTATION

*Submitted to*



School of Studies in Electronics and Photonics,  
Pt. Ravishankar Shukla University,  
Raipur (C.G.)

*In partial fulfillment for the award of the degree of*

**Master of Technology  
In  
(Optoelectronics and Laser Technology)**

*Submitted by*

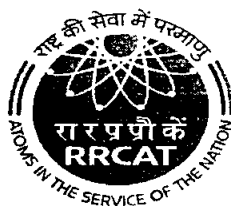
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*Work carried out at*



**Synchrotrons Utilization Section (SUS)  
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June 2017**



**SYNTHESIS AND CHARACTERIZATION  
OF TiO<sub>2</sub> DOPED CARBON AEROGELS**

**A DISSERTATION**

*Submitted to*



**School of Studies in Electronics & Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)**

*In partial fulfillment for the award of the degree in*  
**MASTER OF TECHNOLOGY**

in

**Opto-electronics and Laser Technology**

**(2016-17)**

**Submitted by**

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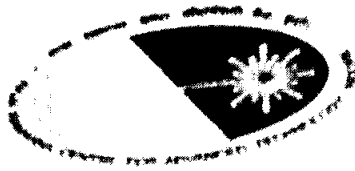
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**Work carried out at**



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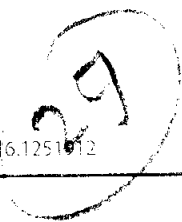
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**CERTIFICATE**

This is to certify that the dissertation worked titled "Synthesis and characterization of TiO<sub>2</sub> doped carbon aerogels" has been carried out by SEEMA VERMA at RAJA RAMANNA CENTER FOR ADVANCED TECHNOLOGY, INDORE during the period July, 2016 to June, 2017 for the requirement of partial fulfillment for the award of the degree of M. Tech. in Optoelectronics & Laser Technology at Pt. Ravishankar Shukla University, Raipur (C.G.).

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## Monitoring of rest-activity rhythm in cancer patients paves the way for the adoption of patient-specific chronotherapeutic approach

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### ABSTRACT

The status and phases of the circadian timing system (CTS) can be ascertained through measuring several biological functions. Of those measurements, rest-activity rhythm is considered as a reliable circadian biomarker to evaluate the function of CTS among oncology population. Its amenable non-invasive monitoring over longitudinal time scale makes it more appropriate and convenient. Its use as reference rhythm for timing the medications is widely accepted in cancer and sleep clinics. Current mini review highlights the present knowledge on different actigraphy devices used for the measurement of circadian rest-activity rhythm. Further, this review presents recent data dealing with the status of circadian rest-activity rhythm in cancer patients and discusses its association with health-related patients' quality of life. Application of this concept supports that the interventions with abilities to reverse CTS dysfunction in cancer patients might prolong their survival with improved and acceptable level of health-related quality of life.

### ARTICLE HISTORY

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### KEYWORDS

Actigraphy; cancer; rest-activity rhythm; quality of life

## 1. Introduction

Clinical oncologists with especial interest in chronotherapy study many biological variables, such as melatonin (Jung-Hynes et al. 2010), cortisol (Sephton et al. 2000), blood cell counts (Manfredini et al. 1994), body temperature (Cajochen et al. 2005), and rest-activity (Lévi et al. 2014) along either transverse or longitudinal time scale in cancer patients. The selection of variable/s of interest rests on a few important criteria, namely (1) it should be a reliable marker of the circadian timing system (CTS) of the target subjects/patients; (2) it should be noninvasive; and (3) it should be amenable for multiple hassle free sampling over a longitudinal time scale. Of the various candidate biological variables, rest-activity has been considered as the most suitable non-invasive and robust marker for the evaluation of human CTS (Mormont et al. 2000). Rest-activity in humans follows light–dark cycles with marked activity during the photo phase and less or no activity during the scoto phase of the naturally

*Duffin*

ORIGINAL ARTICLE

## Worsening of rest-activity circadian rhythm and quality of life in female breast cancer patients along progression of chemotherapy cycles

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### ABSTRACT

Chemotherapy and its associated side effects can induce the disruption of circadian rest-activity rhythm and may have negative consequences on health-related quality of life (HRQoL) of cancer patients. In the current study, repeated-measures cross-sectional design was implemented to determine the status of circadian rest-activity rhythm and to assess the HRQoL of newly diagnosed female breast cancer patients those were planned to receive six cycles of chemotherapy. Rest activity and HRQoL were assessed in twenty-five patients during chemotherapy cycles 1st (C1), 3rd (C3), and 6th (C6) immediately after they reported to the outdoor ward of the Regional Cancer Center, Pt. J.N. M. Medical College, Dr. B.R. Ambedkar Memorial Hospital, Raipur, India. Wrist actigraphs for consecutive spans of 3–4 days were used to record the rest-activity rhythm, and its parameters were computed with the help of Cosinor Rhythmometry. Quality of life (QoL) parameters were assessed using EORTC QLQ-C30 and QLQ-BR23. Results revealed that average scores of all rhythm parameters, such as MESOR, amplitude, acrophase, rhythm quotient, circadian quotient, peak activity, dichotomy index, and autocorrelation coefficient; and all functional scales of QLQ-C30, such as physical, role, emotional, cognitive, and social, and global quality of life statistically significantly decreased with the increasing number of chemotherapy cycles (C1 to C3 and C6). Scores of symptom scales of QLQ-C30, such as fatigue, pain, dyspnoea, insomnia, appetite loss, and diarrhea increased significantly from C1 to C6. Among the QLQ-BR23 scales, scores of sexual functioning, sexual enjoyment, breast symptoms, and arm symptoms significantly decreased, whereas scores of systemic therapy side effects, and upset by hair loss significantly increased across the chemotherapy cycles. We conclude that rest-activity rhythm disrupted and HRQoL of breast cancer patients worsened along the increasing number of chemotherapy cycles. We suggest that along with the treatment protocol, level of disruption of these parameters should be assessed and managed with the proper interventions that prominently include timing of the chemotherapy administration. The latter is pivotal for maintenance of these parameters, which are likely to enhance the physiological ability of patients for better treatment responses and may improve the overall QoL and survival of the patients.

### ARTICLE HISTORY

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### KEYWORDS

Breast cancer; chemotherapy cycle; quality of life; rest-activity rhythm

### Introduction

The master clock, suprachiasmatic nuclei (SCN), controls and coordinates the tissue-specific peripheral oscillators via humoral and neural mechanisms (Haus, 2009) and generates nearly 24-h physiological and behavioral events, including rest-activity rhythm (Dibner et al., 2010; Hastings et al., 2003; Van Someren et al., 2007). Rest-activity rhythm has been used as a marker of the endogenous circadian clock function in isolation studies (Aschoff, 1965, 1994; Wever, 1975), phase-shift studies (Duffy et al., 1996; Honma

et al., 1995; Kronauer et al., 1982), psychiatry (Teicher et al., 1993; Wehr et al., 1983), and in oncological studies (Ancoli-Israel et al., 2006; Lévi et al., 2014; Mormont et al., 2000; Ortiz-Tudela et al., 2014, 2016; Parganiha et al., 2014). In numerous oncological studies, it has been unequivocally demonstrated that cancer patients exhibit disrupted 24-h rest-activity pattern (Lévi et al., 2014; Parganiha et al., 2014; Taj et al., 2013) and the level of disruption worsens during chemotherapy infusions (Lévi et al., 2010; Roscoe et al., 2002; Savard et al., 2009). Likewise, breast cancer patients also confront the similar drift (Ancoli-



## Article

# Animal Welfare Attitudes: Effects of Gender and Diet in University Samples from 22 Countries

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## Attitudes Toward Animal Welfare Among Adolescents from Colombia, France, Germany, and India

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### ABSTRACT

Concerns about animal welfare are becoming increasingly important. Recent research suggests that age and gender are associated with attitudes toward animal welfare in adolescents. In this study, we analyzed attitudes toward animal welfare in adolescents from five geographic regions: Colombia, France, Germany, and two regions in India (Raipur and Kalyani). Individuals responded to the Composite Respect for Animals Scale (CRAS-S). The CRAS-S score integrates 10 facets of attitudes toward animal welfare: the use of animals in research, for food, as pets, for recreation, for clothing, farm animal husbandry, and the conservation of animals, as well as emotional aspects such as feeling superior to animals or emotional affection. A total of 627 males and 506 females ( $n=1,133$ ) participated in this study (France, 134; Colombia, 193; Germany, 377; Raipur, 210; Kalyani, 219). Females scored significantly higher than males (2.9% of variance explained). There was no consistent relationship with age. No relationship was found in Colombia, France, and Raipur, and a negative relationship in attitudes toward animal welfare was found in Germany and Kalyani.

### KEYWORDS

Adolescents; age effects; animal welfare; attitudes; Composite Respect for Animals Scale (CRAS-S); human–animal interaction

Issues regarding animal welfare – such as using animals for food, recreational activities, or scientific research – are becoming increasingly important, at least in Western societies (see, e.g., [https://ec.europa.eu/food/animals/welfare\\_en](https://ec.europa.eu/food/animals/welfare_en)). Accordingly, there are big debates in the general public about how and why science, industry, and society use animals; studying attitudes toward animal welfare is a rapidly growing domain (Deemer & Lobao, 2011; Delon, 2018; Kendall et al., 2006; Ormandy & Schuppli, 2014). These issues have often been investigated regarding the attitudes of adults and the general public (Deemer & Lobao, 2011; Kendall et al., 2006; Ormandy & Schuppli, 2014).

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## Circadian clock, cell cycle, and breast cancer: an updated review

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### ABSTRACT

Some key elements are common to two fundamental periodic regulatory processes; the circadian cycle and the cell cycle. Underlying mechanisms of coordination between the two processes are critical for proper cellular functioning and physiology. Disruption in the mechanisms of one process may affect the role of other that may direct critical physiological changes and may cause severe diseases like cancer, etc. More or less persuasive evidences evolve from the breast cancer research. In this mini review, we highlighted the molecular coordinations of the elements of circadian cycle and the cell cycle and their altered expressions associated with the genesis and progression of breast cancer.

### ARTICLE HISTORY

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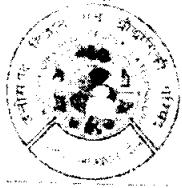
### KEYWORDS

Breast cancer; cell cycle; circadian cycle

### 1. Introduction

All underlying mechanisms of the individual cells are directly or indirectly influenced by two important regulatory processes; the cell cycle and the circadian cycle (Masri et al. 2013; Feillet et al. 2015). Essential elements of these two regulatory processes interact with each other (Panda et al. 2002; Gerard & Goldbeter 2012). The interaction may occur at the transcription level or at the translational level (Gerard & Goldbeter 2012). Strong evidences regarding the interaction of elements of both the cycles emerged from bacteria (Goto & Johnson 1995; Mori et al. 1996; Mori & Johnson 2001; Yang et al. 2010a), mammals (Matsuo et al. 2003; Nagoshi et al. 2004), and from other experimental models such as zebrafish (Tamai et al. 2012; Peyric et al. 2013). Recent studies carried out through single live cell imaging with contemporary computational methods emphasized that coupling between these two regulatory processes harmonize the cell cycle (Bieler et al. 2014; Feillet et al. 2014) that is essential for the proper cellular functioning. It has been reported that disruption in the expression levels of elements of one regulatory process may affect the functioning of elements of other process that may lead to altered physiology and behavior (Bjarnason & Jordan 2000; Nagoshi et al. 2004; Welsh et al. 2004).

Phy. School  
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## छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद

**Chhattisgarh Council of Science & Technology**

M. I. G. 25, Indravati Colony, Raipur, (C. G.) 492 001

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No. CCSE/MP/2016

Raipur, Date: 11/01/2016

### Sanction Order

To  
Registrar  
Pt. Ravishankar Shukla University,  
Raipur (CG)

**Sub:** Sanction of Mini Research Project entitled "Prevalence and awareness of chronic disease among women of different profession in relation to life style and activity level"

**Ref:** Mini Research Project proposal of Dr. Reeta Venugopal, Professor, SOS in Physical Education, Pt. Ravishankar Shukla University, Raipur (CG).

**Project Investigator:** Dr. Reeta Venugopal, Professor, SOS in Physical Education, Pt. Ravishankar Shukla University, Raipur (CG).

**Co-Project Investigator:** Dr. Priyamvada Shrivastava, Professor, SOS in Psychology, Pt. Ravishankar Shukla University, Raipur (CG).

**Co-Project Investigator:** Dr. Rajeev Choudhary, Professor, SOS in Physical Education, Pt. Ravishankar Shukla University, Raipur (CG).

Sanction is hereby accorded for **Rs.4,90,000/- (Rs. Four lacs ninety thousand)** only for two years duration. **The amount is being released on the following terms and conditions:-**

**The Mini research projects must be pertaining to Socio-Economic Development of the State.**

1. In line with the Council's objectives it is imperative to support only such Research & Development Mini Research projects which are relevant to the achievement of specific objectives of the Council as follows.

"To identify and utilize areas of science and technology for-

- Achieving socio-economic development of the state and
- To achieve the objectives of tackling the problems particularly in backwardness, unemployment and poverty in the rural areas and among the under-privileged section of the society".

2. Mini research project will be sanctioned to permanent faculty members)

3. Six copies of the project proposal to be submitted to Council in the prescribed Form.



4. Suitable accommodation and other necessary facilities, equipment etc. should be made available by the Institution for the research project. The Grant -in - Aid would be released through the Head of the Institution who would be responsible for proper utilization of the grant.
5. Annual progress report of the work carried out is required to be submitted to the Council within one-month time limit.
6. The Council reserves the right to terminate the project if progress of the work is not found satisfactory, in the opinion of the Council.
7. Publication of the research data of the project should be done only after taking approval from the Council, for which a copy of research paper should be submitted.
8. **Release of Funds: The contingency amount sanctioned for the research project will be released immediately. Salary will be released after the submission of the papers related to appointment of the staff under the project. The amount under equipment head can be released after receiving the recommendations of purchase committee and approval of head of institute.**
9. **Accounts duly supported by vouchers for the expenditure incurred on salary, contingencies, etc. should be submitted regularly through the Head of the Institution/Research Organization.**
10. **Procedure laid down for appointment of Staff, Purchase of equipment, materials by the Institution concerned must be strictly followed.**
11. Prior approval of the Council for purchase of equipment costing more than Rs. 10,000/- would be necessary. The Council normally does not approve the purchase of any major equipment from its grants, except for exceptional cases.
12. Proper record of purchase, stock entries, breakages, & losses should be maintained for verification, and submitting the verification report to the Council. On completion of the project the equipment and other articles purchased from Council fund should be transferred to the stock books of the Institution.
13. The Institution shall be responsible for submitting the annual and final audited statement of accounts and utilization certificate for the grant released by the Council.

**II Budget:**

- (a) Total amount sanctioned Rs.4,90,000.00  
 (b) Period- Two years from Jan 2016 to Dec. 2018.  
 (c) Break-up of the budget.  
 (d) Additional released, if any Rs.--  
 (e) Break-up of the released amount:

Sl.	Budget Head	1st year Rs.	2nd year Rs.	Total Rs.
1	Staff: One Project Fellow @ Rs. 10,000/- PM for 18 <sup>th</sup> Month	60,000/-	1,20,000/-	1,80,000/-
2	Contingency			
1	Stationary, Books, Journal, Reprints	15,000/-	15,000/-	30,000/-
ii	TA Expenditure only for field work	10,000/-	10,000/-	20,000/-
3	Equipments: Body composition analyzer-01, Somatype software	2,60,000/-		2,60,000/-
	<b>Total Rs.</b>	<b>3,45,000/-</b>	<b>1,45,000/-</b>	<b>4,90,000/-</b>

**Additional Grant:**

<b>A</b>	<b>Recurring</b>	1	Staff	
		i	One Project Fellow	Rs. -
		ii	Field Assistant	Rs. -
		2	Contingencies	
		i	Materials/experimental animals/plants	Rs. -
		ii	Chemical	Rs. -
		iii	Glassware	Rs. -
		iv	Books/journals/reprints/photography	Rs. -
		v	TA	Rs. -
<b>B</b>	<b>Non-Recurring</b>			
			Equipments	Rs. -
<b>C</b>	<b>Total (A+B)</b>			Rs. -

(Prof. M. M. Hambarde)  
 Director General

Raipur, dated 27/11/2016

Endt. No. 2627/COST/MRP/2016

Copy forwarded to:

1. Project Investigator: Dr. Keeta Venugopal, Professor, SOS in Physical Education, Pt. Ravishankar Shukla University, Raipur (CG).
2. Co-Project Investigator: Dr. Priyamvada Shrivastava, Professor, SOS in Psychology, Dr. Rajeev Choudhary, Professor, SOS in Physical Education, Pt. Ravishankar Shukla University, Raipur (CG).
3. Office Copy

(Prof. M. M. Hambarde)  
 Director General

## Comparative study of Ventilatory Functions of Cotton Mill Workers, Mumbai, India

Ingle A.S<sup>1</sup>, Venkatraman B<sup>2</sup>, Bagale K<sup>3</sup>, Choudhary R<sup>4</sup>

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**Address for Correspondence:** Dr. Avinash S Ingle, Department of Physiology, AIIMS, RAIPUR, CG, India. Email: [avinashingle2@gmail.com](mailto:avinashingle2@gmail.com)

### Abstract

**Background & objectives:** The present observational study was carried out in cotton mill workers of Mumbai to compare the pulmonary functions with those of apparently healthy population and to find out the effect of duration of exposure to the working environment. **Materials & Methods:** The study group comprised of 150 cotton mill workers and 150 workers of hospital staff, all males, in age group of 25-60 years. Socio-demographic characteristics and occupational history was noted in pre-designed questionnaire performa for both groups. Respiratory functions namely FEV1, FVC, FEV1/FVC & PEFR were recorded by using portable and electronic instrument pneumotachometer. results were analysed by using difference of means. **Results:** The pulmonary functions were found to be significantly lower in cotton mill workers as compared to hospital staff and pulmonary functions were correlated negatively with duration of exposure to the cotton dust. **Conclusion:** in spite of modernization and recent technical evolution the working conditions and occupational environment has still a long way to go as per as the safety of cotton mill workers of Mumbai city is concerned.

**Key words:** Cotton mill workers, Spirometry, Ventilatory functions

### Introduction

At the time of industrial revolution, the rulers (Britishers) gave priority to set up cotton industries at Mumbai, India so in the earlier periods of last century nearly 1/3<sup>rd</sup> of the working population was employed in textile industries [1]. Many studies abroad noticed the high prevalence of cotton related respiratory diseases in cotton mill workers (CMW) although the reported incidence in India was found to be very low as compared to other countries [2,3]. In state where cotton industries in India, particularly Mumbai are going through difficult phase with most of them being closed down. Those which are still running are grossly neglected and the workers continue to work on same old machines thereby increasing the risk of developing the

diseases due to inhalation of cotton dust or working environment affecting pulmonary functions [4].

This study was undertaken to know the current status of the pulmonary functions of the workers in textile industries of Mumbai and to compare those with the un-exposed population of Mumbai and also to correlate the effect of duration of chronic exposure with lung functions.

### Materials and Methods

The present cross-sectional study was conducted in five cotton mills in Mumbai with prior permission of safety managers of respective cotton mills. A pre-designed semi-structured performa and plan was submitted to the ethical committee and same was used as study tool. A study group of 150 cotton mill workers and control

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## DIFFERENT TYPES OF BHASTRIKA PRANAYAMA: REPEATED MEASURES TRIALS WITH DIFFERENT TREATMENTS TO STUDY THE TREND OF THE EFFECTS ON STATIC BALANCE ABILITY

Original paper

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### ABSTRACT

**Purpose.** The objective of the study was to find out the trend of the effects of 4 varieties of bhasrika pranayama on static balance ability.

**Methods.** The total of 78 male students were selected as subjects. The age of the subjects ranged 17–25 years. The participants were divided randomly into 5 groups, 15 students each. They practiced 4 varieties of bhasrika pranayama.

**Results.** Quadratic components for overall trends were found significant in static balance ability. A significant difference was observed between linear components of the trends for the treatment groups and the control group in static balance ability. Also, a significant difference was noted between quadratic components of the trends for the treatment groups and the control group as for static balance ability.

**Conclusions.** There was a significant difference among the adjusted post-test means of 4 experimental groups and the control group in static balance ability.

**Key words:** balance ability, bhasrika pranayama, trend analysis

### Introduction

Yoga is an ancient system based on philosophical and practical knowledge/concept and a holistic vision of an individual, refined over the ages for the overall development of the body and mind. *Pranayama*, as a part of classical yoga, controls the energy and vital forces (*prana*) within the organism in order to rejuvenate and maintain good health as well as to promote relaxation. A yoga practitioner follows the proper patterns of deep breathing that strengthen and revitalize the respiratory system, soothe the nervous system, and reduce distress. Yoga also helps the mind to set calm and become a useful vehicle for concentration and meditation. *Bhasrika pranayama* is one of the 8 main forms of pranayama. Bhasrika is mentioned in the classical yoga texts, *Hathapradipika* and *Gheranda Samhita*. In Sanskrit, it means ‘bellows’ and is related to the following metaphor: ‘A blacksmith blows to create heat and purify iron and bellows is a device for generating

a strong current of air, used to give flow to fire in old times.’ Swami Sivamanda describes the bhasrika pranayama practice as a process of rapid inhalation and exhalation with a hissing sound. Except the different practices of simple breathing exercises, the old yogis also explained that different types of deep breathing techniques can have varied effects on both mind and body [1–5]. There are different principles and theories which support the concept that by reducing and controlling their breath, yoga practitioners may improve the physical and mental stability [6–8]. Some studies have reported that yogic practices related to breathing employ voluntarily strong abdominal contractions, which brings stimulation related to somatic and splanchnic receptors, and induces parietal areas of the cerebral cortex, with a suggested effective arousal.

The main goal of the study was to select an appropriate bhasrika version to improve the static balance ability of individuals.

**Correspondence address:** Lesław Kulmatycki, Department of Social Sciences and Health Promotion, University School of Physical Education in Wrocław, al. J. Paderewskiego 35, 51-612 Wrocław, Poland, e-mail: leslaw.kulmatycki@wroc.pfu.edu.pl

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## Viral Elimination Strategies for *Musa* spp.

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### Abstract

Banana is one of the major crops in tropical parts of the world. The banana plant is susceptible to many diseases due to the less genetic diversity in its popular cultivars. Particularly viral diseases can severely destruct quantity and quality of the crop. Four major banana infecting viruses doing the damage- banana bunchy top virus, banana streak virus, banana bract mosaic virus, cucumber mosaic virus; two other viruses- banana mild mosaic virus and banana virus X causing mild infections. Treatments are not available to remove viral infections from field crop. Banana-infecting viruses readily transmit through insect vectors and via vegetative planting materials, causing diseases in germplasm storage, their exchanges and in cultivation fields. Present account gathers information on recent viral disease outbreak reports in *Musa* species, about their newer isolates, vector, alternate host, etc. It further reviews viral elimination approaches used to produce virus-free planting material in banana like- in vitro culture, thermotherapy, chemotherapy, and cryo-exposure, for their effectiveness, mode of action and survival rate. In vitro viral eradication approaches those found effective on the other crops also discussed; like new antiviral drugs, electrotherapy, and combinations of various therapies that may steer to formulate future strategies to protect *Musa* species from viral diseases.

**Keywords:** Banana bunchy top virus, Banana streak virus, Banana bract mosaic virus, Cucumber mosaic virus

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### INTRODUCTION

*Musa* species is one of the essential crops, particularly in tropical zones based on production and utilization [1]. Banana is a major staple food crop for a huge number of people and provides income through local and international trades. Banana is the fourth most cultivated fruit in more than 130 countries belonging to Asia, America, Africa, Oceania and the Pacific [2]. Conventional *Musa* cultivation takes place by using suckers as planting material taken from the mother plant. The most vital sucker borne diseases of *Musa* planting materials are nematodes, weevils, and infections, including viruses and bacterial shrivels. Viral diseases are the main threats for the banana crop. Since plants lack the immune system, as a result, virus infection lasts generally for the complete lifespan of their hosts [3]. Popular banana cultivars are sterile and propagated vegetatively. Therefore, acquisition of viral resistance via sexual recombination is difficult. Hence, proficient techniques are required to recover selected

genotypes from the infected stocks in the absence of virus resistance lines in *Musa* for safer germplasm conservation and exchange.

### MUSA INFECTING VIRUSES

The banana plant is susceptible to different viral infections. Four major viruses can cause severe infections; two of them are DNA viruses- banana bunchy top virus (BBTV) and banana streak virus (BSV) while the two other contain RNA genome- banana bract mosaic virus (BBrMV) and cucumber mosaic virus (CMV). Two other RNA viruses- banana mild mosaic virus (BanMMV) and banana virus X (BVX) can cause mild infections.

BBTV is the causal agent of banana bunchy top disease (BBTD) that may destruct banana crop up to 100%, and it is the main reason for limiting cultivation areas in the Asia Pacific regions and some extent to the African continent [4]. BBTV belongs to genus *Babuvirus* of family *Nanoviridae*. BBTV is an isometric virus, 18–20 nm in width, with

# Keratinophilic fungi from warm, moist, cattle - house of Bilaspur Central - India

Research Article

## Abstract

Soil is a well known source that harbors a wide variety of microorganisms. The current study briefly explains the isolation and identification of keratinophilic fungi, which is responsible for the degradation of most abundant and highly stable animal protein keratin. Soil is the home of several such fungi which are not even noticed from various unexplored habitats. During the course of study approximately 18 different fungal species were isolated and identified. The Vanbreuseghem's hair bait techniques were used for the isolation of fungi. The present study includes important fungi like *Aspergillus*, *Chrysosporium*, *Microsporium*, *Trichophyton*, etc. isolated from cattle house located in and around the Bilaspur town of Chhattisgarh state in Central - India.

**Keywords:** *Aspergillus*, *Chrysosporium*, *Microsporium*, *Trichophyton*

Volume 6 Issue 2 - 2018

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## Introduction

The Soil supports a range of microorganisms and is one of the most complex microbial habitats, allowing the fungi to sustain their entire life cycle. Soil is a cosmopolitan habitat for majority of microbial population that can be explored to find out more specific fungal flora.<sup>1</sup> The soils rich in keratinous material were found to more conducive for keratinophilic fungi<sup>2-11</sup> where this group of fungi usually grow abundantly and reproduce. The fungi's nourishment is provided by the keratin substances in skin, hair, nail, feather, horn, hooves, beak etc. The fungi use the keratinous material as carbon source either living or dead.<sup>12-13</sup> Within the potential keratinolytic specificity, some of fungi of this group are potential pathogens to human beings and animals.

Keratinophilic fungi are widely distributed and are responsible for causing dermal infection in man and animal groups.<sup>14</sup> This is one of the most special homogenous groups of fungi which are regarded as potent dermatophytes causing cutaneous infections.<sup>15</sup> In general, the qualitative and quantitative composition of these fungi can be multifunctional and serve as bio-indicators of environmental pollutants. It means that the composition not only include the presence of keratin remnants but also fecal contaminants in the environment and respond to the changes in environmental conditions.<sup>13,14</sup>

The distribution of keratinophilic fungi is influenced by the amount of available keratin wastes which are usually found in dumping yards, animal house, poultry and veterinary farms. However, their number is restricted because these are mostly confined to habitats rich in keratin wastes.<sup>15</sup> Since the habitat of birds (bird's nest, poultry farm) and animal house with different keratin waste set of predominating species to the possibility of fungal growth and to obtain growth indices of keratin degrading species, therefore in present investigation the cattle forms / yards and houses with variable keratin waste seems worthwhile to find out fungal growth indices under any condition. Although a number of keratinophilic fungi from zoo and other cattle farms have been isolated by different workers,<sup>16-18</sup> but the amount of available literature to support the claim is less.

In cattle house plenty of keratin waste found as an important source promoting growth and contamination by keratinophilic fungi. Therefore occurrence of keratinophilic fungi in animal house is quite obvious.

The hot and humid climate, with a temperature 22-30°C in wet season and the acidic pH of the soils in the state seems to be potentially interesting to study the distribution of these fungi.

The prevalence of dermatophytes may vary according to the geographical locations, for the susceptibility of dermatophytosis that also relies on the seasonal conditions and the fungal constituents, under which susceptible animals or human beings are exposed.

In general dermatophytes are mostly found in temperate conditions however the hot and humid climate, with a temperature 22 - 35°C, the acidic pH of the soils, seems to be more conducive in wet season rather than dry and hot summer season of low-land area in Chhattisgarh state. Furthermore the distribution of keratinophilic fungi found that *Trichophyton ajelloi* is commonly found in colder climates but found sporadic in hot climates,<sup>19</sup> where dry hot conditions hindering the fungal germination. Moreover they exclaimed that the fungus is to be more often found associated with acidic soils than with alkaline soils.

Several studies have demonstrated the ability of the fungi to invade keratinized living tissue of the body including skin, hair, nails etc.<sup>11,13,19,20</sup> The dermatophytic fungi are classified in to three ecologically groups,

- i. Geophiles, which are primarily inhabit the soil
- ii. Zoophiles are essentially animal pathogens and
- iii. Anthrophiles restricted to man, which very rarely infect animals.

Evidently, the occurrence of keratinophilic fungi is mainly influenced by keratin waste, but the survival and occurrence of these fungi also affected and controlled by the ecological habitats.<sup>19</sup> Several studies on epidemiology of human dermatophytosis in India confirm the prevalence of fungi in rural areas. However, the prevalence and

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# Ipomoea triloba (Convolvulaceae) a new record for Chhattisgarh India

Article · April 2018

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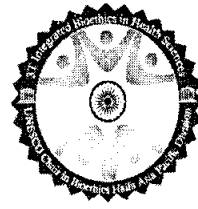
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2)



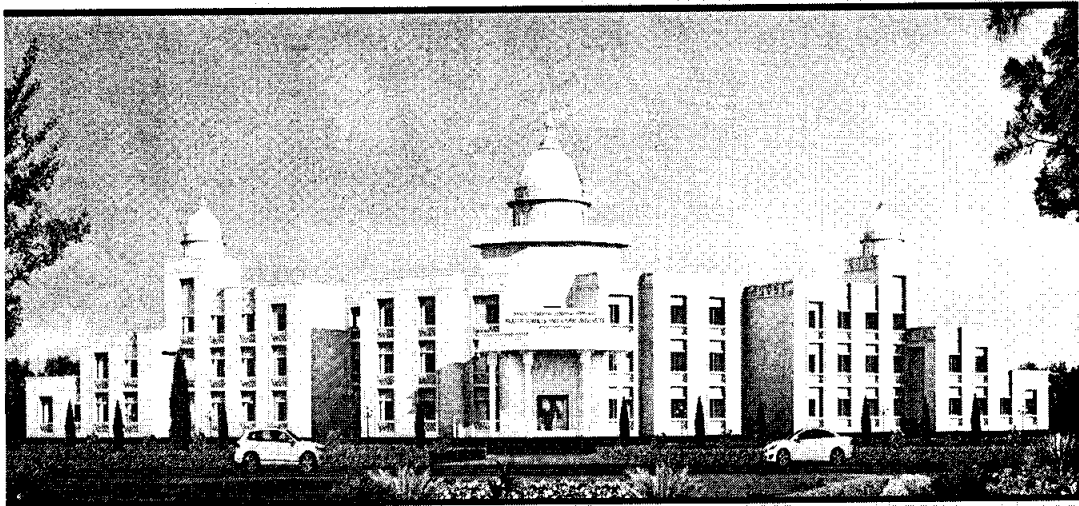
# Inauguration of UNESCO Bioethics Chair (Haifa)

&

## 3T Teachers training

on

### May 28-30, 2018



Organizing Chairman

Organizing Secretary

Vice-Chancellor

Convener

Organized by  
**Pt. Deendayal Upadhyay Memorial Health Science and Ayush University**

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Ref. No. 3278/Raipur

Date 21-3-2018

To,

The Head of Department,  
SOS Biotechnology,  
Pt. Ravishankar Shukla University,  
Raipur (C.G.)

Subject:- Regarding permission to perform research work.

Dear Sir,

On behalf of the Royal College of Pharmacy, Raipur, I am writing this letter to get your permission for our students to perform research work in your laboratory.

It is to inform you that our students Rakesh Dadsena and Abishek Yadav of B.Pharmacy VIII semester doing their research project work entitle "Screening of antibacterial activity of leaves and bark extract of *Buchanania lanzan*". For completion of this research work antibacterial activity is must. For that purpose your laboratory is best option to carry out the same.

So we need your support. Hopefully you will understand the need of the research work for completion of their degree. Hoping for a positive response from your end.

Thanks and Regards


Your's sincerely

Principal

Royal College of Pharmacy

Raipur, (C.G.)

Shri Ramesh

  
21/3/18

23

To,

Directal  
SOS in Biotech. Science  
Pt. R.S.G [Rajput]

Subject :- Application Regarding seeking permission for deep freezing in Biotech. Department.

Dated: 5/4/2018

Respected Sir / Madam

With due respect, I want to say that I am student of M. pharmacy in university institute of pharmacy, for my practical work I need to deep freeze my formulation.

Kindly allow me to use the deep freezer in the Biotech. department

Thanking you

Dr. Chanchandani  
5/4/18

*[Signature]*

Student Rabisa  
Rabsanjani  
Bafnel  
M. pharmacy.  
IV semester

forwarded  
Reedli  
5/4/2018

22

To  
The HOD,  
SOS Biotechnology,  
Pt. RSU Raipur.

Reg: Morphological identification of fungi.

Dear Sir,

This is to inform you that Smt Vaishali Mohril is doing Ph.D. on "Biodiversity of soil fungi in Siltara industrial area, Raipur C.G." under my guidance from Govt. D.B. Girls PG Autonomous Collage, Raipur. For her Ph.D. work she needs to do fungal identification.

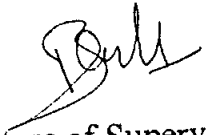
So she is sending fungal culture 15 tubes (Samples)  
for fungal Identification.

Please do the needful.

Date: 26/4/18

Place: Raipur.

Dr. Do. Nagendra  
26/4/18

  
Signature of Supervisor.

Dr. B.M. LALL

Asstt. Professor,

Govt D.B. Girls PG Auto. Collage, Raipur.  
DEPARTMENT OF BOTANY  
GOVT. COLLEGE OF P.G. STUDIES  
RAIPUR (C.G.)

## Modulation in arsenic-induced lipid catabolism in *Glycine max* using proline, 24-epibrassinolide and diphenylene iodonium

Vibhuti CHANDRAKAR<sup>1</sup>, Suruchi PARKHEY<sup>2</sup>, Amit DUBEY<sup>3</sup> & Sahu KESHAVKANT<sup>1\*</sup>

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<sup>3</sup>*Central Laboratory Facility, Chhattisgarh Council of Science and Technology, Raipur 492 010, India*

**Abstract:** Proline, 24-epibrassinolide and diphenylene iodonium are few of the novel antioxidant molecules, involved in growth regulation and abiotic stress tolerance of plants. However, these are scarcely explored in relation to their role in arsenic stress tolerance. Therefore, present study was designed to investigate the involvement of proline, 24-epibrassinolide and diphenylene iodonium in conferring tolerance to *Glycine max* L. against arsenic toxicity. The results showed that arsenic caused decrease in growth attributes like germination percentage, radicle length and dry mass, which were accompanied by the accumulation of arsenic. The application of arsenic steeply reduced total lipid content while increased the levels of oxidative stress markers such as superoxide anion, hydroxyl radical, hydrogen peroxide, free fatty acid, conjugated diene, lipid hydroperoxide, malondialdehyde and 4-hydroxy-2-nonenal, and the activities of lipase and lipoxygenase. Impressively, proline, 24-epibrassinolide and diphenylene iodonium played their roles as protective agents, and caused enhanced growth and reduced arsenic accumulation. These protective molecules enhanced the total lipid content while reduced the levels of oxidative stress markers and activities of lipase and lipoxygenase. The results indicated that proline, 24-epibrassinolide and diphenylene iodonium served as potential inhibitors of As-induced oxidative stress in *Glycine max* L.

**Key words:** arsenic toxicity; 24-epibrassinolide; diphenylene iodonium; lipid metabolism; oxidative stress; proline; reactive oxygen species.

### Introduction

Arsenic (As) is a hazardous metalloid, ubiquitously present in several environment and has no known beneficial biological function. Its contamination in the environment, from both anthropogenic and natural sources, is of global concern (Tripathi et al. 2014). Availability of even low level of As hampers the normal growth and development of plants, resulting in toxicity symptoms. The symptoms of As-toxicity in plants include reduced growth and biomass accumulation, leaf gas exchange, chlorophyll synthesis and thereby photosynthesis, nutrient supply, cellular water potential, and activity of RUBISCO (Chandrakar et al. 2016a). Two dominant forms of As namely arsenite (As<sup>III</sup>) and arsenate (As<sup>V</sup>), are shown to exist naturally, depending upon the redox status of soil (Siddiqui et al. 2015). Out of these, As<sup>III</sup> readily reacts with the sulphhydryl (-SH) groups of both enzymes and proteins, thereby inhibiting cellular functions and leading to cell death (Rai et al. 2015). Alternatively, being an analogue of phosphate, As<sup>V</sup> competes with it for uptake in the root epidermal cells, where it might disrupt normal metabolism by replacing phosphate of ATP, and forms unstable ADP-As

complex (Rai et al. 2015). Moreover, contamination of both As<sup>III</sup> and As<sup>V</sup> are widely reported to induce unrestrained production of reactive oxygen species (ROS) like superoxide anion, hydroxyl radical and hydrogen peroxide (Siddiqui et al. 2015; Chandrakar et al. 2016b). However, these ROS are popularly shown to modify all sort of cellular macromolecules deleteriously, resulting in death of the cells (Parkhey et al. 2014; Chandra & Keshavkant 2016; Singh & Bhardwaj 2016).

Amongst cellular macromolecules, lipids, more particularly poly unsaturated fatty acid (PUFA) fractions of it, are chief and foremost sites of As-promoted ROS attack, inducing changes in structural and functional properties of the cells and its membranes (Chandrakar et al. 2016b). Accumulation of malondialdehyde (MDA), a chief product and reflection of lipid peroxidation reaction, is directly connected with the disturbed integrity or leakiness of the cellular membranes (Keshavkant & Naithani 2010; Chandra et al. 2015). In a number of As-stressed plants, MDA accumulation and membrane leakiness has been observed (Kaur et al. 2012; Singh et al. 2015). Additionally, lipoxygenase (LOX, EC 1.13.11.12) has also been shown to enhance PUFA oxidation by promoting conjugation and

\* Corresponding author



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**Plant Science Today**

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Research Article

## Efficient synthesis of plant-mediated silver nanoparticles and their screening for antimicrobial activity

Rashmi Dwivedi,<sup>1</sup> Bhoopander Giri,<sup>2</sup> and Kamlesh Shukla<sup>3\*</sup>

<sup>1</sup> Department of Biotechnology, Guru Ghasidas Central University, Bilaspur, India

<sup>2</sup> Department of Botany, Swami Shraddhanand College, University of Delhi, Delhi, India

<sup>3</sup> Department of Biotechnology, Pt. Ravishankar Shukla University, Raipur, India

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### Abstract

Now days, the development of safe, cost effective, reliable and eco-friendly processes for the synthesis of nanoparticles is an important aspect of nanotechnology. Among the various agents, plants show immense potential for the synthesis of nanoparticles. The bio-molecules found in plants induce reduction of Ag<sup>+</sup> ions from silver nitrate to silver nanoparticles (AgNPs); therefore, in the present work, the aqueous leaves extract of the plant was used as reducing agent for the synthesis of silver nanoparticles. We synthesized extracellular silver nanoparticles using extract of the leaves of four different medicinal plants which act as a reducing agent at room temperature. The characteristic color change was observed on addition of plant extract to the silver nitrate solution due to their specific properties (Surface Plasmon Resonance). UV-Vis spectroscopy was used for the characterization of the silver nanoparticles. Green synthesized nanoparticles are evaluated for their antimicrobial activity against the Gram-positive and Gram-negative bacteria as well as two pathogenic fungi *Aspergillus fumigatus* and *Curvularia lunata*. The silver nanoparticles (SNPs) of selected plant parts have shown more toxicity towards bacterial species than that of the fungal species. Comparing with simple plant extracts, the SNPs exhibited greater antimicrobial efficacy and advantage over conventional antibiotics to which these microorganisms usually impart resistance.

### Keywords

SNPs; Plant extract; Antimicrobial activity; Nanobiotechnology

### Citation

Dwivedi R, Giri B, Shukla K. Efficient synthesis of plant-mediated silver nanoparticles and their screening for antimicrobial activity. *Plant Science Today* 2017;4(3):143-150. doi: 10.14719/pst.2017.4.3.328

### 1 Introduction

Nanotechnology refers to an extensive area of research with a unifying theme of controlling matter size from micrometer to nanometer which

is known as nanoparticles, which constitute the fundamental building blocks of nanotechnology. Owing to their extensive applications, several artificial methods have been developed



**PT. RAVISHANKAR SHUKLA UNIVERSITY RAIPUR (C.G.)**  
**SCHOOL OF STUDIES IN ELECTRONICS AND**  
**PHOTONICS**

**CERTIFICATE**

This is to certify that work contained in interim dissertation entitled, "INVESTIGATION OF MAGNETIC DOAMIN AND LOCAL STRUCTURE OF MgO/Co/MgO TRILAYER" work carried out by MS.DISHI PUROHIT at RAJA RAMANNA CENTRE FOR ADVANCE TECHNOLOGY during the period July 2016 to Dec 2016, for the requirement of partial fulfillment for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

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INDORE – 452013 (M.P.) INDIA

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This is to certify that the dissertation work entitled, "INVESTIGATION OF MAGNETIC DOMAIN AND LOCAL STRUCTURE OF MgO/Co/MgO TRILAYER" submitted by Miss. Dishy Purohit, is a credible work carried by her at Raja Ramanna Centre For Advanced Technology, Indore. The work has been presented in a manner suitable to affirm acceptance towards the partial fulfillment of the requirement for the degree of Master of Technology in Opto-electronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.) is candidate's own work carried out by her under our supervision. Her dedication and sincerity are praiseworthy.

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This is to certify that work contained in dissertation titled, "Soft X-ray Harmonics Analysis Using Multilayer Technique" has been carried out by Mr. Udit Kumar Dewangan at Raja Ramanna Centre For Advanced Technology, Indore (M.P.), India during the period July 2016 to June 2017, for partial fulfillment of the requirement for the award of degree of Master of Technology in Optoelectronics and Laser Technology. Pt. Ravishankar Shukla University, Raipur (C.G.), India.

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*Udit Kumar*  
Signature of 17.07.17

**EXTERNAL EXAMINER**



**“INVESTIGATION OF MAGNETIC DOMAIN AND LOCAL  
STRUCTURE OF MgO/Co/MgO TRILAYER”**

**A DISSERTATION**

*Submitted to*



School of Studies in Electronics and Photonics  
Pt. Ravishankar Shukla University  
Raipur (C.G.)

*In partial fulfillment for the award of the degree of*

**MASTER OF TECHNOLOGY**

*In*

**(Optoelectronics and Laser Technology)**

*Submitted by*

**MISS DISHI PUROHIT**

*Under the guidance of*

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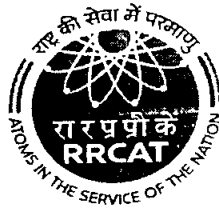
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**JULY-2017**

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CERTIFICATE

It is to certify that work contained in dissertation titled, "SYNTHESIS AND CHARACTERIZATION OF TRANSITION METAL BASED OXIDES" is a one year project report by "Mr. RAHUL KUMAR THAKUR" carried out at Synchrotrons Utilization Section, Raja Ramanna Centre for Advanced Technology, Indore, (M.P), India during the period of July 2016 to June 2017, under my supervision. Further, certified that the work has not been included in the thesis of any other degree or diploma.

Date: 08-07-2017

Place: Raipur

Dr. Tapas Ganguli

Head

Synchrotrons Utilization Section

RRCAT, Indore (M.P.)

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This is to certify that work contained in dissertation titled, "SYNTHESIS AND CHARACTERIZATION OF TRANSITION METAL BASED OXIDES" has been carried out by Mr. RAHUL KUMAR THAKUR at Raja Ramanna Centre For Advanced Technology, Indore (M.P.), India during the period July 2016 to June 2017, for partial fulfillment of the requirement for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.), India.

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Signature of

**EXTERNAL EXAMINER**

16

**NUMERICAL STUDY OF "INVERSE COMPTON SCATTERING"  
THROUGH LASER PRODUCED PLASMAS**

*A Dissertation*

*Submitted by*

**SHIKHA JHA**

*In partial fulfillment of the project for the award of the degree of*

**MASTER OF TECHNOLOGY**

**IN**

**OPTOELECTRONICS AND LASER TECHNOLOGY**

*Under the supervision of*

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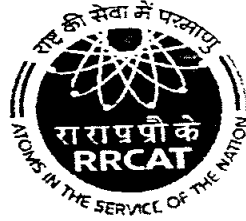


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This is to certify that the dissertation work entitled, "NUMERICAL STUDY OF INVERSE COMPTON SCATTERING THROUGH LASER PRODUCED PLASMA" submitted by SHIKHA JHA, is a credible work carried by her at Laser Plasma Section, Raja Ramanna Centre for Advanced Technology, Indore. The work presented is candidate's own work carried out by her under our supervision in a manner suitable to affirm acceptance towards the partial fulfilment of the requirement for the degree of Master of Technology in Opto-electronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.). Her dedication and sincerity are praiseworthy.

*Ajit Upadhyay*

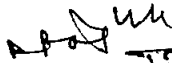
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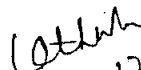
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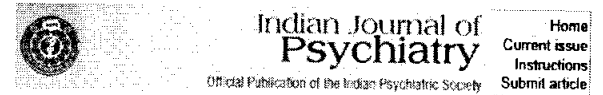
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Indian J Psychiatry, 2020 May-Jun; 62(3): 273-282  
Published online 2020 May 15 doi: 10.4103/psychiatry.IndianJPsychiatry\_91\_20  
PMCID: PMC7368447 PMID: 32773879

### Artificial intelligence-based classification of schizophrenia: A high density electroencephalographic and support vector machine study

Sai Krishna Tikka, Bikesh Kumar Singh<sup>1</sup>, S. Haque Nizamia,<sup>2</sup> Shobit Garg,<sup>3</sup> Sunandan Mandal,<sup>4</sup> Kavita Thakur,<sup>4</sup> and Lokesh Kumar Singh

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Moyna Chakravarty  
Assistant Director  
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JNU Institutional Area  
New Delhi

**SANCTION ORDER**

Project Director, ICSSR

Date: 10/11/2011

The Registrar,  
JNU Institutional Area, New Delhi

Subject: Sanction Order for Project entitled "**Nutritional Status and Utilization of Maternal Healthcare Services among the Baiga Women of Chhattisgarh**" to Dr. Moyna Chakravarty

Dear Sir,

1. The Indian Council of Social Science Research (ICSSR) considered the above project submitted by Dr. Moyna Chakravarty, Professor, School of Studies in Health Sciences, Raipur, Chhattisgarh-492010. Co-Project Director.
2. The Project proposed by the researcher, is to be located at and financed from the institution of the researcher, in the guidelines of this award.
3. The ICSSR has sanctioned a grant-in-aid of Rs.6,00,000/- (Rupees Six Lakhs only) for the project and the grant will be released as follows:

Project grant	Rs. 1,50,000/-
Project overhead	Rs. 1,50,000/-
Project travel	Rs. 1,50,000/-
Project material	Rs. 1,20,000/-
Publication cost*	Rs. 30,000/-
<b>Total</b>	<b>Rs. 6,00,000/-</b>
Overhead charges @ 7.5% over and above	Rs. 45,000/-**

The project budget is subject to recommendation by the expert and approval of the ICSSR. Some portion of the budget, so to be retained by the ICSSR for the release of the grant after successful completion of project after evaluation.

The project budget approved by the ICSSR of Rs. 6, 00,000/- is enclosed.

etc

4. The Project Director of the approved grant-in-aid will be released after receipt of the project proposal, filled in, stamped and signed by the Project Director as well as the receipt of the project budget (if any) received.



A Dissertation on  
“Nanocrystals of mixed Halide all Inorganic Perovskite  $[CsPb(Cl_{1-x}I_x)_3]$  :  
Novel Optoelectronic Material for Efficient Solar Cells”  
Submitted to



School of Study in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)

*In partial fulfilment for the award of the degree of*

**MASTER OF TECHNOLOGY**

IN

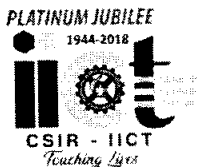
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Work carried out at



Council of Scientific and Industrial Research  
Indian Institute of Chemical Technology  
Polymers & Functional Material Division  
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Jan-June 2019



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S. No: DW0478

Date: 22<sup>nd</sup> July, 2019

### Certificate of Dissertation Work

This is to certify that *Mr. Rahul Sarnagat* has carried out his dissertation work as part of M.Tech (Optoelectronics & Laser Technology) course at CSIR-IICT, Hyderabad under the supervision of *Dr. Ramanuj Narayan*, Department of *Polymers & Functional Materials* during the period *23<sup>rd</sup> July 2018* to *22<sup>nd</sup> July 2019*.

**Project Title:** *Nanocrystals of mixed Halide all Inorganic Perovskite [CsPb(Cl<sub>1-x</sub>I<sub>x</sub>)<sub>3</sub>]:  
Novel Optoelectronic Material for Efficient Solar Cells*

Dr. Ramanuj Narayan  
Principal Scientist



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This is to certify that the dissertation work entitled, "Impedance Spectroscopy of Photovoltaic Material", submitted by Mr. ABHIJEET YADAV, is a credible work carried out by him at Laser Material Processing Division, RRCAT, Indore. The work has been presented in a manner suitable to affirm acceptance towards in the partial fulfilment for the award of the degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

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---

INTERNAL EXAMINER

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EXTERNAL EXAMINER

A Dissertation on  
Time resolved reflectivity studies of semiconductor and their nanostructures  
using circularly polarized pump and probe pulse

Submitted to



School of Study in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)  
*In partial fulfillment for the award of the degree of*

**MASTER OF TECHNOLOGY**

IN

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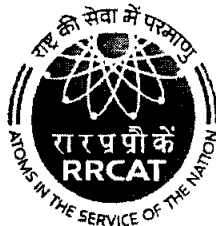
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Work carried out at



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Raja Ramanna Centre for Advanced Technology  
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Indore, India.  
January - 2018

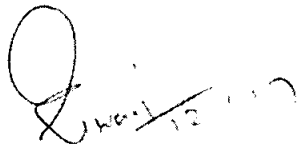
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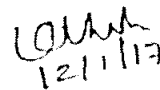
CERTIFICATE

This is to certify that work contained in interim dissertation entitled, "Design of Photonics Components in III-V Hetrostructures" work is carried out by by Miss. Priyanka Roy at III Bombay during the period June 2017 to Dec 2017, for the requirement of partial fulfillment for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt Ravishankar Shukla University, Raipur (C.G.).



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Prof. & Course coordinator  
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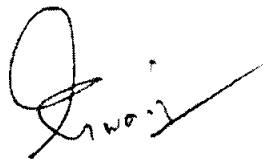


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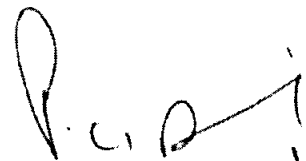
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21

# Design of Photonics Components in III-V Hetrostructures

A DISSERTATION

*Submitted by*

**PRIYANKA ROY**

*In partial fulfillment for the award of the degree of*

Master of Technology

in

Optoelectronics and Laser Technology

*from*

**School of Studies in Electronics & Photonics**

**Pt. Ravishankar Shukla University, Raipur (C.G)**

*Under the guidance of*

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Assistant Professor

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**Dec 2017-18**



# Spermidine and Melatonin Attenuate Fluoride Toxicity by Regulating Gene Expression of Antioxidants in *Cajanus cajan* L.

Bhumika Yadu<sup>1</sup> · Vibhuti Chandrakar<sup>1</sup> · Rakesh Kumar Meena<sup>2</sup> · Aditi Poddar<sup>3</sup> · S. Keshavkant<sup>1</sup>

Received: 6 July 2017 / Accepted: 29 January 2018 / Published online: 8 February 2018  
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## Abstract

Being regulators of growth, both spermidine (Spd) and melatonin (Mel) are involved actively in the modulation of abiotic stress responses of plants. Hence, the present study was aimed to scrutinize the possible involvements of Spd and Mel in alleviation of fluoride ion (F<sup>-</sup>)-induced injuries in *Cajanus cajan* L. Seeds of *C. cajan* L. were exposed to 1) control, 2) F<sup>-</sup>, 3) Spd, 4) Spd + F<sup>-</sup>, 5) Mel and 6) Mel + F<sup>-</sup> for five days. The results unveiled that F<sup>-</sup> treatment caused inhibited growth (radicle length and dry mass accumulation), protein content, genomic template stability, membrane stability index, and free radical scavenging capacity, but enhanced the levels of cell death, active oxygen species (AOS), malondialdehyde, lipase, protein carbonylation, and DNA polymorphism. Moreover, F<sup>-</sup> toxicity elevated the concentrations of endogenous proline, ascorbic acid, and glutathione, and altered the isoenzyme profiles and gene expressions of stress responsive enzymes (superoxide dismutase, catalase, ascorbate peroxidase, and glutathione-S-transferase). In contrast, exogenous supplementation of Spd and Mel alleviated the deleterious effects of F<sup>-</sup>, consequently improved growth, free radical scavenging capacity, and accumulations of protein, proline, ascorbic acid, and glutathione in *C. cajan* L. Additionally, application of Spd or Mel also improved the isoenzyme profiles and gene expressions of stress responsive enzymes, and genomic template stability, thereby reduced cell death, AOS, lipid peroxidation, lipase activity, and DNA polymorphism in stressed tissues. The present study concludes that Spd and Mel, particularly Mel, alleviated the adverse impacts of F<sup>-</sup> by improving antioxidant machinery and genomic template stability.

**Keywords** Active oxygen species · *Cajanus cajan* L. · Fluoride ion · Gene expression · Melatonin · Spermidine

## Introduction

The contamination of potable water with fluoride ions (F<sup>-</sup>) is a worldwide problem with severe implications in animals and human beings. Higher concentrations of F<sup>-</sup> in the soil and irrigation water can disturb both physiological and biochemical processes of plants (Yadu and others 2016). Additionally, it interferes with phosphorylation of proteins, activities of key enzymes, rate of photosynthesis, genomic template stability (GTS), gene expression patterns,

and other metabolic processes via overproduction of active oxygen species (AOS) (Gadi and others 2012; Yadu and others 2016). Fluoride ions intimately bind with sulfhydryl groups of proteins thereby altering the structure, functions, and secretion of proteins involved in cell signaling, proliferation, and apoptosis, and also inactivating the enzymes of the DNA repair system (Agarwal and Khan 2016). However, reduced level of DNA synthesis, weaker protection of DNA from damaged histone protein, and increased activity of DNase have recently been reported in abiotically stressed cells (Chandrakar and others 2017a).

To reduce oxidative stress, plant cells possess a complex network of defensive mechanisms involving both non-enzymic {proline (Pro), ascorbic acid (AsA), glutathione (GSH), and so on}, and enzymic {superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), glutathione-S-transferase (GST), and so on} agents (Iannelli and others 2002; Ahmad and others 2016; Chandrakar and others 2016). However, under severe conditions, this

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## Ageing-regulated changes in genetic integrity of two recalcitrant seeded species having contrasting longevity

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### Abstract

**Key message** Storage longevity of two contrasting recalcitrant seeded species was studied relative to oxidative metabolism and DNA damage under ambient storage ( $25 \pm 2$  °C,  $50 \pm 2\%$  relative humidity).

**Abstract** The present study was aimed to investigate the ageing-induced amendments in two recalcitrant seeded species, *Madhuca latifolia* and *Shorea robusta*. These are economically important tropical trees and are exploited extensively in commercial sectors. Fresh seeds of *M. latifolia* and *S. robusta* lost their germinability within 35 and 8 days after harvest, respectively, under ambient storage (temperature  $25 \pm 2$  °C, relative humidity  $50 \pm 2\%$ ). To untangle the possible mechanisms involved in deteriorative changes in respective seeds, levels of reactive oxygen species (ROS) and changes in DNA content, oxidation, fragmentation and polymorphism, and DNase activity were monitored. The results revealed significant (2.1–7.3 folds) upsurge in ROS levels in these seeds. In contrast, remarkable fall in DNA content of embryonic axes (3.8 fold and twofold) and cotyledons (6.7 fold and twofold) of *M. latifolia* and *S. robusta* seeds, respectively, were observed. Moreover, enhanced oxidation (8.9–18.8 fold) and fragmentation (2.1–2.8 fold) of DNA along with increased (9.9–25.3 fold) DNase activity were observed in axes and cotyledons of respective seeds, revealing active participation of ROS in oxidation ( $r = 0.96$ ,

$p < 0.05$ ), and of DNase in fragmentation ( $r = 0.94$ ,  $p < 0.05$ ) of DNA. Dendrogram of RAPD unveiled significant alterations in similarity coefficients of aged and non-aged seeds of both the species. Thus, overall results concluded that loss of viability of *M. latifolia* and *S. robusta* seeds was closely associated with ageing related changes such as over accumulation of ROS, fall in DNA content, increased oxidation, fragmentation and DNA polymorphism, and DNase activity.

**Keywords** DNA damage · Reactive oxygen species · Recalcitrant · *Madhuca latifolia* · RAPD · Seed viability · *Shorea robusta*

### Introduction

Ageing is a major problem for maintenance of seed quality and viability during long term storage at ambient conditions; however, various plant species and populations from different environments lose germinability in varied pace (Dona et al. 2013). Ageing has been shown to be related closely with a number of deteriorative changes that are taking place at cellular, biochemical and metabolic levels, and in differing magnitudes (El-Maarouf-Bouteau et al. 2011). Therefore, in-depth and precise understanding regarding physiology and biochemistry of ageing phenomenon are crucial to design dedicated seed storage protocols for various species (Chen et al. 2013; Michalak et al. 2015). Being a short lived and metabolically active seeds, recalcitrants are popularly exploited to unravel the basic mechanism(s) underlying ageing phenomenon (Berjak and Pammenter 2013; Walters et al. 2013).

In recalcitrant as well as other categories of seeds, ageing is accompanied with the gradual fall in rate of germination and consequent loss of membrane integrity, reduced energy

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22

**“COMPARATIVE PERFORMANCE ANALYSIS OF PATENTED SOLAR  
PV MODULE DESIGN, DEVELOPED BY GERMI, “SMASH – 4”  
WITH COMMERCIALY AVAILABLE SOLAR PV MODULE DESIGN”**



A Dissertation

*Submitted in Partial Fulfilment of the requirements*

*For the degree of*

**Master of Technology**

in

**Optoelectronics & Laser Technology**

Submitted by

**Ranjeet Singh Ajji**

Roll No. 1714006

Under the Supervision of

**Dr. Sagarkumar M. Agravat**

Head - R&D,

RE4 (Renewable Energy, Environment and Energy Efficiency Research Wing)  
Gujarat Energy Research and Management Institute

**School of Studies in Electronics & Photonics  
Pt. Ravishankar Shukla University, Raipur Chhattisgarh  
Dec – 2018**

## Supervisor's Certificate

**School of Studies in Electronics & Photonics  
Pt. Ravishankar Shukla University, Raipur Chhattisgarh**

This is to certify that the dissertation work entitled "**Comparative Performance Analysis of Patented Solar PV Module Design, developed by GERMI, "SMASH – 4" with Commercially Available Solar PV Module Design**" is a bonafide record of original review/research work carried out by Mr. Ranjeet Singh Aiji (Roll No.1714006), under my guidance and supervision submitted to the **School of Studies in Electronics & Photonics** in partial fulfilment of the requirements for the award of the degree of Master of Technology in Optoelectronics & Laser Technology at **Pt. Ravishankar Shukla University, Raipur Chhattisgarh** during the academic year 2017-2019. The matter embodied in this M.Tech. dissertation has not been submitted for the award of any other degree/diploma/IPR in India or abroad.

Date: \_\_\_\_\_

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(Signature of Supervisor)

**Dr. Sagarkumar M. Agravat**

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Gujarat Energy Research and Management Institute

Date: \_\_\_\_\_

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(Signature of Supervisor)

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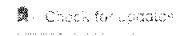
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ARTICLE



## Circadian rhythm characteristics of salivary alpha-amylase – a potential stress marker, in breast cancer in- and out-patients: a follow-up study

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### ABSTRACT

Salivary alpha-amylase has been implemented as renewed non-invasive biomarker of interest to measure the levels of stress in humans. In the current clinical study, two-factor repeated-measures cross-sectional design was implemented to determine the salivary alpha-amylase levels and its rhythm characteristics in newly diagnosed female breast cancer in- and out-patients. Alpha-amylase levels were determined using the Salimetrics<sup>®</sup> salivary alpha-amylase assay kit. Rhythm characteristics of alpha-amylase were computed using the Cosinor Rhythmometry technique. Results showed that the levels of alpha-amylase significantly increased from/to the increasing number of chemotherapy cycle in patients of both group; however the levels were higher in in-patients. Further, results revealed significant differences in rhythm characteristics of alpha-amylase characterized by higher MESOR, lower amplitude, and advanced acrophase in in-patients as compared to out-patients. Current findings indicate that patients of both the groups were associated with progression under stress levels across the number of chemotherapy cycle; however, the levels of stress were higher in in-patients as compared to out-patients. Higher level of stress in cancer in-patients could be attributed to the possible effect of hospitalization and/or relative social isolation.

### ARTICLE HISTORY

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### KEYWORDS

Salivary alpha-amylase;  
in-patients; out-patients;  
stress; circadian rhythm  
characteristics

## 1. Introduction

Individuals diagnosed with cancer experience deterioration in their health conditions along with increasing levels to stress. The later are ascribed to several factors, like diagnosis of cancer, psycho-social changes, fear of recurrence of cancer, and death (Weisman and Worden 1976; Northouse et al. 1998; Yurek et al. 2000; Nelson et al. 2008). In addition, cancer treatment such as repeated chemotherapy administrations has additional negative effects on the human psyche thereby magnifying the pre-existing psychological distress of cancer patients (Chintamani et al. 2011). The increasing level of stress further worsens the patient's health (Schneiderman et al. 2005; Granger et al. 2007). It has been reported that reduced

Revised



## Circadian Rhythm in Energy Expenditure in Cancer In- and Out-Patients: A Comparative Study

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**Abstract.** Unlike normal humans, an alteration in circadian pattern in energy expenditure (EE) has been observed in cancer patients. In the current cross sectional study we examined rhythm characteristics of EE in cancer in- (n = 30) and out-patients (n = 26), and healthy controls (n = 30). EE was assessed non-invasively using an electronic device - the Actical, programmed with data sampling epoch of 60 seconds. All patients and control subjects wore instrument on their non-dominant hand for 3-4 consecutive days. Cosinor rhythmometry was used to determine the rhythm characteristics, such as 24-h average, Mesor, amplitude, and peak/acrophase of EE. Circadian and rhythm quotients were derived from the rhythm characteristics. Two-way ANOVA was employed to determine the effects of factors, 'group' and 'gender' on rhythm characteristics. A significant circadian rhythm in EE was validated in all groups. However, rhythm detection ratio, at 12 h period, was found to be low in both cancer in- and out-patients as compared to controls. Factor 'group' produced significant effect on 24-h average, amplitude, acrophase, rhythm quotient and circadian quotient of EE rhythm. However, effects of factor 'gender' and interaction of both factors was significant on circadian quotient only. At the group level, rhythm characteristics, namely 24-h average, amplitude, and circadian quotient of three groups varied from each other significantly in the following order: in-patient < out-patient < control. In conclusion, EE rhythm deteriorated in both in- and out-patients as compared to control subjects, although the deterioration was more pronounced in cancer in-patients. We suggest that further extensive investigation involving larger sample should be carried out to validate the above findings.

**Keywords:** Cancer, in-patients, out-patients, circadian rhythm, energy expenditure

### Introduction

Energy balance in healthy individuals is synchronized by the circadian clock (Turek *et al.*, 2005). Diurnal pattern of energy expenditure (EE) exists in normal individuals (Swinamer *et al.*, 2004) and is not affected by the different meal timing schedules (Consoli *et al.*, 1981). It has been reported that in humans energy metabolic pathways and rate limiting enzymes for energy producing mechanisms, such as glycogenesis and glycogenolysis are controlled by the circadian clocks that synchronize the energy balance of an individual (Doi *et al.*, 2010; Dallmann *et al.*, 2012).

In disease conditions, like cancer the energy balance has been found to be desynchronized that is characterized by multifaceted factors, such as type and stage of the cancer, symptoms raised from the treatment or alteration in the activity pattern due to disease severity (Keller, 1993; Gibney *et al.*, 1997). Earlier, numerous studies reported reduced or elevated energy expenditure in cancer patients and highlighted that these conditions may be the consequence of reduced energy intake or an increased energy output or both (Warnold *et al.*, 1978; Keller, 1993; Faleoner *et al.*, 1994; Nara-ashizawa *et al.*, 2001; Lundholm *et al.*, 2004). These reports are also supported by the findings in tumor bearing animal models (Oudart *et al.*, 1999). Further, it has been reported that the energy expenditure differs among the individuals that is facilitated by many factors, such as gender and age has a significant effect on the status of energy expenditure (EE) (Ferraro *et al.*, 1992). Studies have reported higher energy expenditure levels in males as compared to females (Ferraro *et al.*, 1992; Morio *et al.*, 1997). Ferraro *et al.* (1992) have reported 5-10% higher 24-h energy expenditure in men as compared to women.

As we know that all most all physiological, molecular, metabolic and behavioral processes are controlled by the circadian clocks. Likewise, it has been reported that energy balance is also under the control of these conserved clocks (Turek *et al.*, 2005; Taj *et al.*, 2013; Sultan *et al.*, 2014). Nonetheless there are very few reports on the pattern of energy expenditure rhythm in humans and in animal models particularly related to clinical populations (Ichikawa and Fujita, 1987; Ichikawa *et*

## Hospitalization-induced exacerbation of the ill effects of chemotherapy on rest-activity rhythm and quality of life of breast cancer patients: a prospective and comparative cross-sectional follow-up study

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### ABSTRACT

Chemotherapy administration may result in the disruption of circadian rhythms and impairment of quality of life (QoL) of cancer patients. Nevertheless, we have little knowledge on the long-term consequences of chemotherapy and the effects of hospitalization. In the present study, we employed the two-factor repeated-measure cross-sectional design to determine the effects of chemotherapy and hospitalization on rest-activity (RA) rhythm and QoL of breast cancer patients. Initially, we randomly selected 39 inpatients and 42 outpatients, scheduled to receive six cycles of chemotherapy, from the Regional Cancer Center (RCC), Raipur, India. Finally, 30 patients in each group were included in the current study. We monitored circadian RA rhythm and QoL using wrist actigraphy and QLQ-C30 and QLQ-BR23, respectively, during the 1st (C1), 3rd (C3) and 6th (C6) chemotherapy cycles. Results revealed that with the progression of chemotherapy cycles (from C1 to C6), all rhythm parameters, namely mesor, amplitude, acrophase, rhythm quotient (RQ), circadian quotient (CQ), peak activity (PA), dichotomy index and autocorrelation coefficient, significantly decreased in both cancer in- and outpatients. In both groups of patients and during C1–C6, all functional and global QoL measures of QLQ-C30 and QLQ-BR23 significantly decreased and the symptoms significantly increased, except constipation, body image, sexual functioning and future perspectives in outpatients. The hospitalization exacerbated the problems associated with the RA rhythm and the QoL of the patients. In conclusion, the current study highlighted the negative consequences of hospitalization among inpatients, irrespective of the stage of cancer. We, therefore, recommend that cancer patients should be administered with chemotherapy as outpatients. The proposed protocol might have a covert bearing on the expression of better physiological state leading to satisfactory treatment outcomes.

### ARTICLE HISTORY

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### KEYWORDS



Breast cancer; chemotherapy cycle; hospitalization; inpatient; outpatient; rest-activity rhythm; quality of life

### Introduction

The data emanating from studies on human and animal models reveal a link between the appropriate functioning of the circadian timing system (CTS) and human well-being. However, people suffering from severe diseases, such as cancer, exhibit consistent alterations in CTS functioning (Ancoli-Israel et al. 2014; Liu et al. 2013b; Mormont and Lévi 1997; Sultan et al. 2017a; Sultan et al. 2014). Therefore, it is essential to measure an appropriate biomarker with a repeated sampling design for the proper dissection of CTS of a given target individual. Here comes the rest-activity (RA) circadian rhythm, a desirable and

ethically appropriate biomarker to assess the status of CTS (Ancoli-Israel et al. 2003). The actigraphy technique is capable of evaluating the CTS based on the data collected over either the transverse or longitudinal timescale. The technique is noninvasive, reliable and convenient for its use in subjects in ambulatory conditions (Sultan et al. 2017b).

Tumor-bearing hosts often exhibit disrupted 24-h RA rhythm (Ancoli-Israel et al. 2006; Ancoli-Israel et al. 2014; Lévi et al. 2014), and this disruption is attributed to the consequences of the disease itself or to the treatment, such as chemotherapy (Bailesta et al. 2017; Sultan et al. 2017c). Earlier findings revealed that the administration of anticancer drugs to mice models leads to

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Color versions of one or more of the figures in this article can be found online at [www.tandfonline.com/ijcbi](http://www.tandfonline.com/ijcbi).

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*In vitro* and *In vivo* Anti-Filarial Effect of  
 Tetracycline/ Doxycycline

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Tetracycline is an established antibiotic and is targets to *Wolbachia* endosymbiont present within the filarial worms. Antibiotic treatment of filarial nematodes results in sterility and inhibits larval development and adult worm viability; this is due to effect on the *Wolbachia*. In the present study *in vitro* and *in vivo* anti-filarial effect of different concentration of tetracycline/ doxycycline was determined. *In vitro* results indicated that 50 µg/ml and 100 µg/ml tetracycline concentrations affects the motility in both microfilariae and adult worms of *B. malayi*. The loss of motility was efficiently higher in female adult worms than male adult worms, could be attributed to the differences in *Wolbachia* load of the filarial worms. 14 (10 Male and 4 female) microfilaraemic subjects were treated with doxycycline @ 200mg/day for 30 days to study the *in vivo* filaricidal effect. In which the mean mf counts were gradually decreased after doxycycline treatment in both male and female subjects upto 6 months. The findings suggest that tetracycline/ doxycycline treatment can eliminate or reduce the mf load due to targeting *Wolbachia* endosymbiont therefore provide good tool for treatment and to hamper the transmission of filariasis from one host to another.

**Keywords:** *Wolbachia*, Tetracycline, Doxycycline, *in vitro*, Filariasis, *Brugia malayi*.

Lymphatic filariasis (LF) is a disease of considerable socio-economic burden in the tropics and sub-tropics and is caused by *Wuchereria bancrofti*, *Brugia malayi* and *B. timori*. *Wolbachia* endosymbiotic bacteria are found in mutualistic relationship in many filarial nematodes infecting animals and humans including *W. bancrofti*. Currently, the estimated 68 million people infected, among them, 36 million are microfilaria carriers and 40 million are symptomatic<sup>1</sup>. Additionally, 946 million people live in areas of southeast Asia and sub-Saharan Africa are at risk of infection<sup>1</sup>.

Anti-filarial chemotherapy is associated with systemic adverse reaction, due to release of microfilariae and *Wolbachia* bacteria into the blood. The available standard chemotherapy kills only the microfilariae and their macrofilaricidal function is not established either *in vitro* or *in vivo*. In recent past anti-*Wolbachia* antibiotics treatment has become a novel approach to treat lymphatic filariasis; these antibiotics inhibit worm development, embryogenesis, fertility and viability. The studies have demonstrated sub-lethal effect of antibiotics on filarial worms and this is due to effect on the *Wolbachia*<sup>2,3,4</sup>. Anti-*Wolbachia* treatment studies of tetracycline on animal models revealed the reduction in worm burden and blocking molting of infective stage larvae (L3 to L4 and L4 to L5)

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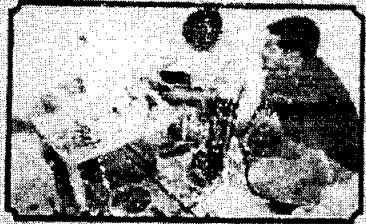
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# National Workshop on "Harappan Stone Beads Making"



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&  
Purakirti Sansthan, Raipur (Chhattisgarh)  
(14<sup>th</sup> Feb. to 18<sup>th</sup> Feb. 2019)



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Workshop Co-ordinator  
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Purakirti Sansthan, Raipur (C.G.)

**Venue :- Seminar Hall Kala Bhavan, Pt. R.S.U., Raipur (C.G.)**

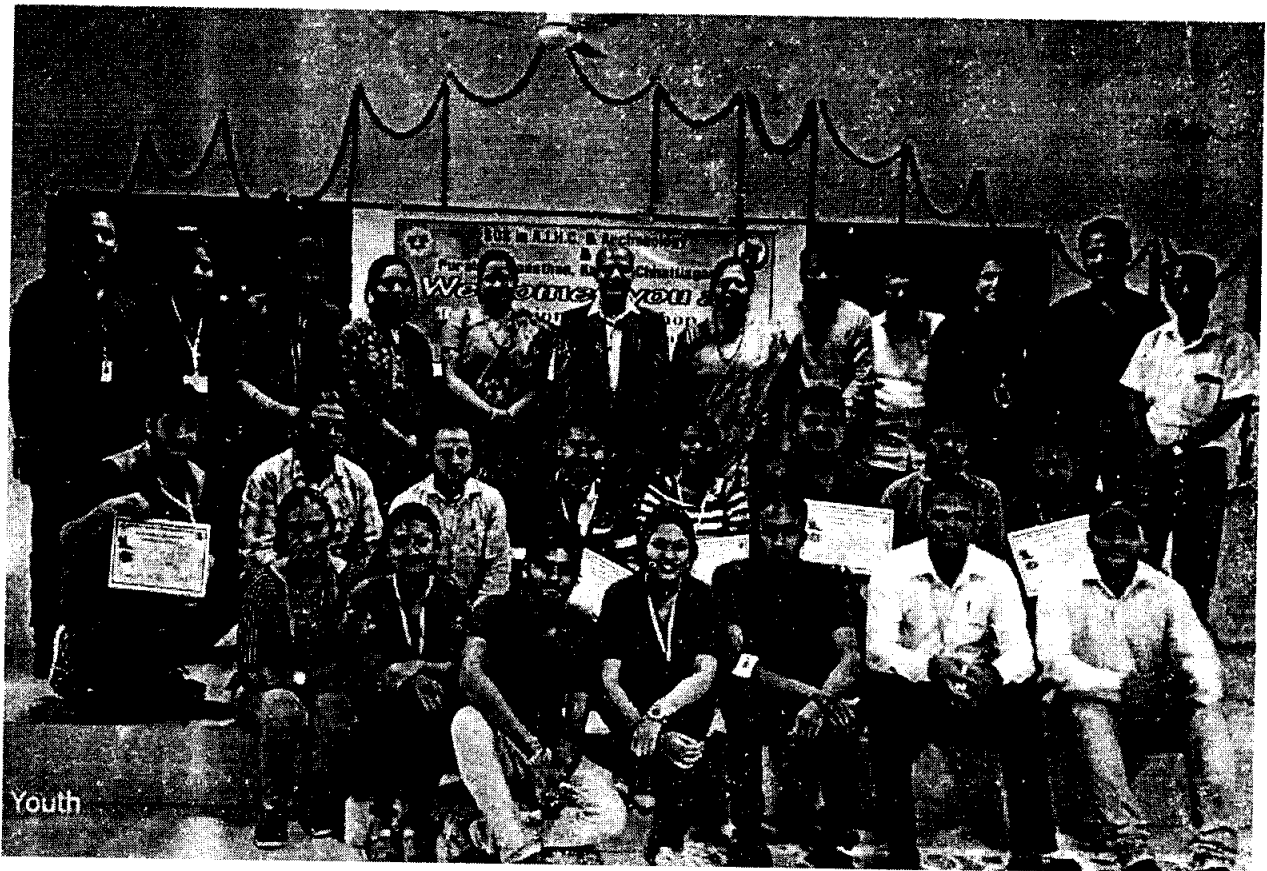
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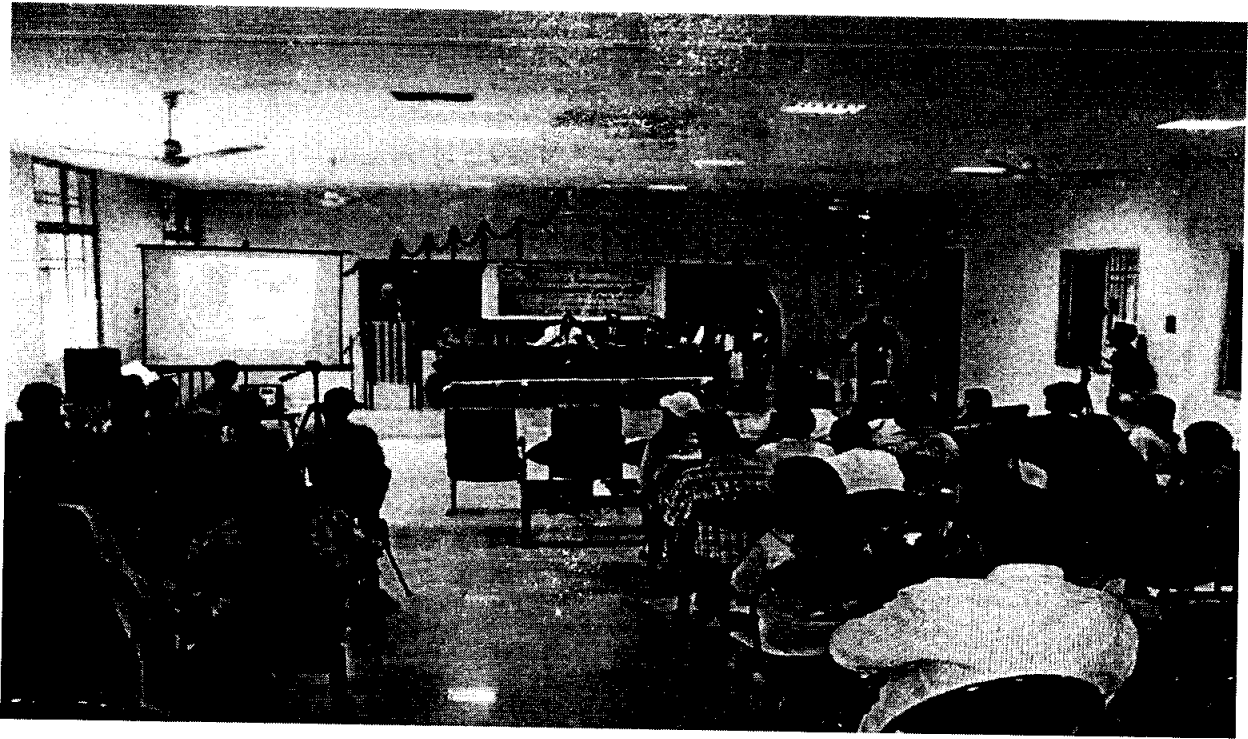


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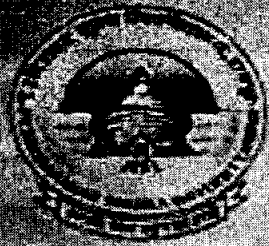


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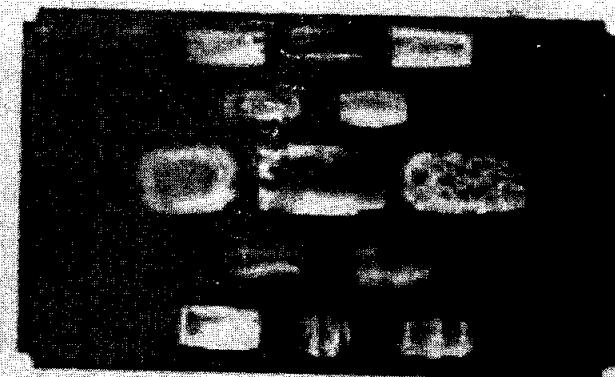
# National Workshop on “Harappan Stone Beads Making”



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&  
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Convener

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Workshop Co-ordinator

Mr. Zakir Khan

Secretary

Purakirti Sansthan, Raipur (C.G.)

**Venue :- Seminar Hall Kala Bhavan, Pt. R.S.U., Raipur (C.G.)**

# Modulation of arsenic-induced oxidative stress and protein metabolism by diphenyleneiodonium, 24-epibrassinolide and proline in *Glycine max* L.

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**Abstract** – Arsenic (As)-toxicity is a major constraint for crop production. The present study was intended to examine the comparative ameliorative effects of diphenyleneiodonium (DPI), 24-epibrassinolide (EBL) and proline (Pro) on As-stress in *Glycine max* L. Seeds of *Glycine max* L. were subjected to As (100  $\mu$ M) singly, and together with DPI (10  $\mu$ M), EBL (0.5  $\mu$ M) or Pro (10 mM), for five days, and were then analyzed. Experimental results showed that As treatment caused a substantial fall in growth traits like germination percentage, radicle length and dry mass, which was accompanied by As accumulation. Additionally, As application also revealed reduced viability, total protein content and activities of antioxidative enzymes (superoxide dismutase, catalase and ascorbate peroxidase), while it increased the levels of total sugar, proline and oxidative stress markers such as electrolyte leakage, reactive oxygen species, lipid oxidized products, protein carbonyls and hydroperoxides, Amadori and Maillard reaction products, malondialdehyde-/4-hydroxy-2-nonenal-protein adducts, protease and proteasome. Isozymes of antioxidative enzymes were also observed to be altered considerably under As-stress. Impressively, DPI, EBL and Pro played their role as protective agents, hence caused enhanced growth and reduced As accumulation. These protective chemicals also improved the viability, accruals of total protein, total sugar and endogenous proline, and activities of antioxidants, while they reduced the levels of oxidative stress markers. Our findings demonstrated the involvement of DPI, EBL and Pro in As-stress tolerance in *Glycine max* L. Further, Pro appears to be superior to DPI and EBL, in alleviating As-induced responses in *Glycine max* L.

**Keywords:** arsenic, diphenylene iodonium, 24-epibrassinolide, oxidative stress, proline, protein metabolism, reactive oxygen species

## Introduction

Arsenic (As) is a hazardous metalloid, which ranks 20<sup>th</sup> in the Earth's crust and is ubiquitously present in the natural environment. Its concentration above the permissible limit (10  $\mu$ g L<sup>-1</sup>, WHO) hampers the normal growth, development and overall metabolic functioning of plants, resulting in toxicity symptoms. The symptoms of As-stress in plants include reduced growth and biomass accumulation, leaf gas exchange, chlorophyll synthesis and thereby photosynthesis, nutrient supply, cellular water potential, protein turnover, and enzymic dysfunction (Chandrakar et al. 2016a). A plant's root serves as the foremost and most susceptible site for the perception of abiotic stress responses including As-toxicity. After entering into the plant's body, As readily binds with sulfhydryl groups of both proteins and enzymes, thereby perturbing the cellular metabolism and inhibiting enzy-

matic activities (Farooq et al. 2015). A well-known consequence of As-toxicity is over-production of reactive oxygen species (ROS) such as superoxide ( $O_2^{\cdot-}$ ), hydroxyl radical ( $\cdot OH$ ) and hydrogen peroxide ( $H_2O_2$ ), affecting the oxidative condition inside the plants (Siddiqui et al. 2015, Chandrakar et al. 2016b). This over-produced ROS are largely shown to attack cellular macromolecules such as lipids, proteins, nucleic acids, etc. (Chandrakar et al. 2017a).

The polyunsaturated fatty acid (PUFA) fractions of membrane lipids are the prime targets of ROS attack (Chandrakar et al. 2016b). Accruals of malondialdehyde (MDA) and 4-hydroxy-2-nonenal (HNE), chief products and biomarkers of lipid peroxidation reaction in stressed cells, are linked directly with the disturbed integrity or leakiness of the membranes (Yadu et al. 2016). Accumulation of ROS has also been shown to cause reduced fluidity of cellular membranes and

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International Training program- Organized a four-days training program on 'banana virus indexing' and 'genetic fidelity testing in tissue-cultured banana plants', for 13 African candidates from July 23 to 26, 2018; funded by Biotech Consortium India Ltd. (BCIL), New Delhi. BCIL is an organization created by Dept. of Biotechnology, New Delhi, Gol.

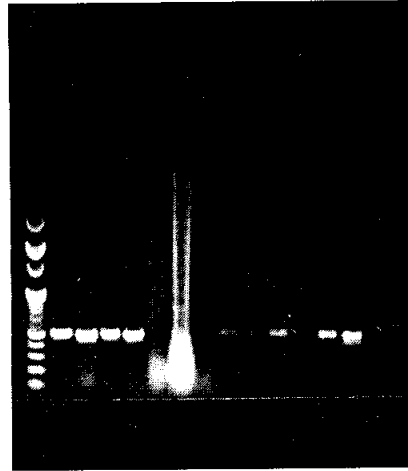
## **A REPORT**

On

### **Training Program of African Candidates Molecular Techniques for Virus Indexing & Clonal Fidelity (July 23-26, 2018)**

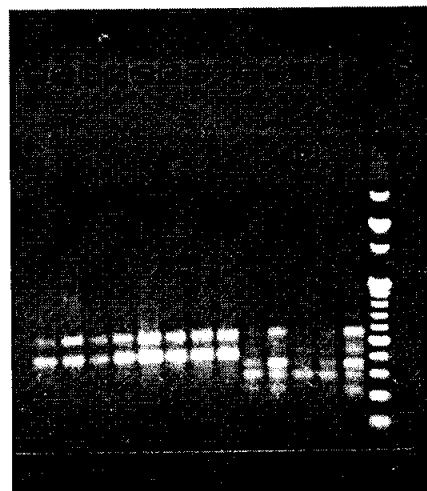
School of Studies in Biotechnology of Pt. Ravishankar Shukla University, Raipur organized a four-days training program for African candidates. The program was scheduled from July 23<sup>rd</sup> to 26<sup>th</sup> 2018. On the first day of the program, the candidates interacted with Prof KL Verma, the Vice-Chancellor of the host University. Further, the program was carried forward by Dr Afaque Quraishi, Coordinator of the training program. An orientation lecture on DNA extraction and purification was given by the respective speaker. Moreover, a briefing was conducted for the participants for their hands-on training on DNA isolation and quantification. Initially, the candidates visited the field for visual identification of BBTV infected banana plants. Then, the candidates performed extraction of DNA from banana plants to diagnose the Banana Bunchy Top Disease following the amplification of extracted DNA via PCR technique. On the second day of the program, the participants performed the PCR and electrophoresis of the PCR amplicons for BBTV indexing. In the second-half of second day, Dr Afaque Quraishi delivered a presentation about PCR, its function, advantages and its application. After that, the participants were trained to observe the bands in electrophoresis gel through a gel documentation system for BBTV indexing (Figure 1).

Figure 1: BBTV indexing via PCR, the band near 500 bp shows the amplicons for BBTV coat protein gene.

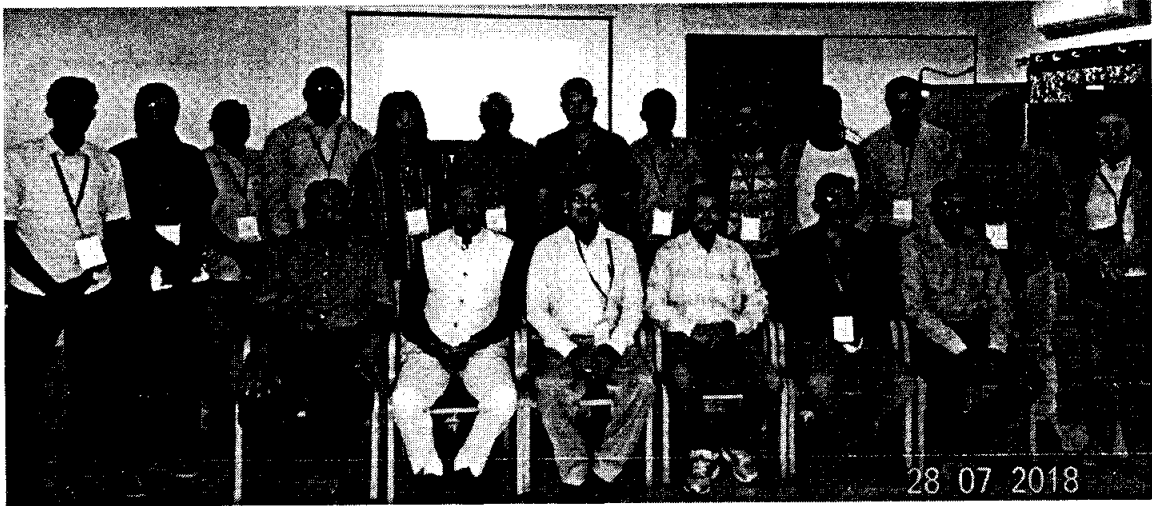


The next day, participants performed the experiments for clonal fidelity of *in vitro* cultured banana plantlets. The ISSR markers were used for accessing genetic fidelity of micropropagated banana plantlets via PCR. A thorough presentation for primer designing was also delivered in the same session. After completion of the session, the African candidates interacted with the post-graduate students of the host department and share the scientific knowledge with them. In the last day of training, the African participants performed the electrophoresis of amplicons and observed the genetic integrity of the micropropagated banana plantlets with their mother-plants (Figure 2). At the last session, the African participants interacted with the Head, faculties, and students of the host department and share their feedback about the training program.

Figure 2: Image showing the genetic integrity of *in vitro* cultured banana plantlets with their mother-plants by using 2 different ISSR markers.













RESEARCH ARTICLE

## Exploring the Efficiency of Native Tree Species Grown at Mine Tailings for Phytoextraction of Lead and Iron

Inderpal Kaur<sup>1</sup> · Sayali Khandwekar<sup>1</sup> · Ravishankar Chauhan<sup>1</sup> · Vikram Singh<sup>2</sup> · S. K. Jadhav<sup>1</sup> · K. L. Tiwari<sup>1</sup> · Afaque Quraishi<sup>1</sup>

Received: 15 December 2017 / Revised: 14 May 2018 / Accepted: 5 July 2018 / Published online: 10 July 2018  
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**Abstract** Four (4) prominently growing tropical tree species were screened for their tolerance to heavy metals and evaluated for their suitability for remediation, at a contaminated site. The partitioning of Iron (Fe) and Lead (Pb) between roots and above-ground aerial parts of the trees, bioconcentration factor (BCF) and translocation factor (TF) were used to determine the remediation potential of the studied trees. *Ficus racemosa* recorded the highest BCF for both the metals, Fe and Pb. The maximum TF was recorded in *T. arjuna* for Fe and *F. racemosa* had the highest TF value for Pb. The recorded BCF and TF values suggested that these tropical tree species can be classified as efficient metal trappers for Fe and Pb. The Pb accumulation was much higher in all the four (4) tree species than the described limit for a Pb-hyperaccumulator (0.1%), revealing the hyperaccumulator potency of all the screened trees.

**Keywords** *Dalbergia sissoo* · *Ficus racemosa* · *Pithecellobium dulce* · Phytoremediation · *Terminalia arjuna*

**Significance statement** In the current manuscript, *Ficus racemosa* and *Terminalia arjuna* have shown their potential for remediation of lead and iron, respectively and accumulate the respective heavy metal more than the set standards for hyperaccumulator species.

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<sup>1</sup> School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur 492 010, India

<sup>2</sup> School of Studies in Life Sciences, Pt. Ravishankar Shukla University, Raipur 492 010, India

### Introduction

Environmental contamination caused by heavy metals (HMs), is a ubiquitous problem in industrial societies. In any ecosystem, HMs persist in the soil for a much longer time than the other essential components [1]. The reasons for soil contamination due to HMs include metalliferous mining and smelting metallurgical industries, sewage sludge treatment, and waste disposal sites [2]. HMs such as Cadmium (Cd), Lead (Pb), Magnesium (Mn) and Zinc (Zn) are well-known contaminants obtained from mining, which adversely affect the soils [3]. When HMs exceed certain concentrations, they become toxic [4], and pose serious health hazards to humans and animals [5].

HM deposits and minerals such as Alumina, Dolomite and Pyrite are found in the central part of India; including the state of Chhattisgarh [6]. Chhattisgarh also has several thermal power plants for energy production and heavy industries such as steel, aluminum and cement plants that lead to the increased deposition of Pb and other metals into the environment [6]. The district of Raigarh in Chhattisgarh is a center for sponge iron production industries with 22 sponge iron industries in operation and some more units coming up. Other than these industries, a big iron-steel factory, for the last 67 years, has been the mainstay of Bhilai.

Restoring degraded soil in any metal-mined land involves the deployment of many chemical, physical and biological techniques [7]. Phytoremediation, using hyperaccumulator plants, is one of these techniques. It is a practical, economical and environment-friendly way of metal remediation [8]. Due to their ability of growing in soils with very high concentrations of metals, hyperaccumulator plants play a significant role in remediation [9]. Reports suggest that only a few temperate trees such as

## ATMOSPHERIC STUDIES OF FUNGAL BIOAEROSOLS IN THE MARKET AREA OF NAWAPARA (RAJIM), DISTRICT- RAIPUR (CHATTISGARH)

RAJU MAHOBIA<sup>a1</sup>, SHAILESH KUMAR JADHAV<sup>b</sup> AND REKHA PIMPALGAONKAR<sup>c</sup>

<sup>a</sup>Department of Botany, Govt. D. K. P. G. College, Balodabazar, Chattisgarh, India

<sup>b</sup>School of Studies in Biotechnology, Pt. Ravishankar Shukla University Raipur, Chattisgarh, India

<sup>c</sup>Department of Botany, Govt. Nagarjun P. G. Science College, Raipur, Chattisgarh, India

### ABSTRACT

Bioaerosols are airborne particles, large molecule or volatile compounds that are ubiquitous in the environment. Fungi are heterogeneous group of organisms belonging to the group of eukaryotes, are the major part of the microbial diversity. Most of them cause disease in plants, animals and humans beings, and are also responsible for deterioration of fruits, vegetables and other food stuffs, when present in more than reasonable limits. Air is not a suitable medium for fungal growth due to lack of nutrients, but it is a suitable medium for dissemination of fungal spores from one place to another. Market area is always densely populated area where people of different area gather. Hence the present study is undertaken to analyze the atmospheric studies of fungal bioaerosols in the market area of Nawapara (Rajim). It was carried out from July 2008 to June 2009 with the help of Gravity petriplates method. During present investigation 728 colonies of 67 fungal sp. were identified maximum 51 fungal sp. were observed in the month of December, while minimum 09 fungal sp. were observed in May. Out of total fungal flora the percentage contributions of different classes were as follows, Zygomycotina (2.60), Ascomycotina (1.09), Anamorphic fungi (92.85) and Mycelia sterilia (3.43). Out of total fungal population *Cladosporium cladosporioides* (15.10) was most dominated were as *Aspergillus niger* (12.08), *A. flavus* (10.43), *A. versicolor* (5.49), *Cladosporium oxysporum* (3.15) and *Curvularia clavata* (2.47) were dominant fungal bioaerosols.

**KEYWORDS:** Bioaerosols, Aerobiology, Nawapara (Rajim)

The American Conference of Governmental Industrial Hygienists (ACGIH) defines bioaerosols as air borne particles, large molecule or volatile compounds that are living contain living organism or were released from living organisms. Dust, Mites, Molds, Fungi, Spores, Pollen, Bacteria, Viruses, Algae, Protozoa's, gases, vapors, fragment of plant materials, and human and pet dander (skin which has been shed) are some example. Bioaerosols are everywhere in the environment and pose no problems in most cases when its quantity and the various types are kept within reasonable limits. However some bioaerosols, when breathed in, can cause diseases including pneumonia, asthma, rhinitis (cold hay fever) and respiratory infection. Bioaerosols may also cause allergic reaction on the skin. However, in agriculture many of the crops are affected by the airborne pathogenic bioaerosols. Airborne fungal spores contribute a major share of bioaerosols and investigations are essential to understand their distribution, ecology and biodeterioration, to forecast plant diseases and to detect allergies and skin diseases. The most significant environmental factors influencing the viability of microorganisms are temperature, relative humidity, and wind velocity. The study of air borne microorganisms their identity, behavior, movement, survival, dispersion, deposition and impact of human beings, animal and plant is referred to the branch of science called Aerobiology. Fungi are heterogeneous group of organisms belonging to the group of eukaryotes. They

are ubiquitous in indoor and outdoor environments. Fungi are the major part of microbial diversity. Nawapara (Rajim) is a place of historical importance. Market area is always densely populated area where people of different area gather. Hence the present study is undertaken to analyze the atmospheric studies of fungal bioaerosols in the market area of Nawapara (Rajim).

### MATERIALS AND METHODS

Bioaerosols are ubiquitous and present in various fields of environment. In the present study entitled "Atmospheric studies of fungal bioaerosols in the Market area of Nawapara (Rajim), District- Raipur" by using gravity petriplates method (containing PDA medium) during July 2008 to June 2009.

Raipur is capital of newly formed Chhattisgarh state. It is geographically located approximately in central part of India at 21- 14' North latitude and 81- 37' in East latitude, situated at a height of 298.60 meters above mean sea level.

Nawapara (Rajim), District-Raipur is located 45 kilometers southeast of Raipur on the bank of the Mahanadi river, this was ones an important urban center of Chhattisgarh state. It is geographically located at 20° 58' North latitude and 81° 50' in East latitude, situated at height of 297.80 meters above the sea level and situated in the middle east of Chhattisgarh. This area is known as the "Prayag" of Chhattisgarh because it is

<sup>1</sup>Corresponding author



Shamsh Pervez &lt;shamshpervez@gmail.com&gt;

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**SERB-Notification**


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SERB\_Administrator@serbonline.in &lt;SERB\_Administrator@serbonline.in&gt;

Thu, Oct 18, 2018 at  
4:09 PM

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**Science and Engineering Research Board**  
(Statutory Body Established Through an Act of Parliament : SERB Act 2008)  
Department of Science and Technology, Government of India

FILE NO. EMR/2015/000928

**SCIENCE & ENGINEERING RESEARCH BOARD**

5 & 5A, Lower Ground Floor  
Vasant Square Mall  
Plot No. A, Community Centre  
Sector-B, Pocket-5, Vasant Kunj  
New Delhi-110070

Dated: 01-Oct-2018

**ORDER**

Subject: Financial Sanction of the research project titled "**Evaluation of Biomass Burning Emissions to address sources of atmospheric Brown Carbon and associated impacts on regional climate**" under the guidance of Dr. Shamsh Pervez, Chemistry, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, Ct, Raipur, Chhatisgarh-492010 and by Prof. Syed Muzaffarali Andrabi, PROFESSOR, UNIVERSITY SCIENCE INSTRUMENTATION CENTRE, Kashmir University and by Dr. Noor Afshan Khan, Scientist, Delhi Zonal Laboratory, National Environmental Engineering Research Institute and by Mrs. Papiya Mandal, Scientist, Zonal Laboratory, Delhi, National Environmental Engineering Research Institute and by Prof. Manas Kanti Deb, Professor, School Of Studies In Chemistry, Pt. Ravishankar Shukla University - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 5589400/- (Rs. Fifty Five Lakh Eighty Nine Thousand Four Hundred Only)** with break-up of **Rs. 1538000/- under Capital (Non-recurring) head** and **Rs.4051400/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 5589400/-** has been approved are given below:

The following budget may be considered for **National Environmental Engineering Research Institute, Nehru Marg, Nagpur**

S. No	Head	Total (in Rs.)

A		Non-recurring	
1	Equipment		0
A'	Total (Non-Recurring)		0
B		Recurring Items	
1	Recurring - I : (Manpower)		0
	Recurring - II :		150000
2	Recurring - III : (Overhead Charges)		12000
B'	Total (Recurring)		162000
C	Total cost of the project (A' + B')		162000

The following budget may be considered for Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT

S. No	Head	Total (in Rs.)
<b>A Non-recurring</b>		
1	Equipment -> Diffuse reflectance and transmittance UV-VIS Spectrometer with Integrated sphere -> PM1 particulate air sampler ( 18% GST) -> Weather meter (GST 18%)	1538000
A'	Total (Non-Recurring)	1538000
<b>B Recurring Items</b>		
1	Recurring - I : (Manpower)	2246400
	Recurring - II : ( Consumables, Travel, Contingencies, Other Cost)	1150000
2	Recurring - III : (Overhead Charges)	493000

B'	Total (Recurring)	3889400
C	Total cost of the project (A' + B')	5427400

2. Sanction of the **SERB** is also accorded to the payment of

- and **Rs. 54000/-** (Rupees Fifty Four Thousand only) under 'Grants-in-aid General' to **The Director, National Environmental Engineering Research Institute, Nehru Marg, Nagpur**
- **Rs. 1538000/-** (Rupees Fifteen Lakh Thirty Eight Thousand only) under 'Grants for creation of capital assets' and **Rs. 1288000/-** (Rupees Twelve Lakh Eighty Eight Thousand only) under 'Grants-in-aid General' to **Vice-Chancellor, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT**

being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website ( www.serb.gov.in).

4. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

5. While providing operational flexibility among various subheads under head Recurring-A, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

6. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

7. The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

8. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

9. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

10. The sanctioned equipments and consumables would be produced as per GFR 2005 and its disposal would be done with prior approval of SERB.

11. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in

To,  
Under Secretary  
SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, Illrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	<p>Dr. Shamsh Pervez Chemistry Pt. Ravishankar Shukla University , G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka,Raipur, Ct, Raipur, Chhattisgarh-492010 Email: shamshpervez@gmail.com Mobile: 919425242455</p> <p>Prof. Syed Muzaffarali Andrabi UNIVERSITY SCIENCE INSTRUMENTATION CENTRE Kashmir University</p> <p>Dr. Noor Afshan Khan Delhi Zonal Laboratory National Environmental Engineering Research Institute</p> <p>Mrs. Papiya Mandal Zonal Laboratory,Delhi National Environmental Engineering Research Institute</p> <p>Prof. Manas Kanti Deb School Of Studies In Chemistry Pt. Ravishankar Shukla University</p> <p>(Start date of the project may be intimated by name to the undersigned. For guidance, terms &amp; Conditions etc. Please visit <a href="http://www.serb.gov.in">www.serb.gov.in</a>.)</p>
5.	<p>The Director, National Environmental Engineering Research Institute, Nehru Marg, Nagpur Vice-Chancellor, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka,Raipur, CT</p> <p>(Receipt of Grant may be intimated by name to the undersigned)</p>

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in



FILE NO. EMR/2015/000928

**SCIENCE & ENGINEERING RESEARCH BOARD(SERB)***(a statutory body of the Department of Science & Technology, government of India)*

5 & 5A, Lower Ground Floor  
 Vasant Square Mall  
 Plot No. A, Community Centre  
 Sector-B, Pocket-5, Vasant Kunj  
 New Delhi-110070

Dated: 01-Oct-2018

**ORDER**

Subject: Financial Sanction of the research project titled "**Evaluation of Biomass Burning Emissions to address sources of atmospheric Brown Carbon and associated impacts on regional climate**" under the guidance of Dr. Shamsh Pervez, Chemistry, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, Ct, Raipur, Chhatisgarh-492010 and by Prof. Manas Kanti Deb, Professor, School Of Studies In Chemistry, Pt. Ravishankar Shukla University - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 5427400/- (Rs. Fifty Four Lakh Twenty Seven Thousand Four Hundred Only)** with break-up of **Rs. 1538000/- under Capital (Non-recurring) head and Rs.3889400/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 5427400/-** has been approved are given below:

The following budget may be considered for **Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT**

S. No	Head	Total (in Rs.)
<b>A</b>	<b>Non-recurring</b>	
1	Equipment -> Diffuse reflectance and transmittance UV-VIS Spectrometer with Integrated sphere -> PM1 particulate air sampler ( 18% GST) -> Weather meter (GST 18%)	1538000
A'	Total (Non-Recurring)	<b>1538000</b>
<b>B</b>	<b>Recurring Items</b>	
1	Recurring - I : (Manpower)	2246400
	Recurring - II : ( Consumables, Travel, Contingencies, Other Cost)	1150000

2	Recurring - III : (Overhead Charges)	493000
B'	Total (Recurring)	3889400
C	Total cost of the project (A' + B')	5427400

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1538000/-** (Rupees Fifteen Lakh Thirty Eight Thousand only) under 'Grants for creation of capital assets' and **Rs. 1288000/-** (Rupees Twelve Lakh Eighty Eight Thousand only) under 'Grants-in-aid General' to **Vice-Chancellor, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**

**This release is being made under Core Research Grant. (PAC Earth & Atmospheric Sciences)**

4. The Sanction has been issued to Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT with the approval of the competent authority under delegated powers on **27 September, 2018** and vide Diary No. **SERB/F/7656/2018-2019** dated **28 September, 2018**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website ( [www.serb.gov.in](http://www.serb.gov.in)).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 2826000/-** (Rupees Twenty Eight Lakh Twenty Six Thousand only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	Registrar
Account Number	10049606501
Bank Name & Branch	State bank of India R.S. University Branch, Amanaka, GE Road, Raipur, 492 010
IFSC/RTGS Code	SBIN 0003739
Email id of A/C Holder	registrar.prsu@gmail.com
Email id of PI	shamshpervez@gmail.com

11. The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. EMR/2015/000928 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by

the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in

To,

Under Secretary

SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R. Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	<p>Dr. Shamsh Pervez Chemistry Pt. Ravishankar Shukla University , G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, Ct, Raipur, Chhatisgarh-492010 Email: shamshpervez@gmail.com Mobile: 919425242455</p> <p>Prof. Manas Kanti Deb School Of Studies In Chemistry Pt. Ravishankar Shukla University</p> <p>(Start date of the project may be intimated by name to the undersigned. For guidance, terms &amp; Conditions etc. Please visit <a href="http://www.serb.gov.in">www.serb.gov.in</a>.)</p>
5.	<p>Vice-Chancellor, Pt. Ravishankar Shukla University, G.E.Road, Amanaka, Raipur, Chhatisgarh, 492010, Amanaka, Raipur, CT</p> <p>(Receipt of Grant may be intimated by name to the undersigned)</p>

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in

FILE NO. EMR/2015/000928

**SCIENCE & ENGINEERING RESEARCH BOARD(SERB)***(a statutory body of the Department of Science & Technology, government of India)*

5 & 5A, Lower Ground Floor  
Vasant Square Mall  
Plot No. A, Community Centre  
Sector-B, Pocket-5, Vasant Kunj  
New Delhi-110070

Dated: 01-Oct-2018

**ORDER**

Subject: Financial Sanction of the research project titled "**Evaluation of Biomass Burning Emissions to address sources of atmospheric Brown Carbon and associated impacts on regional climate**" under the guidance of Dr. Noor Afshan Khan, Delhi Zonal Laboratory, National Environmental Engineering Research Institute, National Environmental Engineering Research Institute and by Mrs. Papiya Mandal, Scientist, Zonal Laboratory, Delhi, National Environmental Engineering Research Institute - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 162000/- (Rs. One Lakh Sixty Two Thousand Only)** with break-up of **Rs. 0/- under Capital (Non-recurring) head** and **Rs. 162000/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 162000/-** has been approved are given below:

The following budget may be considered for **National Environmental Engineering Research Institute, Nehru Marg, Nagpur**

S. No	Head	Total (in Rs.)
<b>A</b>	<b>Non-recurring</b>	
1	Equipment	0
A'	Total (Non-Recurring)	0
<b>B</b>	<b>Recurring Items</b>	
1	Recurring - I : (Manpower)	0
	Recurring - II :	150000
2	Recurring - III : (Overhead Charges)	12000
B'	Total (Recurring)	162000
C	Total cost of the project (A' + B')	162000

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 54000/-** (Rupees Fifty Four Thousand only) under 'Grants-in-aid General' to **The Director, National Environmental Engineering Research Institute, Nehru Marg, Nagpur** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**  
**This release is being made under Core Research Grant. (PAC Earth & Atmospheric Sciences)**

4. The Sanction has been issued to National Environmental Engineering Research Institute, Nehru Marg, Nagpur with the approval of the competent authority under delegated powers on **27 September, 2018** and vide Diary No. **SERB/F/7657/2018-2019** dated **28 September, 2018**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website ( [www.serb.gov.in](http://www.serb.gov.in)).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 54000/-** (Rupees Fifty Four Thousand only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	The Director, National Environmental Engineering Research Institute, NEERI
Account Number	30266513766
Bank Name & Branch	State bank of India NEERI Branch, CSIR-NEERI Campus, Nehru Marg, Wardha Road, Nagpur, 440020 (M.S.)

IFSC/RTGS Code	SBIN0004224
Email id of A/C Holder	fao@neeri.res.in
Email id of PI	shamshpervez@gmail.com

11. The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. EMR/2015/000928 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in

To,  
Under Secretary  
SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, 111rd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	<p><b>Dr. Noor Afshan Khan</b> Delhi Zonal Laboratory National Environmental Engineering Research Institute , National Environmental Engineering Research Institute Email: noor_afshan25@yahoo.com Mobile: 91911004027</p> <p><b>Mrs. Papiya Mandal</b> Zonal Laboratory, Delhi National Environmental Engineering Research Institute</p> <p>(Start date of the project may be intimated by name to the undersigned. For guidance, terms &amp; Conditions etc. Please visit www.serb.gov.in.)</p>
5.	<p><b>The Director,</b> National Environmental Engineering Research Institute, Nehru Marg, Nagpur</p> <p>(Receipt of Grant may be intimated by name to the undersigned)</p>

(Dr. Prahlad Ram)

Scientist C

prahlad@serb.gov.in

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DHAHRAN - SAUDI ARABIA  
DEANSHIP OF RESEARCH

## Memorandum

---

Date : March 17, 2015  
To : Dr. Mohammad Nahid Siddiqui, Chemistry Department  
Subject : Research Grant Proposal titled "Development of Functionality Imprinted Effective Absorbents from Petroleum Heavy Residue for the Removal of Water Pollutants" submitted by you

---

Reference is made to the above mentioned SABIC/Fast Track Research Grant Proposal submitted by you to the Deanship of Research for evaluation and approval.

In this connection, please be informed that the subject was discussed by the Research Committee in its meeting #14 held on March 9, 2015, taking into consideration the detailed evaluations received from the reviewers, and subsequently the Committee made the following recommendation which was approved by H.E. The Rector:

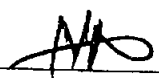
**Recommendation No. RC14 -- 05 (2014 - 2015)**

The Committee recommends approval of Research Proposal under SABIC Grant titled "Development of Functionality Imprinted Effective Absorbents from Petroleum Heavy Residue for the Removal of Water Pollutants" submitted by Dr. Mohammad Nahid Siddiqui of Chemistry Department along with Prof. Shams Pervez (Consultant) from India for 18 months duration together with budget allocation of SR. 105,303.

Please be informed that your project start date is set as **April 01, 2015**. The detailed reviewers' evaluations and the approved budget sheet are enclosed for your information and necessary action.


Your project has been assigned No. **SB141007**. You are kindly requested to fill the agreement form available at the DSR Website and submit to Research office (59-2045) after obtaining the department Chairman's approval within one week. You are also kindly requested to create the project in ERP using the assigned project # (SB141007) and the approved itemized budget.

Thank you.

  
Dr. Nasser Al-Aqeeli  
Dean of Research

Enc: As above.

cc: Chairman, Chemistry Department  
Comptroller  
Director of Financial Affairs  
Project File





# Petrogenetic relationships between 2.37 Ga boninitic dyke swarms of the Indian Shield: Evidence from the Central Bastar Craton and the NE Dharwar Craton

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<sup>f</sup> Institute of Earth Sciences, Academia Sinia, Taipei 11529, Taiwan; <sup>g</sup> Department of Earth and Planetary Sciences, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala 701 022, India; <sup>h</sup> Department of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, Georgia 30332, United States of America; <sup>i</sup> Department of Earth and Atmospheric Sciences, University of Colorado Boulder, Boulder, Colorado 80502, United States of America; <sup>j</sup> Department of Earth and Atmospheric Sciences, University of Colorado Boulder, Boulder, Colorado 80502, United States of America; <sup>k</sup> Department of Earth and Atmospheric Sciences, University of Colorado Boulder, Boulder, Colorado 80502, United States of America

## ARTICLE INFO

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## Keywords

Boninitic dykes

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Petrogenesis

2.37 Ga

## ABSTRACT

The Indian Shield is cross-cut by a number of distinct Paleoproterozoic mafic dyke swarms. The timing of dykes in the Dharwar and Bastar Cratons is amongst the highest on Earth. Globally, boninitic dyke swarms are a common feature to tholeiitic dyke swarms and yet they are common within the Southern Indian Shield. Geochemical and mineralogical data from these dykes are used to constrain the petrogenesis and relationship of the boninitic dykes.  $\text{SiO}_2 = 72.7$  to  $75.1$  wt%,  $\text{MgO} = 5.8$  to  $18.7$  wt%, and  $\text{TiO}_2 = 0.30$  wt% to  $0.77$  wt% from the Central Bastar Craton (Bhanupratappur) and the NE Dharwar Craton (Karimnagar). A single U–Pb zircon date from a boninitic dyke from Bhanupratappur yielded a weighted-mean  $^{206}\text{Pb}/^{238}\text{U}$  age of  $2368.6 \pm 1.0$  Ma (mean  $\pm 1\sigma$ ), which is indistinguishable from the age of the dykes from the Dharwar Craton near Karimnagar ( $2368.5 \pm 2.5$  Ma) and the Bastar Craton (range of  $2368.5 \pm 1.0$  Ma to  $2368.6 \pm 1.3$  Ma). Kynoholite–MELIS modeling indicates that the boninitic dykes are the result of a rise of major element variability of the boninitic dykes from Bhanupratappur whereas their age might be younger, indicating that the primary melt may be derived from a pyroxenite over the mantle in the source of the Dharwar Craton zone. The Nd isotopes ( $\epsilon_{\text{Nd}}(t) = -6.4$  to  $-4.5$ ) of the Bhanupratappur dykes are more variable than the Karimnagar dykes ( $\epsilon_{\text{Nd}}(t) = -0.7$  to  $-0.6$ ) but they overlap. The variability of  $\epsilon_{\text{Nd}}(t)$  does not indicate a significant degree of contamination during emplacement or is indicative of an isotopically heterogeneous mantle source. Geochemical and temporal similarities of the Bhanupratappur dykes with the boninitic dykes from the Dharwar Craton (Karimnagar, Penukonda, Chennakottapalle) indicate they are members of the same dyke swarm. Moreover, our results suggest that the Bastar and Dharwar Cratons were amalgamated many hundreds of millions of years before the break-up of a supercontinent at 2.37 Ga. It is possible that the 2.37 Ga dyke swarm could have been formed by a mantle plume that assisted in the break-up of an unknown or poorly constrained supercontinent.

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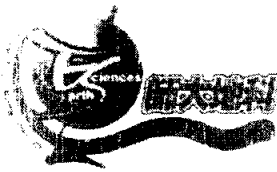
## 1. Introduction

The Indian continent is a collection of cratons that are not a single entity that can be considered the majority of continental crust (Aspiter and Bradley, 1998; Bradley, 2011; Hoffbauer and Rogers, 1996; Rogers and Santosh, 2007; Salmucha et al., 2011). The evolution of supercontinents through the cyclical development of continental growth and dissolution (e.g. Molnar et al., 2009; Bradley, 2011; Rogers and Santosh, 2004; Salmucha et al., 2011). The break-up of a supercontinent into smaller continental blocks is often accompanied by the formation of rift-related

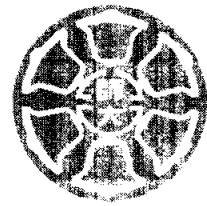
flood basalt and widespread plutonism (e.g. Burke, 2002; Bleeker, 2003; Santosh et al., 2009). Understanding the assembly of a supercontinent requires the application of different techniques that utilize various disciplines including: geology, paleontology, paleomagnetism, geochronology, and geochemistry (Bleeker et al., 2014; Zhao et al., 2004). The reconstruction of older supercontinents is more challenging than for younger supercontinents (e.g. Pangaea) due to the limited amount of paleontological and paleoclimatic evidence, along with a paucity of paleomagnetic and geochronological observations available for the reconstruction of ancient supercontinents (e.g. 1.8 Ga Asgarrud, Chiarenzelli, 1998; Selver et al., 2014; Seltzer et al., 2006; Haxel et al., 2007; Pesonen et al., 2003; Rogers and Santosh, 2003; Salmucha et al., 2009).

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Page 2 of 16

## Whom It May Concern,

Dr. R. Hari was invited to visit National Taiwan Normal University, Department of Earth Sciences, Taipei, Taiwan from June 12<sup>th</sup> to June 18<sup>th</sup>, 2016. The purpose of his visit was to discuss research activities, student exchange, graduate student opportunities, research projects and Ph.D. student opportunities, present his research and to discuss future research collaborations. Funding for Professor Hari's visit was provided by the Ministry of Science and Technology of Taiwan.

Professor Hari was invited to discuss his expertise on the Deccan Traps, Precambrian gabbro dykes and our ongoing research collaborations. Two presentations were given by Professor Hari during his visit. The first presentation was held at the Department of Earth Sciences, National Taiwan Normal University on Tuesday June 15<sup>th</sup> and focused on the formation of the Deccan Trap and large igneous provinces. The presentation was ~45 minutes with an additional 15 minutes for questions. The second presentation was also held at National Taiwan Normal University, Department of Earth Sciences on June 17<sup>th</sup>. The second presentation was an overview of the cratons of India. The presentation was ~45 minutes with another 40 minutes of discussion. The presentation was well received by the audience.

The trip was successful and will lead to opportunities for graduate students to study various types of igneous rocks. In addition, we discussed future research collaborations on the Cambrian rocks in eastern India, most notably in the Bastar and Singhbhum cratons.

Personal information is requested, please contact me at the address below.

Sincerely,

Gregory Sheehan  
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# The Bastar craton, central India: A window to Archean – Paleoproterozoic crustal evolution



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## ARTICLE INFO

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Zircon  
Crustal evolution  
Tectonic implications  
India

## ABSTRACT

The Bastar craton in central India, surrounded by cratonic blocks and Paleoproterozoic to Neoproterozoic orogenic belts, is a window to investigate the Archean–Paleoproterozoic crustal evolution and tectonic processes. Here we propose a new tectonic classification of the craton into the Western Bastar Craton (WBC), Eastern Bastar Craton (EBC), and the intervening Central Bastar Orogen (CBO). We present petrologic, geochemical and zircon U–Pb, REE and Lu–Hf data from a suite of rocks from the CBO and along the eastern margin of the WBC including: (1) volcanic successions comprising meta-andesite and hornblende amphibolite, representing arc-related volcanics along a convergent margin; (2) rhyolite and dacite, in association with rhyolite, representing a volcano-sedimentary succession, deposited in an extensional setting; and (3) metamorphosed mafic-ultramafic suite including gabbro, pyroxenite and dunite, overlain by trondhjemite representing the section of sub-arc mantle and arc root adjacent to a long-lived subduction system. Petrologic studies indicate that the mafic-ultramafic suite crystallized from a mafic and arc tholeiitic parental magma in a suprasubduction zone environment. The chondrite-normalized and primitive mantle normalized diagrams of the mafic and ultramafic rocks suggest derivation from MORB magma. The mixed characters from N-MORB to E-MORB of the studied samples are consistent with subduction modification of a MORB related magma, involving partial melting of the subductated mantle wedge. Our zircon U–Pb age data suggest that the cratonic nuclei was constructed during the Paleoproterozoic. We present evidence for active subduction and arc magmatism throughout the Archean to Neoproterozoic, with the trench remaining open until at least 1.8 Ga. Two major crust building events are recognized in the Bastar craton during Mesoproterozoic and Paleoproterozoic subduction-related as well as juvenile-depleted mafic components, and Neoproterozoic accretion of juvenile oceanic crust, arc magmatism including granitic batholiths and related peggy mineralization). The final cratonization occurred during latest Paleoproterozoic, followed by the final assembly of the craton and its incorporation within the Peninsular Indian mosaic during the Neoproterozoic. In the global supercontinent context, the craton preserves the history of Ur, the earliest supercontinent, followed by the Paleo-Mesoproterozoic Columbia, as well as major thermal impacts of the Neoproterozoic Rodinia and associated Grenvillian orogeny.

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## 1. Introduction

The change in crustal growth rates and stabilization of the Archean cratonic domains during Mesoproterozoic also witnessed the emergence of active plate tectonic processes, where the decrease in mantle potential temperature is considered to have facilitated the

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E-mail address: [santosh@cugb.edu.cn](mailto:santosh@cugb.edu.cn) (M. Santosh).

3.4.5

Dup Gate



ARTICLE

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# Repeated chemotherapy cycles produced progressively worse and enduring impairments in the sleep–wake profile of hospitalized breast cancer patients

Armiya Sultan<sup>a</sup>, Atanu Kumar Pati<sup>a,b,c</sup>, Vivek Choudhary<sup>d</sup> and Arti Parganiha<sup>a,b</sup>

<sup>a</sup>Chronobiology and Animal Behavior Laboratory, School of Studies in Life Sciences, Pt. Ravishankar Shukla University, Raipur, India; <sup>b</sup>Center for Translational Chronobiology, Pt. Ravishankar Shukla University, Raipur, India; <sup>c</sup>Gangadhar Meher University, Sambalpur, India; <sup>d</sup>Regional Cancer Center, Dr. B.R. Ambedkar Memorial Hospital, Raipur, India

## ABSTRACT

Cross-sectional studies, conducted previously, reported disruption of the sleep–wake rhythms of cancer patients on chemotherapy. Although few studies highlighted the effect of hospitalization on sleep, no data were obtained on the effects of longitudinal repeated chronotherapy cycles on sleep pattern of cancer patients. In this study, using the two-factor repeated-measures design, we attempted to assess longitudinally the quality and pattern in sleep–wake behavior of breast cancer in- and outpatients, who received multiple cycles of chemotherapy. We randomly selected the patients from the Regional Cancer Center, Dr. B.R. Ambedkar Memorial Hospital, Raipur, India. We used wrist-worn actigraphs to record the sleep–wake pattern both objectively and subjectively. Additionally, we administered Pittsburgh Sleep Quality Index questionnaire to each patient. Results revealed statistically significant effects of chemotherapy with and without hospitalization mostly on all objective [total sleep time, sleep onset latency, wake after sleep onset, fragmentation index, and sleep efficiency (SE)] and subjective [duration of sleep, sleep disturbance, sleep latency, daytime dysfunction due to sleepiness, SE, and overall sleep quality] sleep–wake parameters of cancer patients. Cancer patients, who received repeated chemotherapy administration followed by hospitalization on each occasion, experienced severely impaired sleep–wake cycle as compared with those who went home after receiving chemotherapy.

## ARTICLE HISTORY

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## KEYWORDS

Actigraphs; breast cancer; chemotherapy; hospitalization; inpatients; outpatients; Pittsburgh Sleep Quality Index; sleep quality

## 1. Introduction

Sleep problem is one of the major concerns in cancer patients including those suffering from breast cancer. Cancer patients may complain about sleep difficulties before, during, and after the chemotherapy (Chen et al. 2014; Ancoli-Israel 2015; Syrowatka et al. 2017). Alfano et al. (2011) reported that about 20–70% breast cancer patients experience sleep disruption. They may also experience disrupted sleep even before the diagnosis and initiation of treatment; however, intensification of preexisting sleep–wake problems



3.7.1

Pharmacy

International Journal of Infectious Diseases  
Volume 73, Supplement, August 2018, Page 302


UMP. 573

# In vitro and in vivo antileishmanial activity of parthenin a sesquiterpene lactone obtained from *Parthenium hysterophorus*



A. Tripathi<sup>1</sup>, R. Kumar<sup>2,3</sup>, G. Sahoo<sup>3</sup>, A. Vyas<sup>4</sup>, H. Kumar<sup>5</sup>, M. Kumar<sup>6</sup>, P. Das<sup>7</sup>

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- <sup>2</sup> Rajendra memorial research institute, Biomedical, Patna, India
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**Background:** Leishmaniasis, a vector borne disease caused by haemoflagellate leishmania parasites. It is caused by several species of flagellated protozoans belonging to the

FEEDBACK 

Soxhlet apparatus to remove fatty substances followed by chloroform. The structure of the isolated compound was identified by nuclear magnetic resonance (NMR: Gemini 2000 BB; Varian),  $^1\text{H}$  NMR (300 MHz), and  $^{13}\text{C}$  NMR (75.5 MHz) analyses in  $\text{CDCl}_3$ ; The compound was characterized by HPLC-UV mass spectra data peaks were detected at 210 nm and nuclear magnetic resonance (NMR) spectra data. To determine the 50% inhibitory concentration i.e.  $\text{IC}_{50}$  of parthenin, the MTT assay, micro method was followed. Briefly, log-phase Leishmania promastigote cells ( $2 \times 10^5/\text{well}$ ) were seeded in 96-well (Corning Inc., COSTAR). During In-vivo study, Female hamsters were infected, with  $2 \times 10^7$  amastigotes of Ag83 *L. donovani*, via the tail vein. After 30 days post infection the potency of infection has been checked against the drug and test compound doses that were given.

**Results:** A structure identified corresponding to a sesquiterpene lactone, 4,5 epoxy-germacra-1-(10),11(13)-dien-12,6-olide (parthenin) by nuclear magnetic resonance (NMR) and HPLC-UV mass spectra data peaks. Parthenin exhibit significant inhibitory activity on *L. donovani* promastigotes incubated with varying concentration (0 - 5 mg/ml) for 48 h of Parthenin and half of the inhibitory concentration ( $\text{IC}_{50}$ ) as determined from dose-response curve was  $0.65 \pm 0.03$  mg/ml. In-vivo results suggest that the load of the parasites was found to be significantly lower for group A ( $93.2 \pm 6.7\%$ ) compared with group B ( $74.6 \pm 14.8$ ).

**Conclusion:** The antileishmanial effect was found during in-vitro and in-vivo study. It will be worthwhile to instigate a large-scale study to look at the toxicity level in animal model before clinical studies are contemplated

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# Estimating Body Fat Percentage Using B-Mode Ultrasonic Technique versus Skinfold Caliper in Obese Healthy Volunteers

Journal Name, Volume, Issue, Date

DOI: 10.1002/... 2022

## Abstract

Background and aims: This study aimed to compare the accuracy of B-mode ultrasonic technique and skinfold caliper in measuring body fat percentage in obese healthy volunteers.





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UNESCO Chair in Community Based  
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University  
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## Case Study Report

on

# Role of youth in Prevention of Sexual Harassment At Work Place



**Case Study submitted by: Dr. Reeta Venugopal**  
**Professor of Physical Education and Director, Centre for**  
**Women's Studies, Pt. Ravishankar Shukla University,**  
**Raipur, Chhattisgarh, India**

**MTP Batch of 2018-19**



# The potential of ROS inhibitors and hydrated storage in improving the storability of recalcitrant *Madhuca latifolia* seeds

Jipsi Chandra<sup>1</sup>, Sershen<sup>2</sup>, Bobby Varghese<sup>2</sup> and S. Keshavkant<sup>1\*</sup>

<sup>1</sup> School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur, 492 010, India

<sup>2</sup> School of Life Sciences, University of KwaZulu-Natal, Westville Campus, Durban, 4001, South Africa

\* Author for correspondence (E-mail: skeshavkant@gmail.com)

(Submitted October 2018; Accepted February 2019; Published online March 2019)

## Abstract

The storage of recalcitrant seeds represents a challenge globally, threatening the germplasm conservation of many economically important tropical and sub-tropical species. This study investigated whether inhibitors of reactive oxygen species (ROS), diphenyliodonium (DPI) and dimethyl thiourea (DMTU), and hydrated storage can enhance the storability of *Madhuca latifolia* seeds. Treatment of *M. latifolia* seeds with varied concentrations of DPI and DMTU solutions revealed 150  $\mu$ M and 3000  $\mu$ M to be ideal concentrations, respectively. Soaking seeds in aqueous solutions of DPI and DMTU, and MilliQ water (MW; control) increased seed water content (WC), so seeds were initially dried back to their original WC, before hydrated storage at 25 and 16°C. A decline in germination (37%) and WC (42%) was observed after 69 days of hydrated storage at 25°C, and complete loss of viability after 120 days. A 50% decline in germination was recorded after just 19 days of hydrated storage at 16°C which is possibly indicative of sensitivity to low temperatures. Even though WC did not decline significantly at 16°C over the entire storage period, all viability was lost after 90 days. The ROS inhibitors did not extend storage lifespan relative to the control but reduced the rate of *in situ* germination during storage, without compromising viability. Hydrated storage at 25°C, coupled with pre-treatment with ROS inhibitors, is recommended for the short- to medium-term storage of *M. latifolia* seeds.

**Keywords:** desiccation, germination, *Madhuca latifolia*, seed longevity, viability, vigour, water content

## Introduction

Seed storage behaviour has been categorised as orthodox and recalcitrant, based on the capacity of seeds to withstand desiccation, *i.e.* tolerant and sensitive, respectively. Recalcitrant seeds do not undergo maturation drying, remaining metabolically active throughout development, and are often sensitive to low temperatures (Walters *et al.*, 2013). Even mild dehydration affects recalcitrant seed viability adversely, largely through deteriorative processes mediated by reactive oxygen species (ROS) (Berjak and Pammenter, 2013). In light of this, such seeds cannot be stored under conventional (orthodox) seed

## RESEARCH ARTICLE

## Exploring the Efficiency of Native Tree Species Grown at Mine Tailings for Phytoextraction of Lead and Iron

Inderpal Kaur<sup>1</sup> · Sayali Khandwekar<sup>1</sup> · Ravishankar Chauhan<sup>1</sup> · Vikram Singh<sup>2</sup> · S. K. Jadhav<sup>1</sup> · K. L. Tiwari<sup>1</sup> · Afaque Quraishi<sup>1</sup>

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**Abstract** Four (4) prominently growing tropical tree species were screened for their tolerance to heavy metals and evaluated for their suitability for remediation, at a contaminated site. The partitioning of Iron (Fe) and Lead (Pb) between roots and above-ground aerial parts of the trees, bioconcentration factor (BCF) and translocation factor (TF) were used to determine the remediation potential of the studied trees. *Ficus racemosa* recorded the highest BCF for both the metals, Fe and Pb. The maximum TF was recorded in *T. arjuna* for Fe and *F. racemosa* had the highest TF value for Pb. The recorded BCF and TF values suggested that these tropical tree species can be classified as efficient metal trappers for Fe and Pb. The Pb accumulation was much higher in all the four (4) tree species than the described limit for a Pb-hyperaccumulator (0.1%), revealing the hyperaccumulator potency of all the screened trees.

**Keywords** *Dalbergia sissoo* · *Ficus racemosa* · *Pithecellobium dulce* · Phytoremediation · *Terminalia arjuna*

**Significance statement** In the current manuscript, *Ficus racemosa* and *Terminalia arjuna* have shown their potential for remediation of lead and iron, respectively and accumulate the respective heavy metal more than the set standards for hyperaccumulator species.

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### Introduction

Environmental contamination caused by heavy metals (HMs), is a ubiquitous problem in industrial societies. In any ecosystem, HMs persist in the soil for a much longer time than the other essential components [1]. The reasons for soil contamination due to HMs include metalliferous mining and smelting metallurgical industries, sewage sludge treatment, and waste disposal sites [2]. HMs such as Cadmium (Cd), Lead (Pb), Magnesium (Mn) and Zinc (Zn) are well-known contaminants obtained from mining, which adversely affect the soils [3]. When HMs exceed certain concentrations, they become toxic [4], and pose serious health hazards to humans and animals [5].

HM deposits and minerals such as Alumina, Dolomite and Pyrite are found in the central part of India; including the state of Chhattisgarh [6]. Chhattisgarh also has several thermal power plants for energy production and heavy industries such as steel, aluminum and cement plants that lead to the increased deposition of Pb and other metals into the environment [6]. The district of Raigarh in Chhattisgarh is a center for sponge iron production industries with 22 sponge iron industries in operation and some more units coming up. Other than these industries, a big iron-steel factory, for the last 67 years, has been the mainstay of Bhilai.

Restoring degraded soil in any metal-mined land involves the deployment of many chemical, physical and biological techniques [7]. Phytoremediation, using hyperaccumulator plants, is one of these techniques. It is a practical, economical and environment-friendly way of metal remediation [8]. Due to their ability of growing in soils with very high concentrations of metals, hyperaccumulator plants play a significant role in remediation [9]. Reports suggest that only a few temperate trees such as

## Isolation and Identification of Novel *Bacillus tequilensis* TB5 from Vegetable Waste and Analyze the Effect of Rudiment Compounds on Bio-Catalytic $\alpha$ -Amylase Production

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Shailesh Kumar Jadhav<sup>1</sup>\*Kishan Lal Tiwari<sup>1</sup>

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<sup>2</sup>Department of Botany, Government DB Girls PG College, Raipur, Chhattisgarh, India

### Abstract

*Amylase is one of the basic components for leather, baking, textiles and paper industries. It hydrolyzes starch into simple productive sugar which reduces the cost of the final desired product. In this work, amylase producing novel Bacillus tequilensis TB5 was isolated from vegetable waste and different chemical compounds were added at different concentration in production medium to analyze its effect on amylase enzyme production. We observed that addition of weight volume (w/v) of starch 1.5%, yeast extract 1%, ammonium nitrate 0.1%, calcium chloride 0.2% and triton x 100 0.2% in the production medium increases the production of enzyme up to 546.64 ± 0.04 U/ml. Storage time of purified enzyme and activity yield was analysed and found to be 98.4% after 72 h, and reuse efficiency of immobilized enzyme was found to be 90% of efficiency after 5th cycle. Purification fold of enzyme shows increase from 1 to 1.93 and MW of purified enzyme was approximately 53 kDa. Enzyme kinetic studies reveal that the Michaelis constant (Km) was found to be 4.56 mg/ml and the reactions maximum velocity (Vmax) was 23.28 mg/ml.min. In summary, we demonstrate that some rudiment compounds present in production medium play a key role for the enhancement of enzyme production.*

**Keywords:**  $\alpha$ -amylase, enzyme production, *Bacillus*, media optimization, enzyme kinetics

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### INTRODUCTION



Amylase is the key enzyme for many industries like textile, leather, baking, pharmaceuticals, paper, detergent, etc. It plays an important role to reduce the production cost and increase the quality of the product. Amylase enzyme can be obtained from many sources, like, plants, microbes and from animals. Among them, microbial amylases have enormous applications in various starch based industries [1-6]. The  $\alpha$ -amylase enzyme hydrolyzes the starch and converts into simple sugars, glucose, maltose and other mixture of oligosaccharides. Further,  $\alpha$ -amylase enzyme acts on  $\alpha$ -1,4 glycosidic bonds of starch to form reducing sugar. Presently, the world market for this enzyme is about US\$ 2.7 billion and is exponentially increasing with the rate of 4%

annually [7]. Amylase covers 65% of enzyme market in the world compared to all other enzymes [8]. Nowadays, mostly amylase enzymes are produced from different *Bacillus* species [9, 10]. Enzyme overproduction can be achieved by media engineering and supplementation of different salts and metal ions, which provide nutrition for good growth of microbes and they produce high amount of enzyme [2]. Therefore, proper optimized medium for the bacterial culture is very important to enhance the production of enzymes [11, 12]. Different carbon sources and other nutrients like organic and inorganic nitrogen sources, and different metal ions are basic needs for the enzyme production. Along with these nutrients, its proper amount is also important for better enzyme production [13-

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## In vitro Antiviral Chemical Treatment to BBTv-Infected Banana Cultures for Production of Virus-Free Plants

*Afaque Quraishi, Vikram Singh, Vijaya Koche*

### Abstract

Obtaining healthy plants from infected germplasm banana stocks is a major problem. Banana bunchy top virus (BBTV) is the most destructive pathogen for the banana crop. Production of virus-free plants is crucial for cultivation, germplasm conservation and their exchanges. In vitro shoot meristem culture is the most common method for producing disease-free planting material. However, BBTV can multiply with in vitro cultures too. Therefore, for eliminating BBTV, the shoot-tip culture was combined with exposure of antiviral drugs. For the purpose, viral infected cultures of *Musa acuminata* cv 'Grand Naine' were exposed to culture medium containing- ribavirin, acyclovir or adefovir for four weeks at different concentrations. Viral elimination was determined by amplification of viral-gene through a polymerase chain reaction (PCR). Only ribavirin was found effective in eliminating BBTV from banana cultures, to some extent, with sufficient survival rates.

**Keywords:** Banana bunchy top virus (BBTV), chemotherapy, Musa, ribavirin, adefovir

**Cite this Article**  
 Singh V, Koche V, Quraishi A. In vitro antiviral chemical treatment to BBTv-infected banana cultures for production of virus-free plants. Research & Reviews: A Journal of Life Sciences. 2019; 9(3): 28-33p.

### Keywords

Banana bunchy top virus; chemotherapy; Musa; ribavirin; adefovir; acyclovir

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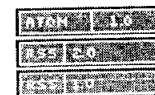
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## Detailed Report of Worksop/ Road Show

on

### “Brewing Bio-entrepreneurship in Raipur”

held at

**School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur**

Bio-entrepreneurship is the integration of two different disciplines, science and business. It is the flow of innovation from academia to industry. Bio-entrepreneurship is the use of biological entities or any idea, related to sciences for purpose of acquiring profit and establishing a business. History has proven that starting a new biotechnology company is not an activity for the faint of heart. Neither is it an endeavour that can be undertaken without patience, perseverance or optimism at their extremes. However, no matter how strong your character, there are three structural elements that are absolutely necessary for biotechnology success. We call these the "three pillars" of bio-entrepreneurship: a quality management team, adequate financing, and access to new technology that leads to products.

With this aim a one day workshop/ road show on “Brewing Bio-entrepreneurship in Raipur” was organized jointly by Technology Business Incubator (TBI), Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar, Regional Centre of BIRAC, DBT, New Delhi and School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur, on 29 August 2019 at 11:00 a.m. in the Seminar Hall of this School.

Biotechnology Industry Research Assistance Council (BIRAC) is a non-profit, public sector enterprise, set up by DBT, Government of India, New Delhi, as an interface agency to strengthen and empower the emerging Biotech enterprise to undertake premediated research and innovation, addressing nationally relevant product development needs. A TBI is a type of business incubator focused on supporting start-ups which use modern technologies as the primary means of innovation. TBI is an initiative of KIIT, which provides vibrant ecosystem for promoting innovation and entrepreneurship development, in various fields including life science through various government schemes.

The proposed event was graced by honourable Vice-Chancellor of Pt. Ravishankar Shukla University, **Professor K. L. Verma**. The workshop session started with warm welcome of esteemed guests, eminent scientists from KIIT-TBI, leading and amateur entrepreneurs by the

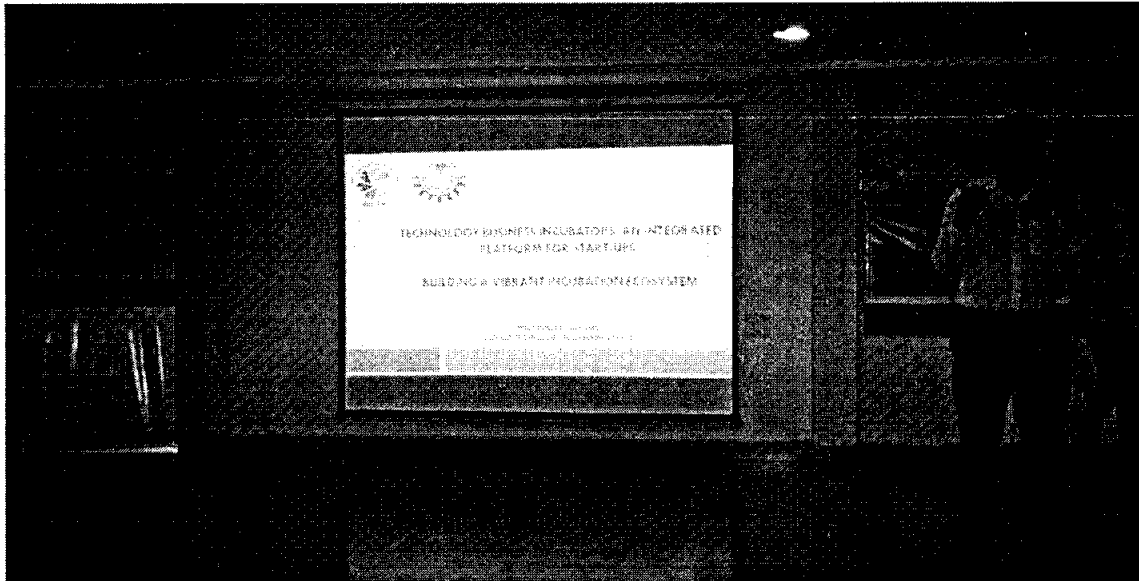


faculty members of School of Studies in Biotechnology. The opening speech of the session was delivered by the Honourable Vice-Chancellor. In his speech he heartily welcomed the team of KIIT-TBI and expressed his privilege of being the host of such an entrepreneurship programme.

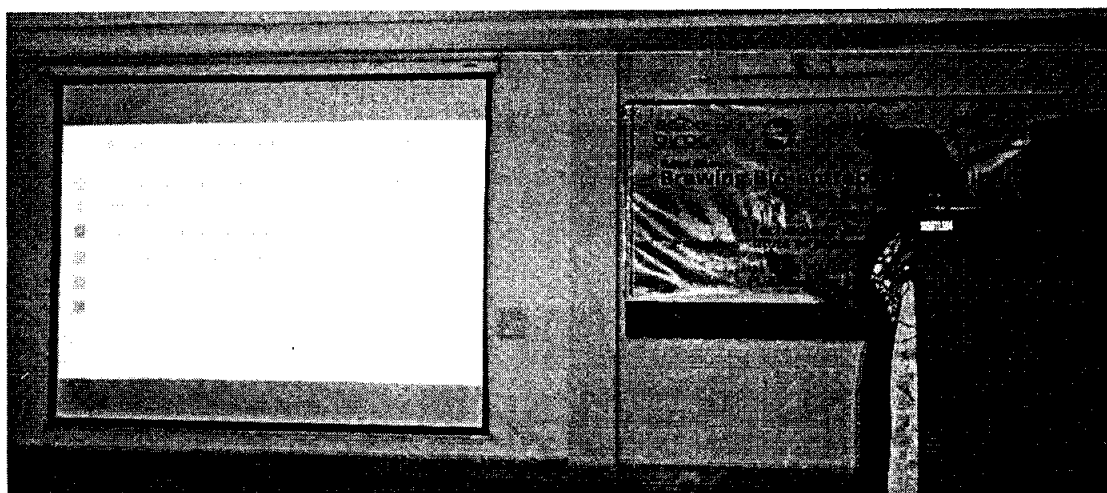


The introductory talk of the session was headed by **Dr. Mrutyunjay Suar**, CEO, KIIT-TBI, Bhubaneswar. In his talk, Dr. Suar provided baseline information on TBI as an integrated platform for start-ups for building a vibrant ecosystem. He apprised regarding various Government agencies such as BIRAC-DBT, DST (NIDHI scheme) NITI Aayog (AIC), MSME, TDB, DIT, MHRD, *etc.*, which stand as supporting pillars along with some PSUs for funding start-ups. More than 200 TBIs have been established so far in India of which only 20 are actively working, the reason being the lack of awareness regarding funding agencies and start-up establishment procedures. He shared success stories of many young entrepreneurs who converted their vibrant innovative idea into business in their start-ups with the help of KIIT-TBI.

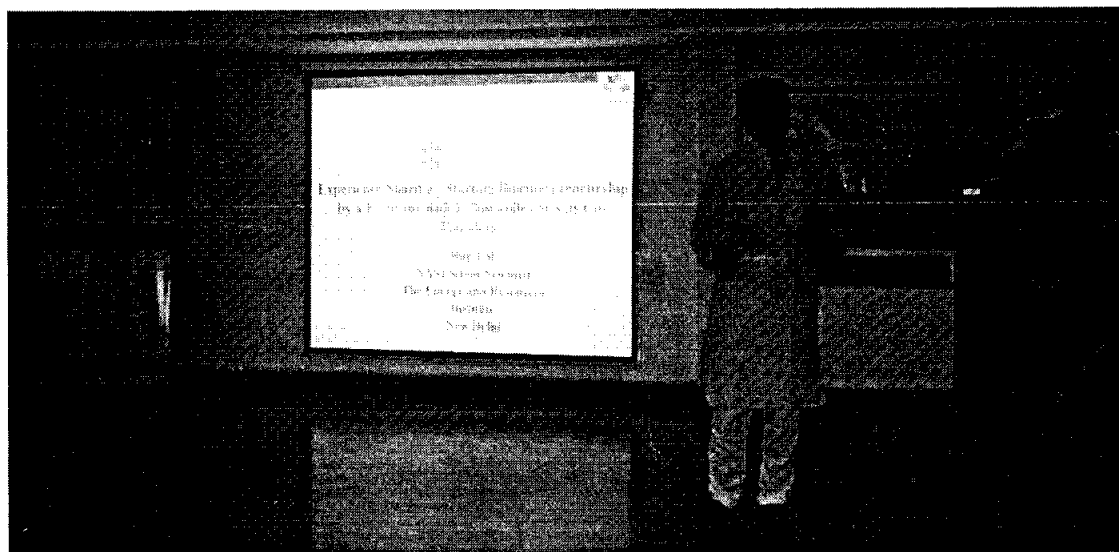




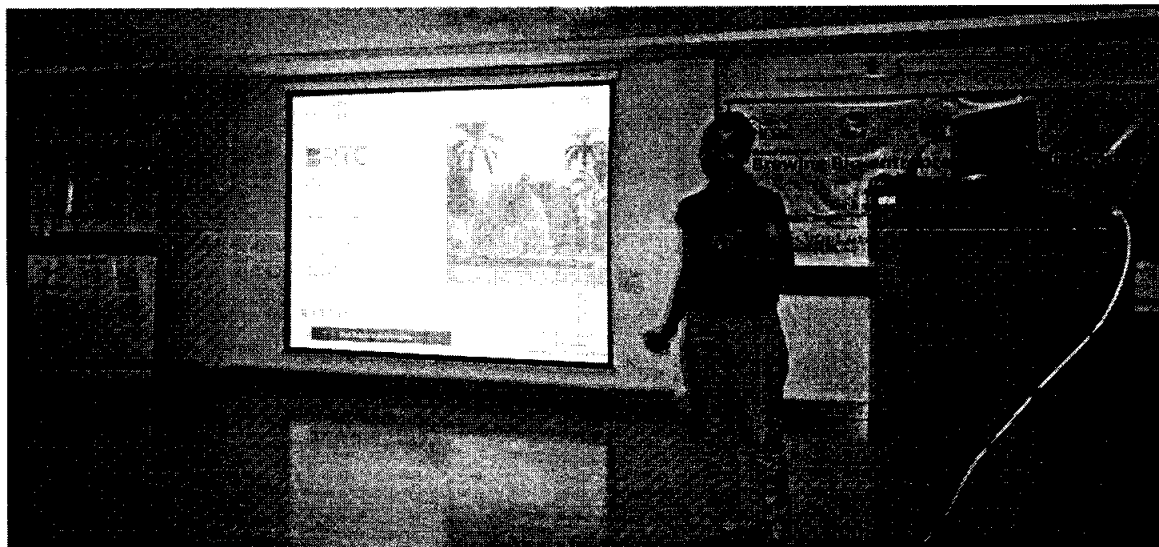
The second talk of the session was given by Dr. Namrata Misra, Head-Bioinnovation, KIIT-TBI, Bhubaneswar. She configured BRTC plan and action plan for start-ups in Raipur city of Chhattisgarh. She emphasized on “Building the Ecosystem : Start-up India – Make in India program” and visioned India as the 3rd largest start-up ecosystem in the world and one of the largest consumer markets with over 14,600+ start-ups with a funding support of 10,000 Crores. TBI aims in bringing together technologists, entrepreneurs and investors on one common platform. Hence provide opportunities in initiating start-ups. She detailed the funding grants available for start-ups viz.; Biotechnology Ignition Grant (BIG), Small Business Innovation Research Initiative (SBIRI), Biotechnology Industry Partnership Programme (BIPP), Promoting Academic Research Conversion to Enterprise (PACE) for academicians and faculties.



A wonderful experience was shared by eminent scientist, Professor **Rup Lal**, MD, PhiXgen Pvt Ltd, New Delhi, who narrated his journey and success story from being a Professor to a leading Bio-entrepreneur. He shared his experience on building his own start-up “PhiXgen” with his fellow colleagues as co-founders and the hurdles they faced right from the beginning of plan of action. He shared the work profile of his company which basically provides Genomic and Metagenomic analyses services, Technical services, Training Services and Healthcare products manufacturing, distribution, and marketing. Recently, PhiXgen has been allotted project on GIS-based Mapping of Microbial Diversity across the Ganges for Ecosystem Services Supported by National Mission for Clean Ganga (NMCG) with Project costing of 9.2 Crores.



The concluding talk of the workshop was delivered by **Ms Shivani Gupta**, a young Entrepreneur and Co-founder of Inochi Care Pvt Ltd, New Delhi, who shared her innovative idea of developing health care diagnostics for healing chronic wounds in her start-up. She has designed VACOX: Multitherapeutic Wound Healing Technology for faster healing of clinically complex wounds.



A total of 150 entries were registered for participation in the workshop/ road show which included faculties, research scholars and post graduate students from various institutions like School of Studies in Biotechnology, Institute of Pharmacy, National Centre for Natural Resources, and School of Life Sciences of Pt. Ravishankar Shukla University Raipur, and colleges like Govt Nagarjuna Science College, Raipur; Pt. Jawahar Lal Nehru Medical College, Raipur; Indira Gandhi Agriculture University, Raipur; Seth Phoolchand Agrawal Smriti PG College, Nawapara-Rajim; Govt. Digvijay College, Rajnandgaon; Bhilai Mahila Mahavidyalaya, Bhilai; and Shri Swami Swaroopanand Saraswati Mahavidyalaya, Bhilai. The focal point of the workshop/ road show was the announcement made by Honourable Vice-Chancellor of Pt. Ravishankar Shukla University, Raipur; he declared establishment of TBI Centre in the university campus. The session ended up with questionnaire and active discussion between the participants and eminent speakers.

## RESEARCH PAPERS

Aluminium Rhizotoxicity in *Cicer arietinum*J. Chandra<sup>a</sup>, S. Parkhey<sup>b</sup>, D. Varghese<sup>c</sup>, Sershen<sup>c, d</sup>, B. Varghese<sup>c</sup>, and S. Keshavkant<sup>a, \*</sup><sup>a</sup>School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur, 492010 India<sup>b</sup>School of Life Sciences, Pt. Ravishankar Shukla University, Raipur, 492010 India<sup>c</sup>School of Life Sciences, University of KwaZulu-Natal, Westville Campus, Durban, 4001 South Africa<sup>d</sup>South African Technology, La Lucia, 4051 Durban

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Received August 10, 2019; revised November 27, 2019; accepted January 20, 2020

**Abstract**—The effects of aluminium (Al)-induced alterations on elongating radicles of *Cicer arietinum* L. were studied in relation to growth and biochemical markers of oxidative stress. Elongating radicles (c. 1 mm) were treated with 0–3 mM aluminium chloride (pH 4.5) for seven days at room temperature (26 ± 2°C). The results indicated that exposure to Al significantly inhibited radicle growth. This growth inhibition was accompanied by excessively high levels of reactive oxygen species (ROS) production. The levels of ROS were significantly positively correlated with Al concentration. Levels of lipid and protein oxidation products increased significantly with an increase in Al concentration, and were significantly positively correlated with ROS levels. On the other hand, Al stress significantly decreased the activities of selected enzymatic antioxidants. Collectively, the results suggest that Al rhizotoxicity in *C. arietinum* is partially mediated by oxidative stress brought about by excessive ROS production and reduced antioxidant scavenging activity.

**Keywords:** *Cicer arietinum*, protein oxidation, oxidative stress, lipid peroxidation, biomass, enzymatic antioxidants

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## INTRODUCTION

Agriculture in many parts of the world is restricted by acidic soils that contain excessively high concentrations of mineral elements. About 50% of the world's potentially arable soils are thought to be sufficiently acidic to significantly limit crop production [1], largely due to aluminium (Al) toxicity. This is particularly true for developing countries like India, where Al toxicity is one of the most widespread problems in acidic soils [2]. Aluminium, which is one of the most abundant metals in the Earth's crust and is highly soluble in soils at low pH levels, often, brings about root growth inhibition, consequently poor plant nutrient uptake and inefficient water use [2]. The Al<sup>3+</sup> ion is the most toxic among all. The soluble forms of Al preferentially accumulate in the root tips [3]. This accumulation at the root tip has been reported to bring about rhizotoxicity (inhibition of root elongation), which is widely recognized as one of the primary symptoms of Al phytotoxicity [4].

Though the molecular mechanisms involved in Al toxicity are unclear [5], there is sufficient evidence to suggest that Al-induced rhizotoxicity depends on various factors regulating cell elongation [5]. The binding of Al to the receptors of plasma membranes are a matter of great interest since it can result in membrane dysfunction and oxidative stress, which stimulates defence-related signalling cascades [5]. The oxidative stress arises due to over accumulation of reactive oxygen species (ROS), which can result in oxidation of membrane lipids and proteins, along with the interference in signal transduction mechanisms. Aluminium can also enter the cell by passing through plasma membranes and thereafter bind directly to DNA and RNA [6]. Despite numerous reports on the involvement of oxidative stress in Al toxicity [6, 7], it should be noted that since Al itself is not a transition metal, it couldn't catalyze redox reactions. Rather, Al has a strong affinity for bio-membranes and causes the rigidification of membranes [8], facilitating free radical chain reactions [mediated by Ferrous (Fe) ions] which promote the peroxidation of membrane lipids. This reaction was reported in *Glycine max* roots [9]; however, in radicles of *Pisum sativum*, the peroxidation of lipids was observed in the absence of Fe supplementation. The peroxidation of lipids is also an early symptom of Al toxicity that appears to cause callose production, in

**Abbreviations:** APX—ascorbate peroxidase; CAT—catalase; GR—glutathione reductase; H<sub>2</sub>O<sub>2</sub>—hydrogen peroxide; HNE—4-hydroxy-2-nonenal; LOOH—lipid hydroperoxide; O<sub>2</sub><sup>•-</sup>—superoxide radical; PUFAs—polyunsaturated fatty acids; POD—guaiacol peroxidase; SOD—superoxide dismutase.



# Screening of plant growth promoting attributes and arsenic remediation efficacy of bacteria isolated from agricultural soils of Chhattisgarh

Neha Pandey<sup>1,2,3</sup> · Kiragandur Manjunath<sup>2</sup> · Keshavkant Sahu<sup>1</sup>

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## Abstract

Arsenic (As) resistant indigenous bacteria with discrete minimum inhibitory concentration values for arsenate [As(V)] and arsenite [As(III)] were isolated from the paddy fields of different regions of Chhattisgarh, India, following enrichment culture technique. Evaluation of the plant growth promoting (PGP) properties of the isolates revealed that two rod-shaped Gram-positive bacteria viz., ARP2 and ART2 acquired various PGP traits, including phosphate solubilization, production of siderophore, indole acetic acid, ammonia, and exopolysaccharide. Both the isolates significantly increased (40–80%) the root length of *Oryza sativa* L. even under As-exposure. Sequencing of 16S rRNA gene identified these isolates as *Bacillus nealsonii* strain ARP2 and *Bacillus tequilensis* strain ART2, respectively. Isolate ARP2 exhibited arsenate reductase activity thereby rapidly reduced As(V) into As(III), achieving a reduction rate of 37.5  $\mu\text{M min}^{-1}$ . Alike, strain ART2 was capable of oxidizing As(III) into As(V) via arsenite oxidase enzyme, and revealed the oxidation rate of 21.8  $\mu\text{M min}^{-1}$ . Quantitative estimation of As through atomic absorption spectrophotometer revealed that the isolates ARP2 and ART2 removed  $93 \pm 0.2\%$  and  $77 \pm 0.14\%$  of As(V) and As(III), respectively, from As-containing culture media. The FTIR analysis showed the interaction of As with the cell membrane and was further confirmed by SEM and TEM techniques, which marked the increase in cell volume owing to successive accumulation of As. The As-resistant and PGP properties of above two isolates demonstrates their potentiality for sustainable bioremediation of As, and establishment of flora in As-rich environment.

**Keywords** Arsenic resistant bacteria · Arsenite · Arsenate · Oxidation · Plant growth promotion · Bioremediation

## Introduction

Arsenic (As) is a metalloid, naturally present in the Earth's crust and is identified as one of the most ruinous threat demanding immediate attention. Environmental contamination of As has gathered worldwide concern due to its many documented menacing effects on almost all the living

organisms (Mandal and Suzuki 2002). Arsenic is introduced into the ecosystems through natural- and anthropogenic activities, making its ways to the food chain (Garelick et al. 2008). Several noxious forms of As have been reported, but the inorganic trivalent arsenite [ $\text{AsO}_2^-/\text{As(III)}$ ] and the pentavalent arsenate [ $\text{AsO}_4^{3-}/\text{As(V)}$ ] are the most prevalent ones (Ascar et al. 2008). Other than the humans and animals, As also extends its deleterious effects on plants by inactivating enzymes and altering metabolic pathways. Once taken up by the cells, both As(V) and As(III) severely inhibit growth by slowing, arresting or disrupting plants metabolism along with impairing reproductive capacity and leading to the loss in production and yield (Zhao et al. 2009).

The toxic properties of As is not only limited to higher life forms but are also conveyed to the lower organisms like microbes (Abbas et al. 2015). This metalloid is known to deliver a number of lethal- and mutagenic effects on variety of microorganisms, nevertheless, they have acquired modes to undermine its toxic effects (Naureen and Rehman

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Perspective

Titanium nanoparticles attenuates arsenic toxicity by up-regulating expressions of defensive genes in *Vigna radiata* L

Priya Katiyar<sup>1</sup>, Bhumika Yadu<sup>1</sup>, Jyoti Korram<sup>2</sup>, Manmohan L. Satnam<sup>2</sup>, Meetul Kumar<sup>3</sup>, S. Keshavkant<sup>1,\*</sup>

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*Vigna radiata* L

ABSTRACT

Arsenic (As)-toxicity is recognized as one of the major environmental problems, affecting productivity of crops worldwide, thereby threatening sustainable agriculture and food security. Progression in nanotechnology and its impacts have brought up concerns about the application of engineered nanoparticles (NPs) in various sectors of the economy, including the field of agronomy. Among various NPs, there has been a rising amount of interest regarding the effects of titanium NPs (TiNPs) on plants growth and development, and their fate of abiotic stress tolerance. Hence, the present study was aimed to assess the ameliorative potentialities of chemically and biologically/green synthesized TiNPs to alleviate As-induced toxic responses in *Vigna radiata* L. The results revealed that exposure to As hindered the growth indices (radicle length and biomass) and membrane integrity, while were improved with the application of chemical and green synthesized TiNPs. In addition, treatment of As provoked the accretion of reactive oxygen species (superoxide and hydrogen peroxide) and malondialdehyde (a lipid peroxidized product), but were diminished by the supplementation of chemical and green manufactured TiNPs. The experimental data also signified that exogenous application of chemical and green synthesized TiNPs conferred tolerance to As-induced oxidative injuries via perking-up the expressions of antioxidant genes and enzyme systems viz; superoxide dismutase and catalase. Therefore, the present study inferred that chemically and green synthesized TiNPs, particularly green manufactured, effectively mitigated the adverse impacts of As by augmenting antioxidant machinery, thereby proving its potentiality in the alleviation of As-toxicity, at least in the *Vignaradiata* L.

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# Silica nanoparticle minimizes aluminium imposed injuries by impeding cytotoxic agents and over expressing protective genes in *Cicer arietinum*

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## ARTICLE INFO

### Keywords:

Antioxidants  
Gene expression  
Lipid peroxidation  
Membrane stability  
Oxidative stress  
Silica nanoparticle

## ABSTRACT

Nanoparticles (NPs) and nano-technological applications in varied economic sectors including agriculture, accomplished great attention in last decades, worldwide. In several instances, NPs has been applied as pre-treatment or toxicant scavenging agent for promoting seed germination/ plant growth responses or for abiotic stress amelioration. In order to promote this propensity, the development of sustainable eco-friendly processes for NP production is of utmost importance. In this study, silica NPs (SiNP) were synthesized following both chemical and biological (green) procedures, and were tested for their ameliorative efficacies against aluminium (Al)-induced toxicity in *Cicer arietinum*. Synthesized NPs were initially characterized following standard methods such as dynamic light scattering/ zetasizer, fourier transform infrared spectroscopy and UV-vis spectroscopy. Experimental results revealed that upon Al-exposure, growth traits and plasma membrane stability of *C. arietinum* were severely repressed along with increased accumulations of reactive oxygen species and malondialdehyde (an outcome of lipid peroxidation reaction), with consequent decline in the activities/ expression profiles of key defensive genes. However, exogenously applied SiNPs provided tolerance to growing *C. arietinum* against Al-toxicity by compensating the cellular redox homeostasis via enhancing the levels/ expression patterns of antioxidants genes and reducing cytotoxic products of lipid peroxidation. Both chemical and green manufactured SiNPs were ascertained as efficient ameliorating agents against Al-stress, at least for *C. arietinum*, but the green synthesized were proven to be comparatively more proficient in mitigating injury symptoms, even in relatively low concentration than the chemically manufactured particles.

## 1. Introduction

Nanotechnology has brought revolution in the field of agriculture and crop productivity by its contribution in the development of new sustainable strategies of crop protection and food production (Fraceto et al., 2016). During the past decade, a number of engineered nano-products incorporating nanoparticles (NPs), nanosensors, nanofertilizers, nanopesticides, etc., have been developed to promote the efficiency and sustainability of agricultural practices, globally (Mahakham et al., 2017). Most of these NPs are synthesized through different physical and chemical methods, which are known to cause numerous environmental and biological hazards in varying intensities (Singh et al., 2016). Therefore, NPs to be applied efficiently in the agricultural sectors should be eco-friendly, economical, non-toxic and biocompatible in nature, and may be synthesized following other than the conventional procedures (Mahakham et al., 2016). The green syntheses of NPs following the use of plant products as reducing agents

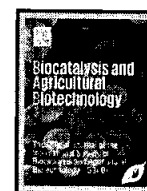
is an efficient, lucrative, fast and eco-friendly technique (Borase, 2014; Yugandhar and Savithramma, 2016).

In recent past, most of the scientists have adopted green synthesis methods for the production of NPs of calcium (Yugandhar and Savithramma, 2013), copper (Shende et al., 2015), gold (Gopinath et al., 2014), iron (Naseem and Farrukh, 2015), silica (Babu et al., 2018), silver (Yasir et al., 2018) and zinc (Bala et al., 2015) by using extracts of various plants. Among these, silica nanoparticles (SiNPs) are well known in the fields of chemistry, physics and biology due to distinct properties of these (Babu et al., 2018). A number of biological applications of SiNPs were evaluated previously, by different researchers, in the fronts of plant biology and medicine more particularly (Koskimaki et al., 2015).

Silica is considered as a non-essential element for plants growth and development; however, increasing evidence in the literature showed that this metalloid is beneficial to plants, especially under stress conditions (Coskun et al., 2016; Guerriero et al., 2016). Indeed, Si

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## Production of biocatalyst $\alpha$ -amylase from agro-waste 'rice bran' by using *Bacillus tequilensis* TB5 and standardizing its production process

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### ARTICLE INFO

**Keywords:**  
 $\alpha$ -Amylase  
 Agro-waste  
*Bacillus tequilensis*  
 Rice bran

### ABSTRACT

Processing (milling, oil extraction) of agricultural products result in accumulation of massive amount of agro-waste residues. A sustainable alternative technique is required to utilize those agro-waste residues through biotechnology to convert them into useful products.  $\alpha$ -Amylase is an enzyme of glycoside hydrolases family which hydrolyzes the  $\alpha$ -D-(1,4) glycosidic bond. In the present research, *Bacillus tequilensis* TB5 was hired for the  $\alpha$ -amylase production through SmF by utilizing agro-waste substrate rice bran. Also, the role of varying Physico-chemical parameters on  $\alpha$ -amylase production was evaluated to determine the optimal conditions required for its maximum production. The findings of this research revealed that the optimal conditions for maximum yield ( $39.736 \pm 0.296$  U/ml) were found at pH 6.0, temperature 37 °C and incubation period of 72 h. On analyzing influence of various nutritional supplement on enzyme production, it was found that some of the nutrients like; peptone, beef extract, ammonium chloride, ammonium sulphate can enhance enzyme yield at a particular concentration. Purification of  $\alpha$ -amylase was also done through ammonium sulphate precipitation method and then molecular weight of 54 kDa was determined by SDS-PAGE. The present research carried strongly supports, that rice bran is an efficient agro-waste substrate can possibilities of the commercial production of  $\alpha$ -amylase.

### 1. Introduction

Enzymes are biocatalyst that are exceptionally fit and explicit under various environmental conditions and that's why they have numerous industrial applications (Pandey et al., 2017). Over the most recent decade many advancement can be seen in enzyme technology. Amylase hydrolyzes the  $\alpha$ -1,4-glycosidic bond which occurs in starch, glycogen and various related polysaccharides to release simple sugar like glucose and maltose in an  $\alpha$ -anomeric form (Xie et al., 2014; Elumalai et al., 2019; Herrera-Márquez et al., 2019). Amylases are the glycoside hydrolases which are ubiquitous in nature, produced by numerous animals, plants, bacteria, fungi and molds; but the majority applications of  $\alpha$ -amylase in a number of modern biotechnological purposes are chiefly derived from bacteria and fungus (Kumar et al., 2013). Various species of Genus *Bacillus* are used for the industrial production of  $\alpha$ -amylase (Paul et al., 2017). Commercial application of  $\alpha$ -amylase enzyme is in textile, food, detergent, paper, sugar and

pharmaceutical industry (Pandey et al., 2017; Asrat and Girma, 2018). Numerous strategies are developing day by day to produce large amount of amylase for industrial purposes and that too by utilizing various cost-effective substrate (Pascoal et al., 2011; Ahmed et al., 2019). Several characteristics of  $\alpha$ -amylase enzyme including specificity, stability, optimum pH and temperature influence its performance, economics and feasibility (Finore et al., 2014). For its entire activity an enzyme requires a selected pH, temperature and incubation period (Paul et al., 2017). At present, amylase production covers up to 65% of the enzyme market globally and is constantly increasing (Simair et al., 2017).

Further, the selection of an appropriate substrate is moreover necessary for fermentation processes (Aullybux and Puchooa, 2013). Generally, at commercial scale starch is employed for the amylase production through bacteria.  $\alpha$ -Amylase production by using synthetic media through SmF is extremely expensive and uneconomical. To minimize the production cost, utilization of agro-waste residue might be a po-

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# Influence of protein damage and proteasome gene expression on the longevity of recalcitrant *Madhuca latifolia* Roxb. seeds

Jipsi Chandra, Mahima Dubey, and S. Keshavkant

**Abstract:** Enhanced cellular damage during desiccation is considered to be one of the key factors limiting vigour and viability of seeds. The uncontrolled accumulation of reactive oxygen species and resultant damaging reactions such as the oxidation of lipids and DNA in desiccating seeds of *Madhuca latifolia* (Roxb.) J. F. Macbr. has already been well characterized. However, hydrolytic and (or) oxidative damage to proteins requires further study. This study investigated the desiccation-induced oxidative damage to proteins and proteolytic systems in recalcitrant *M. latifolia* seeds during ambient storage. Seeds experienced a significant drop in seed water content [ca. 1.32 to ca. 0.23 g·(g dry mass)<sup>-1</sup>] during storage resulting in complete loss of viability after 35 days of storage. A considerable decline in total protein content (3.0–3.6 fold) and activity (4.8–13.8 fold) in the gene expressions of proteasome subunits ( $\alpha$ ,  $\beta$ , and E2) were recorded in the embryonic axis of desiccating *M. latifolia* seeds. In contrast, increases in the level of protein carbonyls (2.46 fold), hydroperoxides (2.31 fold), malondialdehyde- and 4-hydroxy-2-nonenal-protein adducts (1.8 and 3.9 fold), and Amadori and Maillard reaction products, along with proteases (14.5–30.4 fold) were observed in desiccating *M. latifolia* seeds. This study revealed that increased oxidation/modification of proteins and proteasome dysfunction are involved in the deterioration of desiccating *M. latifolia* seeds.

**Key words:** Amadori and Maillard reactions, protease, proteasome, protein oxidation, water content.

**Résumé :** L'accroissement des dommages cellulaires lors de la dessiccation est considéré comme l'un des principaux facteurs limitant la vigueur et la viabilité des semences. L'accumulation incontrôlée de dérivés réactifs de l'oxygène et les réactions dommageables qui en résultent, comme l'oxydation des lipides et de l'ADN, dans les graines de *Madhuca latifolia* (Roxb.) J. F. Macbr. ont été caractérisées antérieurement. Toutefois, les dommages hydrolytiques ou oxydants aux protéines exigent des études plus poussées. Cette étude s'est penchée sur les dommages oxydants provoqués par la dessiccation aux protéines et aux systèmes protéolytiques des semences récalcitrantes de *M. latifolia* durant un entreposage en conditions non contrôlées. Les semences ont subi une chute significative de leur teneur en eau [d'environ 1,32 à environ 0,23 g·(g de poids sec)<sup>-1</sup>] lors de l'entreposage, donnant lieu à une perte complète de viabilité après 35 jours d'entreposage. Une baisse considérable du contenu total en protéines (3,0 à 3,6 fois), et de l'activité (4,8 à 13,8 fois) ou de l'expression génique des sous-unités du protéasome ( $\alpha$ ,  $\beta$  et E2) a été enregistrée dans l'axe embryonnaire des graines de *M. latifolia* au cours de la dessiccation. Par contre, une augmentation du niveau de résidus carbonyles sur les protéines (2,46 fois), de peroxyde d'hydrogène (2,31 fois), d'adduits de malondaldéhyde et de 4-hydroxy-2-nonénal sur les protéines (1,8 et 3,9 fois), de produits de la réaction d'Amadori et Maillard, de même que de protéases (14,5 à 30,4 fois) a été observée dans les graines de *M. latifolia* durant la dessiccation. Cette étude a révélé qu'une oxydation ou des modifications accrues des protéines et un dysfonctionnement du protéasome sont impliqués dans la détérioration des graines de *M. latifolia* au cours de la dessiccation. [Traduit par la Rédaction]

**Mots-clés :** réactions d'Amadori et Maillard, protéase, protéasome, oxydation protéique, teneur en eau.

## Introduction

*Madhuca latifolia* (Roxb.) J. F. Macbr. (family Sapotaceae) is a large, gregarious, deciduous tree with short bole, wide girth, large rounded crown and spreading branches, and grows widely under tropical and sub-

tropical climate conditions (Chandra and Keshavkant 2018). It is one among 8% of the world's plant species that are reported to produce desiccation intolerant seeds (Wyse and Dickie 2017), and have been characterized as recalcitrant with respect to their storability in gene

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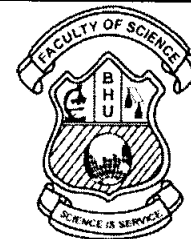
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# Alkamides: Multifunctional Bioactive Agents in *Spilanthes* spp.

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**Abstract:** Plant bioactives have always been a source of many valuable medicines. Alkamides are a class of pseudoalkaloidbioactives that are distributed among 33 medicinal plant families including Asteraceae (Compositae). Genus *Spilanthes* of Asteraceae family is a storehouse of various potent alkamides. *Spilanthes* is considered as a key compound with its maximum concentration in the flower heads. Alkamides are pungent in taste and show analgesic and anaesthetic properties. These have been reported to exhibit significant larvicidal/insecticidal, antimicrobial, aphrodisiac, antimutagenic, anti-inflammatory and immune-enhancing pharmacological activities. Also, transdermal and transmucosal behaviour of spilanthol has been well documented. Therefore, alkamide content make this genus a promising medicinal plant with several biological and pharmacological activities. Thus, this review presents an overview of different alkamides in *Spilanthes* with an emphasis on their properties, distribution, pharmacological aspects and mode of administration.

**Index Terms:** Alkamide, Anti-inflammatory, Asteraceae, Bioactive, Insecticidal, *Spilanthes*.

## I. INTRODUCTION

Medicinal plants have been a source of powerful bioactive agents since time immemorial virtually in all cultures and have provided valuable drugs such as analgesics (morphine), antitussives (codeine), antihypertensives (reserpine), cardiotonics (digoxin), antineoplastics (vinblastine and taxol) and antimalarials (quinine and artemisinin) (Ramawat *et al.*, 2009). There are about 2, 50,000 higher plant species on the earth, out of which more than 80,000 are found to possess medicinal value. But due to the lack of proper documentation and scientific validation only a small proportion of the plants are used for their medicinal values (Balunas & Kinghorn, 2005). However, the recent past has witnessed a tremendous revival of interest in the use of medicinal plant products due to the various drawbacks associated with synthetic medicines. Hence, there is a

need to review the valuable knowledge regarding medicinal plants with proper investigation of bioactive compounds and their properties.

Plant bioactives are the secondary products of primary metabolism representing an important source of active pharmaceuticals. These have been defined as chemicals that do not appear to have a vital biochemical role in the process of building and maintaining plant cells but apparently function as defence (against herbivores, microbes, viruses or competing plants) and signal compounds (to attract pollinating or seed dispersing animals) (Beranet *et al.*, 2019; Briskin, 2000; Kaufman *et al.*, 1999; Wink & Schimmer, 1999). Such secondary products involved in plant defence through cytotoxicity towards microbial and insect pathogens could prove useful as antimicrobials and insecticides for human benefits (Benelli *et al.*, 2018).

One highly promising class of secondary compounds i.e 'Alkamides' form active constituent of many plant families. Genus *Spilanthes* (Asteraceae) popularly known as Toothache Plant has been found as a storehouse of alkamides. Out of 60 species of the genus scattered all over the tropical areas of the globe (Jansen, 1981), six species *S. acmella* Murr. (syn. *Acmellaciliata*), *S. acmella* L. var. *oleraceae* (syn. *Acmellaoleraceae* L.), *S. calva* L., *S. paniculata* and *S. mauritiana* L. have been accounted from Chhattisgarh (Tiwari *et al.*, 2011), Jharkhand (CSIR, 1989) and Rajasthan regions (Sharma *et al.*, 2010) of India. The genus *Spilanthes* has been reported to possess erect or prostrate stems, triangular, dentate and opposite leaves. Flowers grow solitary with long peduncle and have yellow florets with dark red spot in the centre (Tiwari *et al.*, 2011).

Out of the several phytochemicals reported from *Spilanthes*, alkamides have been considered to be responsible for most of its medicinal properties so far. Presently, alkamide containing extracts of *Spilanthes* are commercially sold as dietary supplements, powerful antiseptics (Dentaforce mouth spray &



## Research article

## Carbon dot induces tolerance to arsenic by regulating arsenic uptake, reactive oxygen species detoxification and defense-related gene expression in *Cicer arietinum* L

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## ARTICLE INFO

## Keywords:

Arsenic  
Carbon dot  
*Cicer arietinum* L.  
Gene expression  
Nanomaterials  
Oxidative damage  
Reactive oxygen species

## ABSTRACT

The scientific and technological applications of one of the nanomaterials viz.; carbon dot (C-dots), having extraordinary properties, is becoming an emerging and ongoing research area in recent times. In the present study, we have evaluated the effectiveness of C-dots in reducing arsenic (As) toxicity by analyzing physiological, biochemical and molecular parameters in *Cicer arietinum* L. The results revealed that As decreased the germination rate, growth, biomass, and membrane stability of the cell to a significant extent. Further, As was taken up by the growing seeds which eventually caused cell death. Levels of reactive oxygen species (ROS), stress markers (malondialdehyde), activities of defensive enzymes (glutathione-S-transferase and pyrroline-5-carboxylate synthetase) and non-enzymatic antioxidant contents (proline and glutathione) were increased under As stress. Moreover, As treatment resulted in the up-regulation of expressions of NADPH oxidase and defense-related genes in *Cicer arietinum* L. However, application of C-dots along with As improved the germination and growth of *Cicer arietinum* L. Exogenous application of C-dots, enhanced the expressions of defense-related genes and, contents of proline and glutathione, thereby causing considerable reductions in ROS, and malondialdehyde levels. Overall, this study suggests the possible involvement of C-dots in lowering the toxic effects of As on biomass by reducing As uptake and, inducing the activities/gene expressions and contents of enzymatic and non-enzymatic antioxidants.

## Author contribution

Vibhuti Chandrakar, Bhumika Yadu, Jyoti Korram, Manmohan L. Satnami, Amit Dubey, Meetul Kumar, S. Keshavkant.

## 1. Introduction

Arsenic (As) is a non-essential metalloid, which instigates many toxic effects in the living systems (Kidwai et al., 2019). The plant roots absorb As predominantly in its inorganic forms: arsenate ( $As^V$ ) and arsenite ( $As^{III}$ ).  $As^{III}$  is considered to be more toxic to plants, since it permeates the membrane and reacts with the sulphhydryl groups of plant proteins

and enzymes, disconcerting energy flow, causing leaking of electrolytes and generating reactive oxygen species (ROS) (Singh et al., 2015). A membrane localized enzyme NADPH oxidase (NOX) is also responsible for the production of ROS in plant cells (Reddy et al., 2015). These ROS oxidize/damage most major cellular bio-polymers such as lipid, protein, etc., resulting in the dysfunction, and sometimes death of the cells. A product of lipid peroxidation reaction; malondialdehyde (MDA) leads to disintegration of cellular organelles, oxidation and dysfunction of proteins and nucleic acids (Singh et al., 2015).

To counter the As stress, plants detoxify this metalloid by promptly converting it into  $As^{III}$ , in the cytosol, by arsenate reductase. This  $As^{III}$  is then expelled outside of the cell or sequestered into the vacuoles

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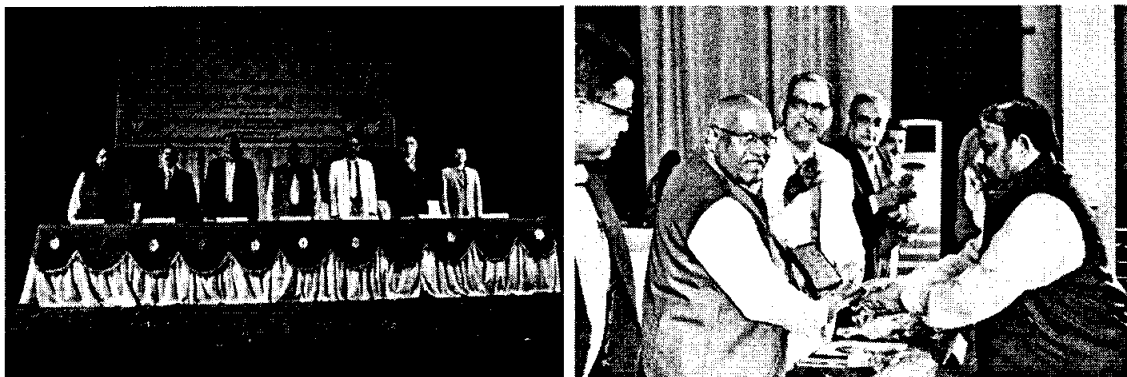
## Report of the National Conference

*held at*

**School of Studies in Biotechnology, Pt. Ravishankar Shukla University, Raipur 492 010**

Three days national conference from 10<sup>th</sup> -12<sup>th</sup> January 2020 was organized by School of Studies in Biotechnology, Pt. Ravishankar Shukla University Raipur, Chhattisgarh in collaboration with Pt. Deendayal Upadhyay Memorial Health Sciences and AYUSH University of Chhattisgarh, Raipur, on Recent Advances and Trends in Biotechnology.

The inaugural function was presided by Prof. Keshari Lal Verma, Honorable Vice Chancellor, Pt. Ravishankar Shukla University, Raipur Chhattisgarh. Dr. P.G. Rao, CSIR- former director, and distinguished Scientist, CSIR-NEIST, Jorhat was present as Chief guest, while, Dr. Manoj Prasad, Senior Scientist, National Institute of Plant Genomic Research, New Delhi was the Guest of honor. Prof. Girish Kant Pandey, Registrar, Pt. Ravishankar Shukla University, Raipur Chhattisgarh and Dr. R. Hishikar, Registrar, PDUMHSAU, Raipur, were also present for the same.

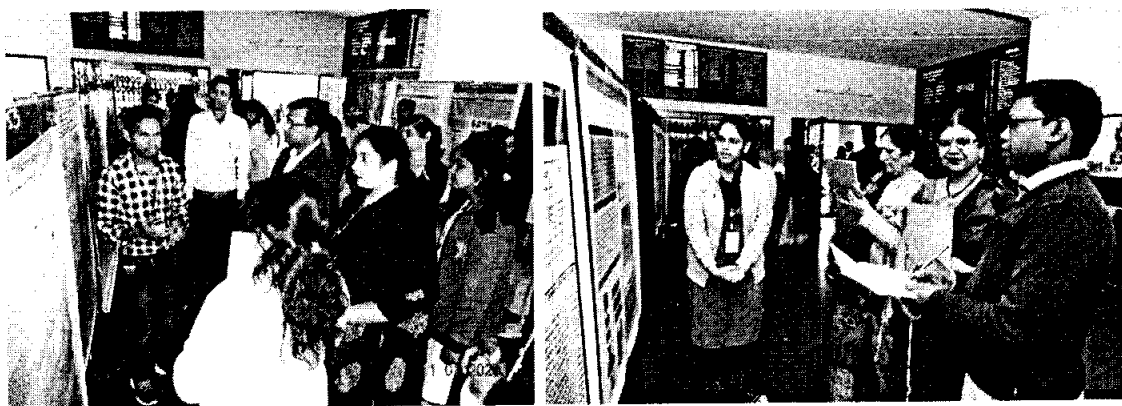


Dr. Manoj Prasad delivered the key note lecture titled '**Structural and Functional Genomic Interventions in the C4 model. Foxtail Millet (*Setaria italica* L.) towards Enabling Climate Resilient Agriculture**'. He described the development of molecular markers like EST-SSRs, intron length polymorphisms, miRNA-based and transposable elements-based markers in foxtail millet which can aid in the further construction of physical maps, germplasm characterization, phylogenetics and comparative mapping studies with respect to other millets, cereals and bioenergy grasses. He concluded that the genetic and genomic resource obtained through these

techniques would help in crop improvement programs involving millets, non-millets and bioenergy grass species, and thus possess a scope for addressing global food insecurity.

In this Conference, more than 300 young and seniors scientists, faculties and students from various esteemed organizations recorded their participation. A total of 255 young researchers registered in this conference out of which 238 attended the event.

A total of 14 renowned scientists/ academicians from prestigious organizations delivered invited lectures. A total of 161 abstracts were received for this Conference, out of which 89 were listed for oral presentation and 72 for posters. Total 117 (47 oral and 70 poster) young researchers actively presented their research work in different themes of this conference. All the presentations were conducted in nine technical sessions, seven for oral and two for poster presentations, in the span of 3 days.



*Invited talks were conducted in seven technical sessions.*

#### **First Technical Session:**

##### **1. Prof S Saraf - Pt. Ravishankar Shukla University, Raipur**

Prof S Saraf spoke on 'Biotechnology and Pharmaceutical Industry'. He briefed the audience on the collaboration of Biotechnology and Pharmaceuticals – Biopharmaceuticals, its significance and application, rather than the usually used chemical pharmaceuticals. He also said that India is currently placed at second position in Asia, and is in top ten in the whole world in the field of utilizing biological products as pharmaceuticals. He also discussed the effect of this fusion on health sector with respect to challenges faced and future perspectives.

## **2. Prof PK Mohapatra - Ravenshaw University, Cuttack**

Prof PK Mohapatra delivered his lecture on '**OJIP Fluorescence Transient for Analysis of Biotic and Abiotic Stress Effects in Plants**'. He explained the role of OJIP fluorescence transient, fluorescence measuring technique, change in its patterns and magnitude with respect to abiotic and biotic stress. The speaker gave the example of the intensity of concentration dependent fluorescence rise as well as the shape of OJIP fluorescence transients in green algae *Chlorella vulgaris* and cyanobacteria *Anabaena* sp. PCC 7119 and *Synechocystis* sp. PCC 6803, under insecticide (dimethoate and chlorpyrifos) applied stress.

## **3. Dr PK Patra - CIMS, Bilaspur**

Dr PK Patra spoke on '**Regenerative Medicine: A Hope for Future Medical Practice**'. According to his lecture, the regeneration property of stem cells, in the human body, with unrestricted potential to divide is used for the regeneration and repair of cells within the body during tissue/organ anomalies occurring due to congenital defects, disease, and age associated effects. This could aid burn victims, repair central nervous system diseases such as ischemia and cerebral palsy, cardiovascular diseases, as well as autoimmune diseases including type 1 diabetes. He also explained the concept of regenerative medicine through his experiment on non-healing ulcer, on 110 patients, using autologous PRPP and mesenchymal stem cells.

### **Second Technical Session:**

#### **1. Prof LVKS Bhaskar-Guru Ghasidas University, Koni, Bilaspur**

Prof LVKS Bhaskar delivered a lecture titled '**Experimental Studies on the Possible Mechanisms Involved in Testing the Herbal Medicines used for the Treatment of Sickle Cell Anaemia**'. The speaker emphasized the use of herbal medicines to fight Sickle cell disease (SCD) for which there is only one FDA approved drug present. As there are restrictions on drug therapies, transplantations, and several possible side-effects, herbal medicines can be an alternate SCD. The herbal preparations in SCD condition have shown different activities such as anti-sickling, anti-aggregating, anti-polymerization, radical scavenging or antioxidant, anti-inflammatory, analgesic, anti-pyretic and anti-dehydrating to anti-osmotic effects.

### **Third Technical Session:**

#### **1. Prof Kashinath Bhattacharya-Visva-Bharati,Santiniketan, West Bengal**

Prof Kashinath Bhattacharya briefed the audience on '**Pollen/ Spore Allergy and Allergen Biology in India**'. According to his presentation allergens originating from pollen grains, fungal spores, foods, insects and house dust mites, have resulted in an increase in the prevalence IgE-mediated atopic diseases in the last few decades. India, being the home of diverse climates, vegetations, and food habits, has a broad range of these allergens. The speaker mentioned the possible mechanism to prevent spore allergen based on the biochemical, immunological and molecular information on the various allergens vis-a-vis allergen specific immunotherapy testified from India.

#### **2. Prof Rizwan Hasan Khan-Head and editor IJBM**

Prof Rizwan Hasan Khan gave a lecture on '**Role of Surfactants on Amyloid Fibrillation**'. He explained the implication of electrostatic and hydrophobic properties of surfactants in protein aggregation. Investigation was done by using measurements of turbidity, Rayleigh scattering, ThT and CR dye binding, DLS as well as far-UV CD. The speaker concluded that greater the charge on the surfactants or greater the hydrophobicity of surfactants (proportional to the C chain length) more is the protein aggregation and more amyloid fibril formation. Among the anionic surfactants studied by the presenter, AOT had a much stronger propensity to induce amyloid formation than SDBS and SDS.

### **Fourth Technical Session:**

#### **1. Prof RLS Sikarwar-Deendayal Research Institute,Chitrakoot, Dist. Satna**

Prof RLS Sikarwar presented a detailed lecture titled '**Indian Sub Continent, A Treasure Trove of Biodiversity: Present Status and Future Strategy**'. He gave a detailed view of the present biodiversity of India - 48,158 plants, and 91,000 animal species. Various species of Angiosperms, Gymnosperms, Fungi, Algae, Lichens, Bryophytes, Pteridophytes and Bacteria found in India were also mentioned. Endemic species, i.e. species restricted in Indian subcontinent only were also given a special mention. The author mentioned that India was known as "Hindustan Centre of Origin of Cultivated plants" as 167 species of crops, 335 species of wild relatives and several species of domesticated animals have originated here. He emphasized the role of government and personal efforts to stop the natural and man-influenced

disturbance of biodiversities, certain government measures already implemented, and further measures that need to be taken.

## **2. Prof RC Dubey-Gurukul Kangri University, Haridwar**

Prof RC Dubey spoke on '**Probiotics: The Health Improving Microbes of Future**'. He explained the significance of living beneficial microorganisms, produced industrially and made commercially available as "probiotics" when administered in adequate amounts, to get rid of pathogenic microorganisms, such as *Bifidobacterium* which includes *B. bifidum* and *B. longum* strains (used for control of mineral absorption and regulation of other bacteria), *Enterococcus faecium* (affect cholesterol levels and relieves symptoms associated with antibiotic diarrhea), *Lactobacillus* - *L. acidophilus*, *L. bulgaricus* and *L. rhamnosus* strains, and *Streptococcus thermophilus* (lactose digestion and aid persons who are lactose-intolerance). The speaker also talked about synbiotics, a fusion of probiotics and prebiotics for the maintenance of beneficial microorganisms in human body. He discussed the increasing demands of probiotics in food and dietary supplements industry.

## **3. Prof Surekha Kalkar-Institute of Science, Nagpur**

Prof Surekha Kalkar discussed '**Pollen Grains as Sustainable Material for Research in Advanced Technology**'. The speaker spoke on application of sporopollenin – in the exine, outer layer of spore wall as a micro-carrier in drug delivery systems, oral vaccinations, food, pharmaceuticals, cosmetics and personal care industries. The sporopollenin is a highly cross linked polymer composed of hydrogen, oxygen and carbon, which is thermally and chemically stable and has been preserved as fossils from 500 million years ago. Also, the speaker emphasized that as pollen grains are obtained from plants they are sustainably explorable sources in accordance with the environment.

### **Fifth Technical Session:**

#### **1. Prof. SM Prasad-University of Allahabad**

Prof SM Prasad spoke on the '**Role of Nitric Oxide in Managing Chromium (VI) Toxicity in Vegetables by Application of Calcium and Sulfur**'. He listed the significance of nutrient management is maintaining toxic metal pressure citing the example of C or S in reducing Chromium (VI) toxicity. Exogenous addition of either Ca or S reversed the side effects of metal



toxicity and hence improved growth noticed in both vegetables tomato and brinjal. The speaker also suggested that NO may have a possible role in the reduction of Chromium (VI) toxicity.

## **2. Prof. Milind Jadhav- Sir Sayyed College, Roshan Gate, Aurangabad**

Prof Milind Jadhav presented his findings on '**Soil Algal Flora - Diversity and Abundance**'. His Present research work analysed the algal flora in cultivated and non-cultivated fields, correlation between physiochemical parameters of soil and rhizosphere algal flora. *Cyanophycean* algae were found dominant in soil of cultivated and non-cultivated fields in the experiment. *Gloeocystis*, *Chlorococcum*, *Chlorella*, *Nitzschia*, *Gloeotheca*, *Aphanothece*, *Myxosarcina*, *Oscillatoria*, *Phormidium*, *Microcoleus* and *Plectonema* were found in maximum amount.

### **Sixth Technical Session:**

#### **1. Prof Vishnu Agrawal-Motilal Nehru National Institute of Technology Allahabad**

Prof Vishnu Agrawal spoke on topic '**Quorum Sensing at the Crossroad of Inter-kingdom Signaling**'. The speaker spoke on biofilm and quorum sensing, as all the human pathogen, including *P. aeruginosa*, causes pathogenesis through their biofilm mode of growth in which quorum sensing triggers their gene for biofilm mode of growth and lead to virulence and pathogenesis. Quorum molecules have effects on neutrophils, its functions and apoptosis, platelet activation and autophagy of macrophages. According to the speaker research can be done on infections and their side effects related to biofilm microorganisms and quorum sensing, even after the microorganism population is cleared.

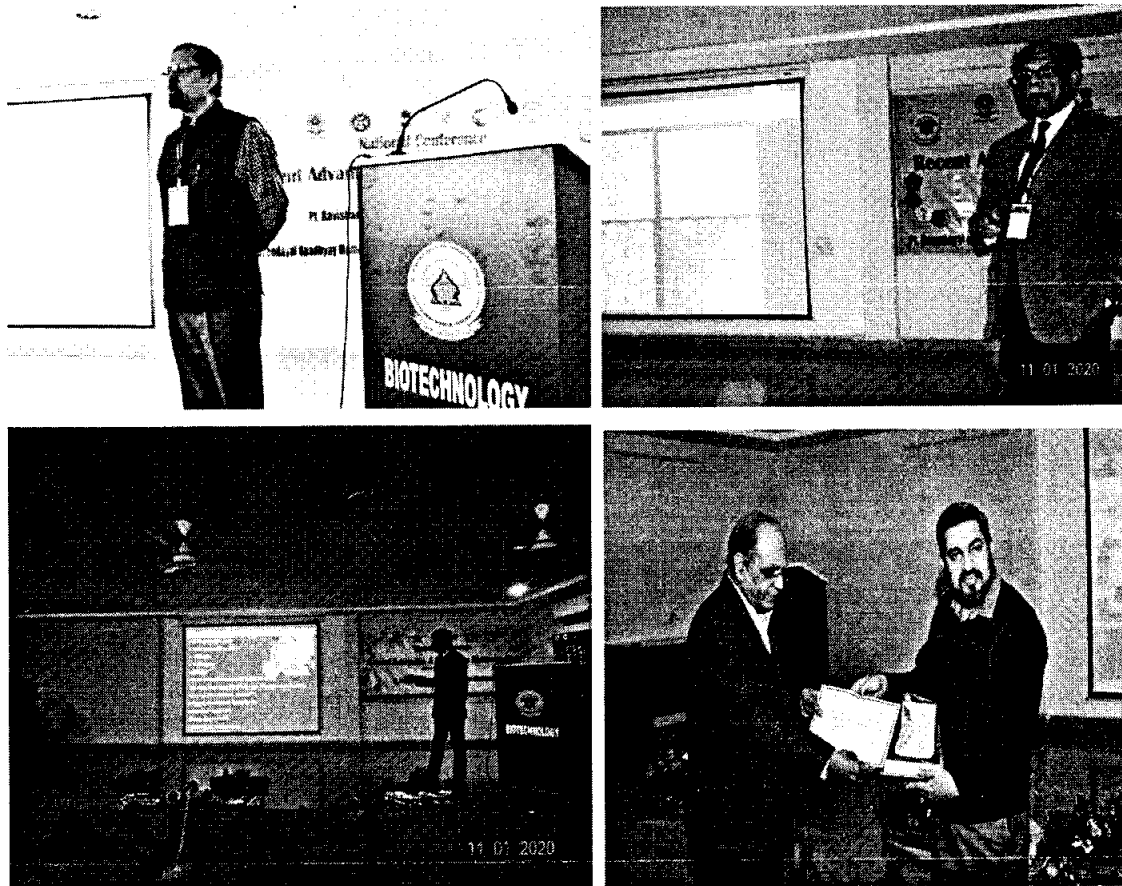
### **Seventh Technical Session:**

#### **1. Prof YK Bansal-R.D. University, Jabalpur**

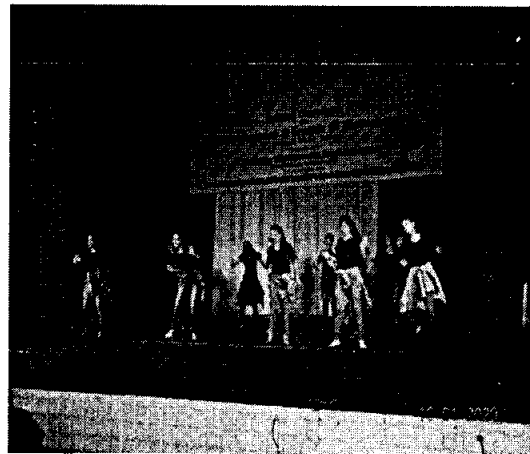
Prof YK Bansal discussed '**Selective Protocols for *In Vitro* Propagation and Secondary Metabolite Production of some Important Medicinal Plants of Madhya Pradesh**'. Discussing the role of medicinal plants in human lives the speaker discussed the methodology for micropropagation and secondary metabolite production of some endangered herbal plants of Madhya Pradesh.

## 2. Prof SB Verulkar-Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur

Prof SB Verulkar explained 'Genomic Approaches for Genetic Improvement of Rice for Rainfed Ecosystem - Precision Phenotyping and Genotyping'. He discussed Marker Assisted Selection in Rice Improvement Program. In this presentation he gave details on simultaneous identification and selection for multiple QTLs, Improvement of mega varieties - incorporation of major QTL(s) and transfer of Major Gene(s) and Pyramiding.



In this Conference, a cultural program was also organized by the students of School of Studies in Biotechnology, Pt. Ravishankar Shukla University Raipur, after a long day of interactive lectures on 10<sup>th</sup> January 2020.



This Conference was empowered by various National funding agencies like SERB, DBT, CSIR, UGC, CGCOST, POC and other enterprises such as HiMedia lab, Borosil Glass work, Surana, Kasliwal Brothers, Syma Medical & Dental Surgical Raipur, Chhattisgarh.

The conference concluding ceremony was presided by Prof Chandra Deo Singh, Vice Chancellor, Indira Gandhi National Tribal University, Amarkantak, Madhya Pradesh, Prof A.K. Chandrakar, Vice Chancellor Pt. Deendayal Upadhyay Memorial Health Sciences and Ayush University of Chhattisgarh, and Prof Keshari Lal Verma, Vice Chancellor, Pt. Ravishankar Shukla University, Raipur. Prizes were distributed to best presentations in both oral and poster category. The program ended with vote of thanks and hi-tea.



**(Keshav Kant Sahu)**  
Organizing Secretary

To,

The Head of Department

Department of Biotechnology

Pt. Ravishankar Shukla University, Raipur C.G.

Topic: - Procurement of Fungal Culture from the Department.

Respected Sir,

I Aditya L. Toppo, PhD student from the Department of Biotechnology, NIT Raipur C.G. I need five fungal culture from your department, for my antifungal studies of my sample.

Kindly grant me the permission

Thanking you,

Yours Sincerely  
Aditya L. Toppo  
Ph.D. Scholar  
NIT Raipur C.G.

Date  
13/02/2020

*Forwarded*  
*13/2/19*

Dr. J. Satya Eswari  
Assistant professor  
NIT Raipur C.G.

*Dr. Nagendra Chandrasekhari*  
*24/2/20*

27

A Dissertation on  
“Development of Pointing Acquisition and Tracking control using  
KALMAN filter for LEO to ground optical terminal”  
Submitted to



School of Study in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)  
*In partial fulfilment for the award of the degree of*  
**MASTER OF TECHNOLOGY**

*in*

**Optoelectronics and Laser Technology**

Submitted By  
**SAMVED NAIK**

Under the Supervision of

Mr. Sachin Kumar Daksh  
Scientist/Engineer – ‘SF’  
SSD/EOSDIG/SEDA  
SAC(ISRO), Ahmedabad

Dr. Sanjay Tiwari  
Professor & H.O.D.  
S.O.S. In Elec. & Pho.  
P.R.S.U. Raipur

Work carried out at



Space Applications centre  
Indian space research organisation  
Ahmedabad, India  
July 2019 – June 2020

**Pt. Ravishankar Shukla University, Raipur (C.G)**

**School of Studies in Electronics and Photonics**



**CERTIFICATE**

**Session 2019-20**

This is to certify that work contained in interim dissertation entitled, “**Development of Pointing Acquisition and Tracking control using KALMAN filter for LEO to ground optical terminal**” is carried out by **Samved Naik** at **Space Applications Centre, Indian Space Research Organisation, Ahmedabad(Gujarat)** during the period of July 2019 to June 2020, for the requirement of partial fulfilment for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

-----  
**INTERNAL SUPERVISOR**

Dr. Sanjay Tiwari  
Prof. & Course Coordinator  
S.O.S. In Electronics & Pho.  
P.R.S.U. Raipur (C.G.)

-----  
**HEAD OF DEPARTMENT**

Dr. Sanjay Tiwari  
S.O.S. In Electronics & Pho.  
P.R.S.U. Raipur (C.G.)

-----  
**INTERNAL EXAMINER**

-----  
**EXTERNAL EXAMINER**

## DECLARATION

I declare that this written submission entitled "**Development of Pointing Acquisition and Tracking control using KALMAN filter for LEO to ground optical terminal**" for the award of Master of Technology in Optoelectronics & Laser Technology of **Pt. Ravishankar Shukla University, Raipur Chhattisgarh**, represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

-----  
SAMVED NAIK  
ROLL No: 1810196004  
DATE:

**Space Applications Center  
Indian Space Research Organization  
Ahmedabad (Gujarat)**



**CERTIFICATE**

**Session 2019-20**

This is to certify that work contained in interim dissertation entitled, "Development of Pointing Acquisition and Tracking control using KALMAN filter for LEO to ground optical terminal" is carried out by Samved Naik at Space Applications Centre, Indian Space Research Organisation, Ahmedabad(Gujarat) during the period of July 2019 to June 2020, for the requirement of partial fulfilment for the award of degree of Master of Technology in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

Date: 22/09/20

Signature of Supervisor

Mr. Sachin Kumar Daksh

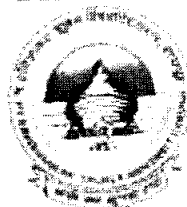
Sci/Eng. 'SF'

SSD/EOSDIG/SEDA

SAC (ISRO) Ahmedabad



A Project (Dissertation Phase-II)  
On  
"Design of multijunction solar cell to achieve greater efficiency"  
Submitted to



25

School of Study in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)

*In partial fulfilment for the award of the degree of*

**MASTER OF TECHNOLOGY**

IN

**Optoelectronics and Laser Technology**

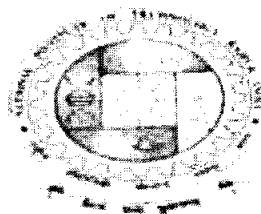
Submitted By  
**Brijmohan Chaurasia**

Under the Supervision of

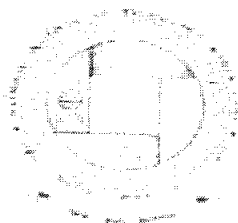
Dr. B. Acharya  
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Dr. Sanjay Tiwari  
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S.O.S. In Elec. & Pho.  
P.R.S.U. Raipur

Work carried out at



National Institute of Technology,  
Raipur, India  
July 2019-June 2020



**National Institute of Technology Raipur, India**

**CERTIFICATE**

**Session 2019-2020**

This is to certify that the dissertation work entitled "**Design of multijunction solar cell to achieve greater efficiency**" is a bonafide record of original review/research work carried out by **Mr. Brijmohan Chaurasia (Roll No:- 1810196002)** at **National Institute of Technology Raipur, (C.G.) India**, under my guidance and supervision submitted to the **School of Studies in Electronics & Photonics** in partial fulfillment of the requirements for the award of the degree of **Master of Technology in Optoelectronics & Laser Technology** at **Pt. Ravishankar Shukla University, Raipur, Chhattisgarh** during the academic year **July 2019 - June 2020**. The matter embodied in this M. Tech dissertation has not been submitted for the award of any other degree.

(Signature of Supervisor)

**Dr. B. Acharya**

**Assistant Professor & Head CCC**

**NIT, Raipur**

Dr. B. Acharya  
Assistant Professor  
School of Studies in Electronics & Photonics  
National Institute of Technology Raipur  
Raipur-492019

26

A Dissertation on  
"Polarization Measurement of Soft x-ray Synchrotron Radiation"  
Submitted to



School of Study in Electronics and Photonics  
Pt. Ravishankar Shukla University, Raipur (C.G.)  
*In partial fulfillment for the award of the degree of*  
**MASTER OF TECHNOLOGY**

**IN**

**Optoelectronics and Laser Technology**

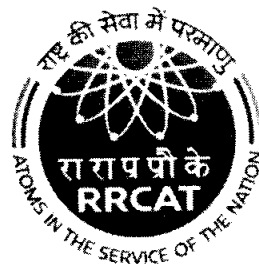
Submitted By  
**MOHIT KUMAR SINHA**

Under the Supervision of

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Scientific Officer "H"  
RRCAT Indore (M.P.)

Dr. Sanjay Tiwari  
Professor & H.O.D.  
S.O.S. In Elec. & Pho.  
P.R.S.U. Raipur

Work carried out at



**SYNCHROTRONS UTILIZATION SECTION**  
**RAJA RAMANNA CENTRE FOR ADVANCED TECHNOLOGY**  
**DEPARTMENT OF ATOMIC ENERGY, INDORE -452013**  
**JULY 2019 – JULY. 2020**



GOVERNMENT OF INDIA  
RAJA RAMANNA CENTRE FOR ADVANCED TECHNOLOGY  
DEPARTMENT OF ATOMIC ENERGY, INDORE -452013

**CERTIFICATE**

This is to certify that the dissertation work entitled “Polarization Analysis of Soft X-Ray Synchrotron radiation” is carried out by MOHIT KUMAR SINHA at Raja Ramanna Centre For Advanced Technology, Indore(M.P.) during the period July 2019 to <sup>June</sup> July 2020, for the requirement of partial fulfillment for the award of the degree of Master of Technology in Optoelectronics & Laser Technology at Pt. Ravishankar Shukla University, Raipur (C.G.).

Date: 28/9/2020

*M. H. Modi*  
28/9/2020

SIGNATURE OF SUPERVISOR

डॉ. मोहम्मद हुसैन मोदी / Dr. M. H. Modi  
वैज्ञानिक अधिकारी / Scientific Officer  
भारतीय परमाणु ऊर्जा आयोग / Atomic Energy Commission  
राजा रामान्ना के परमाणु प्रयोगशाला / Raja Ramanna Centre for Advanced Technology  
राजा रामान्ना के परमाणु प्रयोगशाला, इंदौर (म.प्र.) / Raja Ramanna Centre for Advanced Technology, Indore (M.P.)  
आयतांक: P. O. Ltd. - 452013 (M.P.)

SCIENTIFIC OFFICER- H

INDORE (M.P.)

Government of India  
Department of Atomic Energy



Raja Ramanna Centre for Advanced Technology, Indore (M.P)

**CERTIFICATE**

This is to certify that the dissertation entitled "Magnetoelectric properties of lead free composite materials  $BaTiO_3/NiFe_2O_4$  and  $CoFe_2O_4$ " work is carried out by SWETA MINJ (Reg. No. AD50077) at RAJA RAMANNA CENTER FOR ADVANCED TECHNOLOGY, INDORE during the period July 2019 - June 2020 for the requirement of partial fulfilment for the award of the degree of Master of Technology in Optoelectronics & Laser Technology at Pt. Ravishankar Shukla University, Raipur (C.G.).

**Dr. Ravindra Jangir**

Scientific Officer - E  
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**School of Studies in Electronics and Photonics**



22

**CERTIFICATE**

**Session 2019-20**

This is to certify that work contained in interim dissertation entitled, "Magnetolectric properties of lead free composite materials  $BaTiO_3/NiFe_2O_4$  and  $CoFe_2O_4$ " work carried out by Sweta Minj at RAJA RAMANNA CENTER OF ADVANCED TECHNOLOGY, INDORE (M.P.). during the period of July 2019 to June 2020, for the requirement of partial fulfilment for the award of degree of Master of Technology (III-semester) in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

-----  
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**HEAD OF DEPARTMENT**

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P.R.S.U. Raipur (C.G.)

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**INTERNAL EXAMINER**

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**EXTERNAL EXAMINER**



# The Bastar craton, central India: A window to Archean – Paleoproterozoic crustal evolution

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M.P. Manu Prasanth<sup>c</sup>, Sam Uthup<sup>a</sup>

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Tectonic implications

Bastar craton

## ABSTRACT

The Bastar craton in central India, surrounded by cratonic blocks and Paleoproterozoic to Neoproterozoic orogenic belts, is a window to investigate the Archean–Paleoproterozoic crustal evolution and tectonic processes. Here we propose a new tectonic classification of the craton into the Western Bastar Craton (WBC), Eastern Bastar Craton (EBC), and the intervening Central Bastar Orogen (CBO). We present petrologic, geochemical and zircon U–Pb, REE and Lu–Hf data from a suite of rocks from the CBO and along the eastern margin of the WBC including: (1) volcanic successions comprising meta-andesite and fine-grained amphibolite, representing arc-related volcanics along a convergent margin; (2) ferruginous sandstone, in association with rhyolite, representing a volcano-sedimentary succession, deposited in an active trench; and (3) metamorphosed mafic-ultramafic suite including gabbro, pyroxenite and dunite invaded by trondhjemite representing the section of sub-arc mantle and arc root adjacent to a long-lasting subduction system. Petrologic studies indicate that the mafic-ultramafic suite crystallized from an island arc tholeiitic parental magma in a suprasubduction zone environment. The chondrite-normalized and primitive mantle normalized diagrams of the mafic and ultramafic rocks suggest derivation from MORB magma. The mixed characters from N-MORB to E-MORB of the studied samples are consistent with subduction modification of a MORB related magma, involving partial melting of the metasomatized mantle wedge. Our zircon U–Pb age data suggest that the cratonic nuclei was constructed as early as Paleoproterozoic. We present evidence for active subduction and arc magmatism through Mesoproterozoic to Neoproterozoic and early Paleoproterozoic, with the trench remaining open until at least 2.3 Ga. Two major crust building events are recognized in the Bastar craton: during Mesoproterozoic (recycled Paleoproterozoic subduction-related as well as juvenile/depleted mantle components) and Neoproterozoic (accretion of juvenile oceanic crust, arc magmatism including granite batholiths and related porphyry mineralization). The final cratonization occurred during latest Paleoproterozoic, followed by collisional assembly of the craton and its incorporation within the Peninsular Indian mosaic during Mesoproterozoic. In the global supercontinent context, the craton preserves the history of Ur, the earliest supercontinent, followed by the Paleo-Mesoproterozoic Columbia, as well as minor thermal imprints of the Neoproterozoic Rodinia and associated Grenvillian orogeny.

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## 1. Introduction

The change in crustal growth rates and stabilization of the Archean cratonic domains during Mesoproterozoic also witnessed the emergence of active plate tectonic processes, where the decrease in mantle potential temperature is considered to have facilitated the

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E-mail address: [santosh@cugb.edu.cn](mailto:santosh@cugb.edu.cn) (M. Santosh).



Jan Długosz  
University  
in Częstochowa

Częstochowa, 22.10.2019

NN/931/PZ/17/2019-2020

### INVITATION

**Dear Prof. Rajeev Choudhary, Ph. D.**  
School of Studies in Physical Education,  
Pt. Ravishankar Shukla University,  
Raipur, Chhattisgarh, India-492010

**T8744151**  
passport number

**27<sup>th</sup> February 1972**  
date of birth

On behalf of Jan Długosz University's authorities I would be honored to host you at our university with the aim of giving a series of classes (60 hours) in the capacity of a **foreign professor** for the students of the Faculty of Health Sciences.

The expected period of your stay will last from **12<sup>th</sup> November 2019** to **20<sup>th</sup> December 2019**. The attendant during your stay will be **dr Karol Piłis (k.pilis@ujd.edu.pl)**, with whom you may discuss organizational and substantive issues.

All conditions regarding the salary and your stay will be defined in accordance with the civil law contract. Accommodation at Jan Długosz University's guest rooms will be booked for you in the above-mentioned period of time.

I look forward to your arrival and working with you at our university. If you have any questions regarding your visit, you may also contact the Department for Research and International Relations: **Mr. Bartłomiej Kowalik (b.kowalik@ujd.edu.pl)**.

Yours sincerely,

**PROREKTOR**  
ds. Nauk i Współpracy z Zagranicą  
Uniwersytetu Janusza Korczaka  
im. Jana Długosza w Częstochowie

*dr hab. Janusz Kapuśnik, prof. UJD*

---

Jan Długosz University in Częstochowa  
Waszyngtowska 4/8 str. | 42 200 Częstochowa | phone: +34 378-41-00 | fax: +34 378-40-55  
e-mail: kancelaria@ujd.czest.pl | www.ujd.edu.pl



# Contract of Mandate with UJD, Poland

UMOWA ZLECENIE NR 551/2019

Zawarta w dniu 25.11.2019 pomiędzy Uniwersytem Humanistyczno-Przyrodniczym im. Jana Długosza w Częstochowie, zwanym dalej „Zleceniodawcą” reprezentowaną przez:  
dr. hab. Anna Wypych-Gawronska, prof. UJD, Rektor  
Nazwisko i imię  
przy kontrasygnacie finansowej Kwestora mgr Joanna Parkitna  
a Pania/Panem Prof. zw. dr. Rajeev Choudham  
zwanym dalej „Zleceniobiorcą” nr PESEL 5730 0599 1685 (ATR PS 0013J) indyjski  
zamieszkałym w 204, Royal Hills Apartments, D.D. Nagar Raipur  
Chhattisgarh, India 492010

§1

- Zamawiający zleca, a Zleceniobiorca zobowiązuje się do wykonania następujących prac:  
przepracowanie zajęć dydaktycznych w wymiarze 60 godzin zę studentami kierunku fizjoterapii na Wydziale Nauk o Zdrowiu
- Zleceniobiorca zobowiązuje się wykonać czynności określone w ust. 1 osobiście z należytą starannością.
- Integralną częścią niniejszej umowy jest oświadczenie „Formularz zgłoszenia wy Zleceniobiorcy niebędącego pracownikiem UJD do umowy zlecenia” stanowiący załącznik nr 1 do umowy.

§2

Zleceniobiorca wykonywać będzie zlecenie w okresie od 25.11.2019 do 21.12.2019 w siedzibie Uczelni/poza Uczelnią\*

§3

- Zleceniobiorca za wykonanie czynności określonych w §1, otrzyma wynagrodzenie brutto w wysokości 18.000 zł, słownie osiemnastacie tysięcy i 00/100. Wysokość wynagrodzenia wynika z iloczynu ilości godzin objętych umową 60 i stawki godzinowej brutto wynoszącej 300 zł.
- Wynagrodzenie będzie wypłacone po wystawieniu przez Zleceniobiorcę rachunku, którego wzór stanowi załącznik nr 2 do niniejszej umowy. Rachunek stanowi podstawę do wypłaty wynagrodzenia Zleceniobiorcy w którym potwierdza on rzeczywistą ilość przepracowanych godzin i wysokość wynagrodzenia należnego za wykonanie całości lub części przedmiotu zlecenia za dany miesiąc.
- Zleceniobiorca rachunek o którym mowa w ust. 2 powinien złożyć w terminie do 5 dnia każdego miesiąca następującego po miesiącu za który wystawiony jest rachunek.
- Wynagrodzenie będzie wypłacone jednorazowo/miesięcznie\* po potrąceniu zaliczek na podatek dochodowy oraz obowiązujących składek na ubezpieczenie społeczne i zdrowotne:
  - gotówką w kasie
  - przekazem pocztowym na adres
  - przelewem na konto bankowe nr .....
- W przypadkach zawarcia umowy na okres dłuższy niż miesiąc wypłata wynagrodzenia będzie następować w miesięcznych okresach rozliczeniowych. Wypłata wynagrodzenia nastąpi w terminie do ostatniego dnia miesiąca następującego po miesiącu, za który należne jest wynagrodzenie. Podstawą do wypłaty wynagrodzenia jest potwierdzenie przez Zamawiającego wykonania przedmiotu umowy przez Zleceniobiorcę oraz rachunek złożony przez Zleceniobiorcę zgodnie z postanowieniami niniejszej umowy.

§4

Zleceniobiorca nie może bez pisemnej zgody Zleceniodawcy powierzyć wykonania w całości lub części czynności określonych w §1 osobie trzeciej.

§5

- Zleceniobiorca (nie dotyczy pracowników UJD) oświadcza, że:
  - jest zatrudniony na podstawie umowy o pracę, mianowania, umowy zlecenie\* oraz osiąga wynagrodzenie miesięczne brutto z w/w tytułu w kwocie nie niższej od minimalnego wynagrodzenia,
  - jest emerytem lub rencistą
  - jest studentem, uczniem do 26-go roku życia ..... nazwa szkoły, uczelni:
- d) umowa nie będzie wykonywana w ramach pozarolniczej działalności gospodarczej

2. Zleceniobiorca zobowiązuje się pod rygorem skutków prawnych i finansowych do powiadomienia Zleceniodawcy w terminie 3 dni o zmianach w charakterze zatrudnienia i wynagrodzenia, o których mowa w 1 punkcie oświadczenia, bezpośrednio po zaistnieniu zmiany nie później jednak jak przed terminem złożenia rachunku.

§6

Zleceniobiorca oświadcza, że złożone w § 5 niniejszej umowy oświadczenie wraz oświadczenie złożone w załączniku o którym mowa w § 1 ust. 3 są zgodne ze stanem faktycznym.

§7

Wszelkie zmiany w niniejszej umowie, wymagają formy pisemnej w postaci aneksu, pod rygorem nieważności, są skuteczne po podpisaniu przez obie strony.

§8

Wszelkie spory mogące wynikać na tle niniejszej umowy, rozstrzygane będą przez sąd właściwy miejscowo dla siedziby Zleceniobiorcy.

§9

Zleceniobiorca nie podlega podporządkowaniu pracowniczemu z art.22 § 1 Kodeksu Pracy.

§10

W sprawach nie unormowanych umową mają zastosowanie przepisy kodeksu cywilnego.

§11

Umowa niniejsza została sporządzona w trzech jednobrzmiących egzemplarzach, z których jeden otrzymał Zleceniobiorca, a dwa pozostają u Zleceniodawcy.

§12

Zleceniobiorca oświadcza, że

- jest świadomy czynników ryzyka i zagrożeń dla zdrowia związanych z realizacją umowy

- zobowiązuje się do stosowania i przestrzegania zasad higieny i bezpieczeństwa pracy, a w szczególności:

1. wykonywania pracy w sposób zgodny z przepisami i zasadami bezpieczeństwa i higieny pracy,
2. dbania o należyty stan mienia Zleceniobiorcy oraz o porządek i ład w miejscu wykonywania pracy
3. stosowania środków ochrony zbiorowej, a także używania środków ochrony indywidualnej oraz odzieży i obuwia roboczego, o ile charakter wykonywanej pracy tego wymaga,
4. niezwłocznego zawiadomienia Zleceniodawcy o zauważonym w UJD wypadku albo zagrożeniu życia lub zdrowia ludzkiego oraz ostrzeżenia współpracowników i innych osób znajdujących się w rejonie zagrożenia o groźącym im niebezpieczeństwie
5. współdziałania ze Zleceniodawcą w czasie ewakuacji, w sytuacji pożaru oraz w przypadku konieczności udzielenia pomocy ofiarom wypadków.

§13

Zgodnie z art. 13 ust. 1 i ust. 2 ogólnego rozporządzenia o ochronie danych osobowych z dnia 27 kwietnia 2016 r. Uniwersytet Humanistyczno-Przyrodniczy im. Jana Długosza w Częstochowie informuje, że:

- 1) administratorem Pani/Pana danych osobowych jest Uniwersytet Humanistyczno-Przyrodniczy im. Jana Długosza w Częstochowie, ul. Waszyngtona 4/8, 42-200 Częstochowa;
- 2) dane kontaktowe inspektora ochrony danych w Uniwersytecie Humanistyczno-Przyrodniczym im. Jana Długosza w Częstochowie: mail: [iod@uj.edu.pl](mailto:iod@uj.edu.pl), tel. 34 37-84-133;
- 3) Pani/Pana dane osobowe przetwarzane będą w celu realizacji umowy, przetwarzanie jest niezbędne do wykonania umowy;
- 4) Pani/Pana dane osobowe nie będą udostępniane innym odbiorcom;
- 5) Pani/Pana dane osobowe nie będą przekazywane do państwa trzeciego/organizacji międzynarodowej;
- 6) Pani/Pana dane osobowe będą przechowywane przez okres wymagany przepisami obowiązującego prawa – dane podstawowe – 5 lat, dane finansowe – 5 lat;
- 7) posiada Pani/Pan prawo dostępu do treści swoich danych oraz prawo ich sprostowania, prawo do ograniczenia przetwarzania, prawo do przenoszenia danych;
- 8) ma Pani/Pan prawo wniesienia skargi do Prezesa Urzędu Ochrony Danych Osobowych, gdy uzna Pani/Pan, iż przetwarzanie danych osobowych Pani/Pana dotyczących narusza przepisy ogólnego rozporządzenia o ochronie danych osobowych z dnia 27 kwietnia 2016 r.;
- 9) podanie przez Panią/Pana danych osobowych jest warunkiem zawarcia umowy, jest Pani/Pan zobowiązana do tego podania, konsekwencją niepodania danych osobowych będzie brak możliwości zawarcia umowy;
- 10) Pani/Pana dane nie będą przetwarzane w sposób zautomatyzowany, w tym w formie profilowania.

**DLA PRACOWNIKÓW UJD:**

**Stwierdzam, że praca wyszczególniona w umowie nie należy do obowiązków Zleceniobiorcy, wynikających ze stosunku pracy w UJD i będzie wykonana poza obowiązującym czasem pracy.**

DZIEKAN

Wydział Nauk o Zdrowiu  
Uniwersytetu Humanistyczno-Przyrodniczego  
im. Jana Długosza w Częstochowie

.....  
podpis bezpośredniego przełożonego

Źródło finansowania umowy środki subwencji Dto wydziału zdrowia  
z przeznaczeniem na profesora zagranicznego

.....  
PROF. DR. hab. Anna Wypych-Gawrońska

KWESTOR  
.....  
mgr Joanna Parkłan  
Kwestor

.....  
Zleceniobiorca

Dr. Rajeev Choudhary  
Professor  
School of Studies in Physical Education  
Pt. Ravishankar Shukla University  
RAIPUR (C.G.) 492010  
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\* niepotrzebne skreślić

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18.12.2017

**Betreff: Invitation as a foreign visiting professor for Prof. Rajeev Choudhary, Ph.D., passport number T8744251,  
date of birth 27 Feb. 1972**

Dear Professor Choudhary,

It is our pleasure to invite you to stay at our university from 7<sup>th</sup> to 19<sup>th</sup> of February, 2020, to give two day classes for Prof. candidates and advanced master students in the field of research and applied statistics, esp. of data analysis. Further we would like to ask you to give lectures for a wider audience on your research and on research and Higher Education in India.

An allowance for travel costs of max. 1050 € is provided by Trier UAS international office.

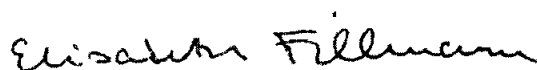
Your stay at Trier University can be covered by a fixum per each day at our university up to a maximum of 10 days.

Accommodation at the university's partner hotels near the campuses in Trier and Birkenfeld will be booked for you.

The vicepresident for research, Prof. Dr. S. Diemer, the international office and the doctoral advisors office are looking forward to your arrival and to your lectures and classes.

In case of questions, please do not hesitate to contact me. Together with the colleagues from the international office we will strive to facilitate your visit.

Sincerely yours



Dr. Elisabeth Filmann

Seite 1 von 1

**DAAD**

Deutscher Akademischer Austausch Dienst  
German Academic Exchange Service

Trier University  
of Applied Sciences

H O C H  
S C H U L E  
T R I E R

Letter of confirmation for Teaching Assignment

Academic Year 2019/2020

To whom it may concern


Name of institution: Pt. Ravishankar Shukla University

I herewith confirm that Prof. Dr. Rajeev Choudhary (title and name)

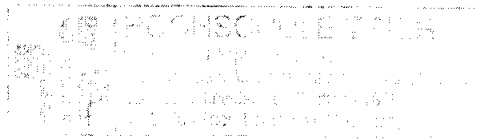
has given instruction in the framework the DAAD HAW international Project of the Hochschule Trier as a visiting professor.

Duration of stay (days): 11 from: 07 Feb, 2020 till: 18 Feb, 2020

Date, place: Trier, 18 Feb. 2020



Christoph Lex M.A. Manager, International Office  
(Signature and stamp of the authorized person of the partner institution)



# Certificate from Trier University of Applied Sciences

The University  
of Applied Sciences

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Promotionsberatungsstelle  
Dr. Elisabeth Fillmann

049 4499720-11000  
fillmann@hochschule-trier.de

09.07.2020

## Confirmation - To whom it may concern

Wir bestätigen, dass

Prof. Dr. Rajeev Chouhary

1. delivered a lecture on 11/02/2020 from 14 to 15 PM on the topic "Analysing Data - Contributions from an Indian university's point of view for Trier UAS" in main campus of Trier University of Applied Sciences, Trier
2. delivered lectures / conducted workshop on "Basic Concepts of Research and Applied Statistics" on 11/02/2020 from 9 AM to 5 PM in main campus of Trier University of Applied Sciences, Trier
3. provided consultancy to research scholars personally for data analysis on 19/02/2020 in main campus of Trier University of Applied Sciences, Trier
4. delivered lectures / conducted workshop on "Recent trends in Data Analysis" on 01/02/2020 from 9 AM to 5 PM in Environmental Campus of Trier University of Applied Sciences, Birkenfeld
5. delivered a lecture on 18/02/2020 from 11 to 12 AM on the topic "Analysing Data - Contributions from an Indian university's point of view for UCB (Environmental Campus Birkenfeld)"
6. provided consultancy to research scholars personally for data analysis on 18/02/2020 in Environmental Campus of Trier University of Applied Sciences, Birkenfeld

*Elisabeth Fillmann*

Dr. Elisabeth Fillmann  
Head of PhD Consulting office

Litwin, Campus  
Birkenfeld  
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RESEARCH ARTICLE

# Vitrification-Based Cryopreservation of In Vitro-Grown Apical Meristems of *Chlorophytum borivilianum* Sant et Fernand: A Critically Endangered Species

Ravishankar Chauhan<sup>1,2</sup> · Vikram Singh<sup>3</sup> · S. Keshavkant<sup>1</sup> · Afaque Quraishi<sup>1</sup>

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**Abstract** This article reports the cryopreservation of apical meristems of *Chlorophytum borivilianum*, a tropical and IUCN critically endangered species. Initially, in vitro cultured shoots were pre-adapted on 12% (w/v) sucrose for 2-months and were found appropriate stock material for further experimentations. Furthermore, the preculture of meristems excised from pre-adapted in vitro shoots on 12% (w/v) sucrose containing MS medium with 50 mg/l abscisic acid for 48 h, followed by treatment with loading solution (LS), and plant vitrification solution (PVS2) was found crucial for recovery following cryostorage. Thereafter, durations of exposure to the LS and PVS2 were optimized to enhance the regeneration efficiency of apical meristems. Treatment with LS for 20 min followed by 30 min exposure to PVS2 was standardized for the vitrification of the apical meristems before plunging them into liquid nitrogen. Moreover, after cryoexposure thawing was performed for 1 min at 38 °C ± 2 in a water-bath followed by the treatment with unloading solution for 10 min resulted in enhanced recovery up to 33% on 2 mg/l

6-benzyladenine (BA) and 0.2 mg/l  $\alpha$ -naphthalene acetic acid containing MS medium.

**Keywords** Abscisic acid · Liquid nitrogen · PVS2 · Sucrose · Vitrification

## Introduction

*Chlorophytum borivilianum* Sant et Fernand is a tropical and vegetatively propagated species. Its tuberous root contains steroidal saponins, which vary considerably among the genotypes and ranges between 2 and 17% of its dry weight [1]. A number of reports are there revealing the impact of this herb on diabetes, arthritis, rheumatism and its aphrodisiac potential [2, 3]. Huge commercial and pharmaceutical importance is one of the major causes of overexploitation of this species from its natural habitats [3]. Moreover, seed germination rate is very poor i.e., 8–16% only [4]. Therefore, it has been documented as a critically endangered herb in the Red List of the IUCN [5] and as a rare plant species by the Botanical Survey of India [6]. A number of literatures are available for in vitro propagation of this herb; however, conservation through cryopreservation was not attempted till now.

The conventional method of germplasm conservation includes maintenance of whole plants in the field [7]. Field maintenance of plant materials not only carries the risks of infections of viral, fungal, bacterial diseases and insect-pests, but also includes losses due to environmental disasters, which has led to the erosion of valuable germplasm resources [8]. The most appropriate method suggested for long-term ex situ conservation of any species is storage of their seeds. However, in the case of vegetatively propagated species or of species with low germination rate,

**Significance Statement:** For the cryopreservation of *Chlorophytum borivilianum* abscisic acid was found crucial that helps in freeze tolerance. Moreover, the exposure times to cryoprotectants were optimized which minimizes the toxicity and helps in regeneration of meristems.

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**Airborne *Aspergillus* at some rural areas adjoining to Raipur city (C.G.) India**

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**ABSTRACT**

Increased urbanization and industrialization in recent time has made a significant impact on air quality of the area. The atmosphere is rich in propagule of different fungal species. The investigation on airborne *Aspergillus* concentration was conducted in Periphery of Raipur city from February, 2018 to March, 2019 with the help of gravity petriplate containing PDA (Potato Dextrose Agar) medium. In this study, total 11 species of *Aspergillus* were recorded. The percentage frequency and percentage contribution of different *Aspergillus* species were different in different seasons. *Aspergillus niger* was most frequent throughout the year followed by *Aspergillus fumigatus*, *A. Beauverii*, and *A. nidulans* etc. While *Aspergillus clavatus*, and *A. versicolor*, *A. aculeatus* were the least frequent species. The result indicated the highest percentage contribution of *Aspergillus niger* (43.29 percent) followed by *A. fumigatus* (9.02 percent), *A. Beauverii* (8.42 percent) while *A. clavatus* (0.21 percent). The objective of the studies was to determine a seasonal variation in concentrations of *Aspergillus* on the basis of meteorological parameters.

Figure: 00

References: 12

Table: 01

KEY WORDS: Airborne *Aspergillus*, Raipur city Rural Area

**Introduction**

Fungal spores constitute a major component of air-spore. Qualitative and quantitative variations depend on the meteorological factors and geographical conditions. Fungal spores that are transported by air currents cause many plant diseases and knowledge of their periodicity is of great value in terms of predicting plant epidemics. *Aspergillus* is a universal fungus. The great majority of species are saprophytes, commonly or occasionally found in soil, decaying vegetation, seeds and grains. The aim of present work was to analyse the behaviour of *Aspergillus* spore type at some rural areas adjoining to Raipur city and to study the relationship between the fungal spore levels and the main environmental factors.

**Materials and Methods**

In present study, four different sites were selected for sampling Aeromycoflora Chandanidih, Zora, Boriakala, Dhaneli, Baronda, and Dumartarai. The study was carried out during March 2018 to February 2019. The culture plate exposure method was adopted for trapping the mycoflora. PDA (Potato, Dextrose and Agar) was used as culture medium. 10 ml of sterilized PDA medium was aseptically

poured in petriplates and allowed to solidify. Five petriplates containing potato dextrose agar (PDA) medium were exposed in the air for 5-10 minutes at 1 meter above the ground level at the above-mentioned sites. The study was conducted at interval of 15 days in every month. The exposed petridishes were sealed and brought to the laboratory and incubated for 3 to 6 days at 26 ± 1°C. After incubation fungal colonies were counted, isolated and identified with the help of literature<sup>1,2</sup>. The results were recorded separately for different sites / season. Percentage frequency and percentage contribution of the fungal flora will be calculated with the help of following formula<sup>3</sup> -

% Contribution = Total No. of colonies of species in all the observations taken together / Total no. of colonies of all species X 100

**Result and Discussion**

The investigation of airborne *Aspergillus* concentration was conducted at some rural areas of adjoining to Raipur city, 2019. During present study 377 fungal colonies of 11 species of *Aspergillus* were recorded (Table -1).

## AIRBORNE *Penicillium* IN THE ATMOSPHERE OF PANABARAS, RAJNANDGAON DISTRICT

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### ABSTRACT

Aerobiological studies are widely used to determine the fungal spectrum in the air. One year survey of airborne *Penicillium* was carried out in the atmosphere of Panabaras, Rajnandgaon district with help of gravity petriplates method containing PDA (Potato Dextrose Agar) medium. The survey revealed a total 12 species of *Penicillium* with marked seasonal and annual variations. *Penicillium chrysogenum* (20.15%) was found to be the most dominant atmospheric fungal species throughout the season followed by *Penicillium spinulosum* (14.72%), *P. jenseni* and *P. multicolor* (13.17%), *P. notatum* (12.41%), *P. verrucosum* (7.75%) and *P. turbatum* (6.21%) etc. Aim of the present work was to analyze the behavior of *Penicillium* species and to study the relationship between the fungal spore levels and the environmental factors.

**KEYWORDS:** Airborne *Penicillium*, Panabaras. Environmental factors.

The air is abundant of fungal spores although it is not a good medium for growth unlike the soil, water, surfaces of living organisms and non-living materials (Deacon 1980). The knowledge of air-spora not only contributes to the understanding of their abundance and seasonal variations, but is also helpful in forecasting the epidemics of crop plants (Waggoner, 1960). Geographical location, climate, and short-term meteorological conditions are responsible for outdoor types and levels of fungal spores. Many aerobiological studies have confirmed that *Aspergillus* and *Penicillium* spores are the most abundant species found in indoor ambient (Garret et al. 1998; Ren et al. 1999; Aira et al. 2002; Gorny and Dutkiewicz 2002; Archana and Aarti 2004; Cho et al. 2008; Sen and Asan 2009). The small size and the ease dispersion of their propagules favour the presence of high concentrations of fungal spores in both indoor and outdoor environments (Aira et al. 2002). Evaluation of airborne fungal contaminants has gained importance because of the health hazards caused by the spores or microbial metabolites (Sen and Asan 2009). Therefore; the purposes of our study were to determine variations in the composition and concentration of the aeromycoflora in tribal area.

### MATERIALS AND METHODS

#### Study Site

Samples were collected from February 2005 to March 2006 in the Panabaras of Rajnandgaon district, Chhattisgarh State, India. A suitable substrate or culture medium supporting nutritional needs of fungi was required for our study. For this purpose, Potato Dextrose Agar (PDA) media was used.

#### Sampling Procedure and Identification of Fungi

The samples were collected at fifteen days intervals using gravity petriplate method for the isolation of fungi. Petriplates were exposed to the air for 10 minutes, so that spores of fungi in the air can fall and settle on the potato dextrose agar in the petriplates. After the exposed petriplates were brought into the laboratory and incubated for 3-5 days at 25±1°C temperature to allow proper growth of the fungal colonies for identification. All the fungi growing on the plates were numbered and later sub cultured onto new potato dextrose agar plates.

After the incubation period, fungal colonies were counted and identified on the basis of morphological characters and available literatures (Barent and Hunter, 1972, Ellis 1971 and Gilman 1959) and finally identify the authentic authority. The meteorological parameters like temperature (°C), relative humidity (%) and rainfall had intense effect on air-borne fungal species both qualitatively and quantitatively and these were also recorded.

### RESULTS AND DISCUSSION

Aerobiological studies are widely used to determine the fungal spectrum in the air. One year atmospheric survey of airborne *Penicillium* was carried out in the atmosphere of Panabaras. The survey revealed a total of 12 species of *Penicillium* with marked and annual variations. The average *Penicillium* percentage contributions as well as number of *Penicillium* species isolated at air are also shown in Table 1. Out of total mycoflora *Penicillium chrysogenum* (20.15%) showing the maximum percentage contribution followed by *P. spinulosum* (14.72%), *P. jenseni* and *P. multicolor* (13.17%), *P.*

<sup>1</sup>Corresponding author



47 45



# Molecular strategies to enhance stability and catalysis of extremophile-derived $\alpha$ -amylase using computational biology

Nisha Gupta<sup>1</sup> · Esmil Beliya<sup>1,2</sup> · Jai Shankar Paul<sup>1</sup> · Shubhra Tiwari<sup>1</sup> · Shriram Kunjam<sup>3</sup> · Shailesh Kumar Jadhav<sup>1</sup>

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## Abstract

$\alpha$ -Amylase is the most significant glycoside hydrolase having applications in various industries. It cleaves the  $\alpha$ ,1–4 glucosidic linkages of polysaccharides like starch, glycogen to yield a small polymer of glucose in  $\alpha$ -anomeric configuration.  $\alpha$ -Amylase is produced by all the three domains of life but microorganisms are preferred sources for industrial-scale production due to several advantages. Enormous studies and research have been done in this field in the past few decades. Still, it is requisite to work on enzyme stability and catalysis, as it loses its functionality in extreme. As the enzyme loses its structural and catalytic property under extreme environmental conditions, it is mandatory to confer some potential strategies for enhancing enzyme behaviour in such conditions. This limitation of an enzyme can be overcome up to some extent by extremophiles. They serve as an excellent source of  $\alpha$ -amylase with outstanding features. This review is an attempt to encapsulate some structure-based strategies for improving enzyme behaviour thereby enabling researchers to selectively amend any of the strategies as per requirement during upstream and downstream processing for higher enzyme yield and stability. Thus, it will provide some cutting-edge strategies for tailoring  $\alpha$ -amylase producing organism and enzyme with the help of several computational biology tools.

**Keywords**  $\alpha$ -Amylase · Computational biology · Extremophiles · Glycoside hydrolase · Structural insights

## Introduction

Enzymes are the most vital bio-product needed for sustaining life on earth. In recent years,  $\alpha$ -amylase has significantly replaced the chemical hydrolysis of starch in industries.  $\alpha$ -Amylase ( $\alpha$ -1,4-glucan 4-glucanohydrolase, EC 3.2.1.1) is an endo-acting hydrolyzing enzyme responsible for the breakdown of  $\alpha$ ,1–4 glucosidic linkages of starch and other related polysaccharides to yield maltooligosaccharides,

glucose, and limit dextrin in an  $\alpha$ -anomeric form (Machius et al. 1995; Yadav 2012; Al-Dhabi et al. 2020; Abd-Elaziz et al. 2020; Janeček and Zámocká 2020). The total contribution of  $\alpha$ -amylases in the enzyme market is about 30% and hence occupies the second position after proteases (Wu et al. 2018; Allala et al. 2019; Wang et al. 2019a; Abd-Elaziz et al. 2020). It is synthesized by microorganisms, plants, and animals. But for large-scale production, microorganisms are generally selected. Microorganisms are preferred because they offer cheaper large-scale production, ease of genetic engineering approaches, enormous strain availability etc. (Abdel-Fattah et al. 2013; Abd-Elhalem et al. 2015; Afrisham et al. 2016). It is extensively used in several industries and plays a substantial role in them (Table 1).

Despite having lots of industrial applications there are certain shortcomings related to the use of  $\alpha$ -amylase. They tend to drop their structural conformations, stability, and catalysis when allowed to work in extreme conditions (Ahmed et al. 2020). To overcome this sensitivity of  $\alpha$ -amylase towards harsh conditions, researchers are seeking sources living in extreme environmental conditions. Extremophiles are the organism inhabiting such harsh environment

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Nisha Gupta, Esmil Beliya have contributed equally as first author.

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48 47 46



## Aspects and Recent Trends in Microbial $\alpha$ -Amylase: a Review

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### Abstract

$\alpha$ -Amylases are the oldest and versatile starch hydrolysing enzymes which can replace chemical hydrolysis of starch in industries. It cleaves the  $\alpha$ -(1,4)-D-glucosidic linkage of starch and other related polysaccharides to yield simple sugars like glucose, maltose and limit dextrin.  $\alpha$ -Amylase covers about 30% shares of the total enzyme market. On account of their superior features,  $\alpha$ -amylase is the most widely used among all the existing amylases for hydrolysis of polysaccharides. Endo-acting  $\alpha$ -amylase of glycoside hydrolase family 13 is an extensively used biocatalyst and has various biotechnological applications like in starch processing, detergent, textile, paper and pharmaceutical industries. Apart from these, it has some novel applications including polymeric material for drug delivery, bioremediating agent, biodemulsifier and biofilm inhibitor. The present review will accomplish the research gap by providing the unexplored aspects of microbial  $\alpha$ -amylase. It will allow the readers to know about the works that have already been done and the latest trends in this field. The manuscript has covered the latest immobilization techniques and the site-directed mutagenesis approaches which are readily being performed to confer the desirable property in wild-type  $\alpha$ -amylases. Furthermore, it will state the inadequacies and the numerous obstacles coming in the way of its production during upstream and downstream steps and will also suggest some measures to obtain stable and industrial-grade  $\alpha$ -amylase.

**Keywords**  $\alpha$ -Amylase · Biocatalyst · Drug delivery · Glycoside hydrolases · Glycosidic linkage

Jai Shankar Paul and Nisha Gupta these authors contributed equally as first author.

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## Silver nanoparticle modulates gene expressions, glyoxalase system and oxidative stress markers in fluoride stressed *Cajanus cajan* L.

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<https://doi.org/10.1016/j.jhazmat.2018.03.061>

### Highlights

- Fluoride caused marked reduction in growth and membrane stability index.
- Enhanced production of ROS revealed higher rates of oxidative stress markers.
- Fluoride promoted proline and glutathione syntheses.
- Exposure of fluoride altered expressions of NOX and P5CS genes.
- Silver nanoparticles effectively reduced fluoride-imposed injury symptoms.

### Abstract

Application of engineered nanomaterials has increased these days due to their beneficial impacts on several sectors of the economy, including agriculture. Silver nanoparticles (AgNP) are commonly used to improve rate of seed germination, and growth and development of plants. The present study was aimed to monitor the role of engineered AgNP (non-dialysed) in the amelioration of fluoride (F)-induced oxidative injuries in *Cajanus cajan* L. Experimental results revealed that F-exposure inhibited growth and membrane stability index, while were enhanced with the augmentation of AgNP. The results also demonstrated that F treatment enhanced the accumulations of reactive oxygen species, malondialdehyde and oxidized glutathione, gene expression of NADPH oxidase, and activity of lipoyxygenase, but were decreased by the addition of AgNP. The results indicated that exogenous application of AgNP provided tolerance against F-toxicity via enhancing the levels of proline, total and reduced glutathione, glyoxalase I and II activities, and expression of pyrroline-5-carboxylate synthetase gene. Conducted study uniquely suggested potential role of AgNP in the remediation of F-toxicity, at least in the *Cajanus cajan* L. radicles. Further research would be intended to unravel the molecular mechanism(s) involved precisely in the AgNP mediated alleviation of F-toxicity.

## SEASONAL DISTRIBUTION OF AIRBORNE FUNGI AT THE PERIPHERY OF RAIPUR CITY, CHHATTISGARH, INDIA

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Raipur is the capital city of Chhattisgarh state. The city is located centrally in the state of Chhattisgarh. Fungal spores are widely distributed all over the world, which constitute the major component of the air-borne microflora. Various environmental factors affect the distribution of fungi in a particular area. Occurrence and the type of fungal species change with the season and geographical location. Seasonal variation affects the distribution of fungi in a particular area. To investigate this fact, a Survey of air-borne fungi was carried out from March 2018 to February 2019 by using the Gravity petri-plates method containing PDA (Potato Dextrose Agar) medium. The study recorded a total of 35 fungal species belonging to 14 fungal genera. The dominant species noted were *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. oryzae*, *Alternaria alternata*, *Cladosporium* sp., *Curvularia lunata*, *Fusarium* sp. and *Phoma pomorum*. It was observed that medical and phytopathological consequences are associated with fungal spores. In that respect, study elucidated the distribution and occurrence of air-borne fungi during the year 2018-2019 at the periphery of Raipur city.

**Key Words:** Airborne fungi, Seasonal distribution, Phytopathological, Fungal spores.

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### INTRODUCTION

Raipur is the capital city of Chhattisgarh state in India. It is situated between 22° 33'N to 21° 14'N Latitude and 82° 6' to 81° 38'E Longitude. The city is located centrally in the state of Chhattisgarh, and now serves as a regional hub for trade and commerce for a variety of local agricultural and forest products. Increased urbanization and industrialization in recent time has made a significant impact on air quality of the area. Seasonal variation affects aero-mycoflora of the area. The microbial population of the atmosphere at any place constitutes its aero-spores. Fungal spores are not equally distributed in the environment; their distribution varies according to geographical location and metrological conditions. The concentration of airborne fungal spores has been linked to wind, humidity, temperature, rainfall, altitude, vegetation and various specific reservoirs of contamination. Also, fungal propagative units may be dispersed in the air by insects<sup>1</sup>. Fungal spores are part of air quality depending on the time of the day, weather, season, climatic conditions, and local source of spores<sup>2</sup>. Based on the microbiological analysis of air samples from inhabited areas, it was reported that airborne fungi

are among the most common organisms correlated with the air pollution that have adverse effects on human health as well as causing plant diseases. In light of the above knowledge, the present investigation on airborne fungal flora is essential to understand the deposition and dissemination of fungal spores at the periphery of Raipur city.

### MATERIALS AND METHODS

#### Description of the study site

The study was conducted at the periphery of Raipur city, Chhattisgarh, India. 4 different villages in surrounding of Raipur city, were selected viz. Chandanidih (21° 15'NL and 81° 32'EL), Zora (21°v23'NL and 81° 71'EL), Boriakala (21° 19'NL and 81° 64' EL) and Dhaneli (21° 33'NL and 81° 65'EL). The present study was conducted for a period of one year that is from March 2018 to February 2019.

#### Sampling and calculation

The culture plate exposure method was adopted for trapping the airborne fungi. PDA (Potato, Dextrose and Agar) was used as a culture medium. 10 ml of sterilized

# DIVERSITY OF SOIL AND LEAF SURFACE MYCOFLORA: A SOURCE OF AEROMYCOFLORA

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Microorganisms are introduced into the air from various sources. The important sources of these microorganisms are soil and vegetation of that area. Microorganisms, which are found on plants' surface either as pathogens or as saprophytes, also get suspended in the air. Man-made actions like digging or ploughing the soil may also release soil-borne microbes into the air. The surrounding atmosphere plays an important role as the sources of organisms in the experimental area. The studies were carried out from February 2006 to March 2007. In the present study, aeromycoflora, mycoflora were observed from soil and plant near the experimental sites as their sources. The Potato Dextrose Agar medium containing plates were used for the isolation of mycoflora from their sources around the Panabaras of Rajnandgaon district. During the present study, a total of 22 fungal species of 120 fungal colonies belonging to 14 genera were reported from the soil. While 24 fungal species of 166 fungal colonies belonging to 16 genera were isolated from the leaf surface. *Aspergillus fumigatus* (10.00%) showed the maximum percentage contribution, followed by *Fusarium oxysporium* and *Khuskia oryzae* (8.33%), *Aspergillus japonicus* and *Paecilomyces variotii* (7.5%) and *Alternaria radicina*, *Penicillium notatum* (5.83%) in the soil mycoflora. It is also shown that *Cladosporium cladosporioides* (11.44%) followed by *Aspergillus niger* (9.63%), *A. fumigatus* (6.62%), *Monodictys fluctuata* (6.02%), *Curvularia lunata* (5.42%) and *Aspergillus fumigatus* (4.81%) were the most contributed to leaf surface mycoflora.

**Key Words:** Fungal diversity, aeromycoflora, sources, soil, leaf surface.

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Accepted: 28.07.2020

## INTRODUCTION

Fungi are very successful inhabitants of soil due to their high plasticity and their capacity to adopt various forms in response to adverse or unfavorable conditions<sup>1</sup>. The diversity and activity of fungi are regulated by multiple biotic (plants and other organisms) and abiotic (soil pH, moisture, salinity, structure, and temperature) factors<sup>2,3</sup>. Fungi can be found in almost every environment and can live in a wide range of pH and temperature<sup>4</sup>. Fungal populations are strongly influenced by the diversity and composition of the plant community and in return, affect plant growth through mutualism, pathogenicity, and their effect on nutrient availability and cycling<sup>5-7</sup>. The contribution of soil organisms is very significant in many soil functions such as supporting the growth of plants, absorbing, neutralizing and transforming com-

pounds that might otherwise become pollutants in the environment. Soil is a complex habitat for microbial growth and these microbes generally exist as micro-colonies or biofilms on mineral particles, organic matter, and roots. Currently, microorganisms are exploited to get valuable products that include enzymes, secondary metabolites, therapeutic agents and industrial products. Such potential microorganisms are usually isolated from the soil sample. Among such microbes, filamentous fungi dominate our globe as sources of food, plant and animal pathogens, and other worthy products' biosynthesis.

The phylloplane, the surface of plant leaves, is a complex terrestrial habitat, characterized by a variety of microorganisms, including bacteria, filamentous fungi and yeast. Pathogens, saprobes and epiphytes occur in



## Amelioration of Ageing Associated Alterations and Oxidative Inequity in Seeds of *Cicer arietinum* by Silver Nanoparticles

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### Abstract

Metal-based nanoparticles (NPs) have recently been accomplished a great attention worldwide, in various sectors including agriculture due to their beneficial impacts in plant growth, development and stress tolerance. However, it shows dose-dependent response and may vary with type of metal and synthesis procedure followed. Among many, silver nanoparticles (AgNPs) are most frequently used NP in agricultural sector. In the present study, AgNPs were synthesized following both green (gAgNP) and chemical (cAgNP) synthesis processes, characterized by standard methods and were applied to artificially aged *Cicer arietinum* seeds. Initial characterization of synthesized NPs was done by UV–Visible spectroscopy, and concentrations were calculated as 2.7 nmol for gAgNP, while, 5.8 nmol for cAgNP. Furthermore, the presence of different functional groups in synthesized AgNPs was evaluated by fourier transform infrared spectroscopy (1000 and 4000  $\text{cm}^{-1}$ ). However, the particle size of synthesized AgNPs was estimated by dynamic light scattering/ zetasizer (90–120 nm) and transmission electron microscopy (15–60 nm). Synthesized NPs were then assessed for their ameliorative efficiencies against accelerated ageing-induced injuries in *Cicer arietinum* seeds. Experimental results revealed various physiological and biochemical alterations due to accelerated ageing in seeds of *Cicer arietinum* including the over accumulation of reactive oxygen species and consequent decline in the expressions/ activities of key defensive genes. However, exogenous application of AgNPs provided tolerance against ageing-induced damages by compensating the cellular redox homeostasis via up-regulating the levels/ gene expression of antioxidants in *Cicer arietinum*.

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Session 2020-21

This is to certify that work contained in interim dissertation entitled, "Simulation of  $\text{TiO}_2/\text{Cu}_2\text{O}$  solar cell with SCAPS-1D software" work carried out by Bhaskar at Council of Scientific and Industrial Research, Central Electronics Engineering Research Institute (CSIR-CEERI) Pilani Rajasthan during the period 2020 to 2021, for the requirement of partial fulfillment for the award of degree of Master of Technology (3<sup>rd</sup> semester) in Optoelectronics and Laser Technology, Pt. Ravishankar Shukla University, Raipur (C.G.).

Date- 25/09/2022

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Date 23/09/2021

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A Dissertation on  
"Simulation of  $\text{TiO}_2/\text{Cu}_2\text{O}$  solar cell with SCAPS-1D Software"

Submitted to



School of Study in Electronics and Photonics Pt. Ravishankar Shukla University,  
Raipur (C.G.)

In partial fulfillment for the award of the degree of

**MASTER OF TECHNOLOGY**

In

**Optoelectronics and Laser Technology**

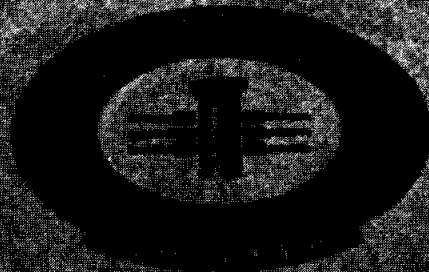
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A Dissertation on  
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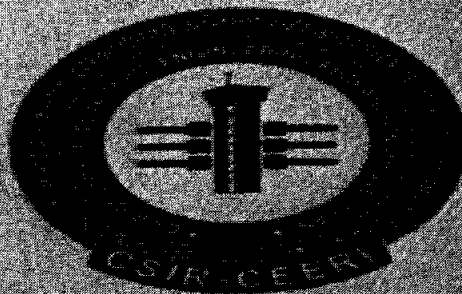
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**Council of scientific and industrial Research, Central Electronics Engineering**

**Research institute Pilani (Rajasthan)**

**Jan 2021 – June 2021**

## DECLARATION

I hereby declare that this written submission entitled "Simulation of TIG, Cu-Au joint with SCAPS-1D software" submitted to the S.O.S. in Electronics & Photonics, Ravishankar Shukla University, Raipur (C.G.) for the degree of Master of Technology in Optoelectronics & Laser Technology is an original record of work done by me at council of scientific and industrial Research Central Electronics Research Institute Pilani (Rajasthan) under the guidance of Dr. S.K. Mishra, Senior Scientist, Semiconductor Device Design Group and Asst. Prof., Academy of scientific and innovation Research CSIR-Central Electronics Research Institute Pilani (Rajasthan). I hereby declare that this work has not been included in any other thesis submitted previously for the award of any degree.

  
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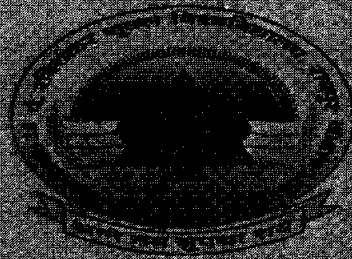
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**INTERNAL EXAMINATION**

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29

A Dissertation on  
"Design and simulation of Nitride based blue LED"  
Submitted to



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*in*

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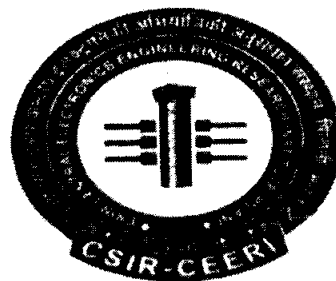
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Rajasthan January 2021 - July 2021

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**Signature of supervisor.**  
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## DECLARATION

I declare that this written submission entitled "**Design and simulation of Nitride based LED** " for the award of Master of Technology in Optoelectronics & Laser Technology of **Pt. Ravishankar Shukla University, Raipur Chhattisgarh**, represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.



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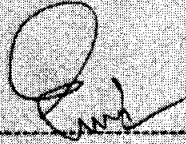
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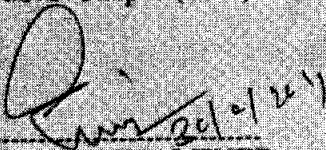
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Advances in Biomedical Engineering and Technology pp 413-424 | Cite as

# Comparative Investigation of Different Classification Techniques for Epilepsy Detection Using EEG Signals

Authors Authors and affiliations

Sunandan Mandal, Manendra Thakur, Kavita Thakur, Bikesh Kumar Singh

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## Abstract

Among the major brain abnormalities that have been identified, various remedial strategies are proposed to tackle most of such conditions. One of the serious abnormalities of the nervous system is epilepsy, which causes electrical distraction and strains the neural system. Usually, epilepsy is determined by the neurologist by analyzing the EEG signals grabbed from the brain. The task is very challenging as it requires continuous examination and connotation of the EEG signal of an epileptic patient. Hence, the development of efficient automatic systems is

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## Performance Evaluation of Spectrogram Based Epilepsy Detection Techniques Using Gray Scale Features

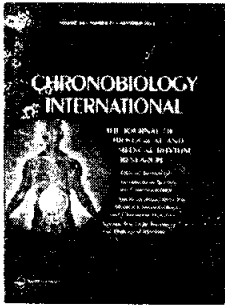
Author(s): Sunandan Mandal, Kavita Thakur, Bikesh Kumar Singh, Heera Ram  
Email(s): sunandan.mandal12@gmail.com  
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# Chronobiology International

The Journal of Biological and Medical Rhythm Research

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## Sexual dimorphism in ultradian and 24h rhythms in plasma levels of growth hormone in Indian walking catfish, *Clarias batrachus*

Raj Naresh Gopal, Dhanananajay Kumar, Vinay Kumar Singh, Atanu Kumar Pati & Bechan Lal

To cite this article: Raj Naresh Gopal, Dhanananajay Kumar, Vinay Kumar Singh, Atanu Kumar Pati & Bechan Lal (2021): Sexual dimorphism in ultradian and 24h rhythms in plasma levels of growth hormone in Indian walking catfish, *Clarias batrachus*, Chronobiology International, DOI: [10.1080/07420528.2021.1896533](https://doi.org/10.1080/07420528.2021.1896533)

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Gmail - Your lab has been matched with the PSA Valence-Dominance Study



Arti Parganiha <arti.parganiha@gmail.com>

## Your lab has been matched with the PSA Valence-Dominance Study

11 messages

**Chris Chartier** <cchartie@ashland.edu>  
To: Arti Parganiha <arti.parganiha@gmail.com>

Tue, Jan 9, 2018 at 11:45 PM

Dear Arti,

You signed up to be part of the first Accelerator Data Collection Wave, and you have been selected as a data collection laboratory for this project! We are so happy to have you on board!

The most urgent next step is for all data collection labs to obtain ethics approval. Please start this process as soon as possible. Ethics approval has created the longest hold ups in the past for similar projects (such as Many Labs) so we have set the deadline for each lab's submission as 2 weeks from receiving this email. We have attached the final study proposal here if that helps you get started.

Please update your ethics approval status in this spreadsheet when you have submitted your materials, and again when you have received approval.

The lead authors for this project, Lisa de Bruine and Ben Jones (University of Glasgow), and the PSA Director, Chris Chartier (Ashland University), have submitted their materials for IRB approval, and we will share them when they are approved in the case that their materials may help you prepare yours or that their approval may expedite your own review process.

We anticipate that between 50 and 100 labs will collect data for this project. The included labs were selected based on their data collection capacity as well as geographic location, to allow for an adequate distribution over world regions. We look forward to sharing this exciting journey with you!

All the best.



**Dr. Christopher R. Chartier**  
Associate Professor, Psychology  
Director, Psychological Science Accelerator  
Ashland University  
cchartie@ashland.edu

**Arti Parganiha** <arti.parganiha@gmail.com>  
To: babita pande <habitatime14@gmail.com>

Thu, Jan 11, 2018 at 12:39 PM

----- Forwarded message -----

From: **Chris Chartier** <cchartie@ashland.edu>  
Date: Tue, Jan 9, 2018 at 11:45 PM  
Subject: Your lab has been matched with the PSA Valence-Dominance Study  
To: Arti Parganiha <arti.parganiha@gmail.com>

Dear Arti,

You signed up to be part of the first Accelerator Data Collection Wave, and you have been selected as a data collection laboratory for this project! We are so happy to have you on board!

# The Psychological Science Accelerator: Advancing Psychology Through a Distributed Collaborative Network

Advances in Methods and  
Practices in Psychological Science  
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Hannah Moshontz<sup>1</sup>, Lorne Campbell<sup>2</sup>, Charles R. Ebersole<sup>3</sup>,  
Hans IJzerman<sup>4</sup>, Heather L. Urry<sup>5</sup>, Patrick S. Forscher<sup>6</sup>,  
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Ceylan Okan<sup>47</sup>, Jerome Olsen<sup>50</sup>, Oscar Oviedo-Trespalacios<sup>51</sup>,  
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Noorshama Parveen<sup>26</sup>, Gerit Pfuhl<sup>53</sup>, Sraddha Pradhan<sup>26</sup>,  
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## Circadian rhythmicity of heart rate variability and its impact on cardiac autonomic modulation in asthma

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### ABSTRACT

The commonly observed nocturnal attack of asthma is accompanied by circadian variations in airway inflammation and other physiological variables. It is also documented to present with a significantly higher risk of adverse cardiovascular events that are associated with lower heart rate variability (HRV) and depressed sympathetic and enhanced parasympathetic modulations. However, available literature is scarce with regard to the impact of alteration in circadian rhythmicity of long-term HRV and its day–night variation in asthmatic patients. Thus, 72-h continuous recording of RR interval and oxygen saturation was done to study the circadian variability of HRV (in terms of time and frequency domain indices) and also to assess the pattern of alterations in sympathetic and parasympathetic tones at different times of the day in asthmatic patients ( $n = 32$ ) and healthy control subjects ( $n = 31$ ). Repeated-measure analysis of variance and independent-samples *t*-test revealed significantly increased parasympathetic tone [in terms of increased square root of the mean squared differences of successive NN intervals (RMSSD), percentage of number of pairs of adjacent RR interval differing by more than 50 ms (pNN50), standard deviation of NN intervals (SDNN), and high frequency (HF)] with reduced sympathetic activity [decreased low frequency (LF) and LF/HF ratio] at early morning hours (between 04:00 and 10:00 h) in the asthma patients in contrast to the healthy subjects who had opposite response. Also, significant phase delay ( $p < 0.05$ ) of all the HRV indices and SpO<sub>2</sub>, was evident by cosinor analysis. Therefore, disturbed circadian rhythm of HRV indices and early morning increased parasympathetic tone points toward the possible pathophysiological basis of exacerbated asthmatic symptoms at late night/early morning hours and susceptibility of future cardiovascular pathologies. This also necessitates the assessment of HRV rhythm while dealing with the therapeutic management of asthma patients.

### ARTICLE HISTORY

Received 25 June 2020  
Revised 3 December 2020  
Accepted 31 May 2021

### KEYWORDS



HRV; HRV circadian rhythm; circadian rhythm in asthma; oxygen saturation rhythm

### Introduction

Asthma, a chronic lung disease due to inflammation and narrowing of the airways, frequently presents with worsening of symptoms overnight, particularly in the early hours of the morning. In fact, nocturnal symptoms in asthma are the most frequent reason and essential indicator of the escalation of treatment. Circadian variations in airflow limitation and airways hyper-responsiveness accompanied by the nocturnal symptoms of cough and dyspnea have been documented as the pathophysiological basis for the same (Sutherland 2005).

On the other hand, a significantly higher risk of cardiovascular events, including myocardial infarction, cardiac arrest, angina, and stroke, has been seen in persistent asthma (Tattersall et al. 2015). In this context, heart rate variability (HRV) has emerged as a noninvasive validated tool for the evaluation of cardiac autonomic function

Poor asthma control has been found to be associated with lower HRV, depressed sympathetic, and enhanced parasympathetic modulations with longer asthma duration, whereas an opposite HRV response is found in controlled asthmatics (Lutfi 2015). Children with stable chronic asthma have been documented recently to present with enhanced parasympathetic modulation and cardiac autonomic imbalance (Franco et al. 2020). But the impact of altered circadian rhythm of HRV in the disease process is still largely unclear. The well-known circadian rhythmicity of various HRV indices in healthy individuals shows increased HRV during the night with predominance of vagal activity and a nighttime peak during the second half of the night (Sammito et al. 2016). A maximal shift toward sympathetic autonomic activation during sleep-to-wake transitions takes place, which has been linked to the observed increase in cardiovascular

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# Circadian clock modulating small molecules repurposing as inhibitors of SARS-CoV-2 M<sup>Pro</sup> for pharmacological interventions in COVID-19 pandemic

Armiya Sultan<sup>a,b,c</sup>, Rafat Ali<sup>b</sup>, Tahira Sultan<sup>d</sup>, Sher Ali<sup>e</sup>, Nida Jamil Khan<sup>b</sup>, and Arti Parganiha<sup>a,c</sup>

<sup>a</sup>Functional Genomics Laboratory, Center for Interdisciplinary Research in Basic Sciences, Jamia Millia Islamia (A Central University), New Delhi, India; <sup>b</sup>Department of Biosciences, Jamia Millia Islamia (A Central University), New Delhi, India; <sup>c</sup>Chronobiology and Animal Behaviour Laboratory, School of Studies in Life Sciences, Pt. Ravishankar Shukla University, Raipur, India; <sup>d</sup>Department of Biochemistry, University of Kashmir, Srinagar, India; <sup>e</sup>Department of Life Sciences, Sharda University, Greater Noida, India

## ABSTRACT

The COVID-19 pandemic caused by SARS-CoV-2 is a global health emergency warranting the development of targeted treatment. The main protease M<sup>Pro</sup> is considered as a key drug target in coronavirus infections because of its vital role in the proteolytic processing of two essential polyproteins required for the replication and transcription of viral RNA. Targeting and inhibiting the M<sup>Pro</sup> activity represents a valid approach to prevent the SARS-CoV-2 replication and spread. Based on the structure-assisted drug designing, here we report a circadian clock-modulating small molecule "SRT2183" as a potent inhibitor of M<sup>Pro</sup> to block the replication of SARS-CoV-2. The findings are expected to pave the way for the development of therapeutics for COVID-19.

## ARTICLE HISTORY

Received 13 July 2020  
Revised 5 March 2021  
Accepted 9 March 2021

## KEYWORDS

Circadian clock-modulating molecules; COVID-19; inhibitors; main protease; pandemic; SARS-CoV-2 M<sup>Pro</sup>; SRT2183; targeted therapy

## Introduction

Outbreaks of deadly contagious diseases, particularly caused by viruses, have always been a big threat to the human race. During the last five decades, herpes, legionnaires, HIV/AIDS, Western African Ebola epidemic, Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), and now new coronavirus disease 2019 (COVID-19) viruses have attacked human population worldwide. The members of the coronavirus family, alone, have caused two deadly outbreaks, namely MERS caused by MERS coronavirus (MERS-CoV) and SARS caused by SARS coronavirus (SARS-CoV) during the last two decades (Zhong et al. 2020). In December 2019, a new unprecedented viral infection emerged in Wuhan, China. Genomic studies have shown that about 82% genome of this novel virus match the RNA genome of SARS-CoV (Wu et al. 2020a, 2020b; Zhou et al. 2020). The novel virus was named as Severe Acute Respiratory Syndrome coronavirus-2 (SARS-CoV-2) and the contagious infectious disease caused by this new virus was named as coronavirus disease 2019 (COVID-19) (Gorbalenya et al. 2020).

Pathophysiological findings made it evident that SARS-CoV-2 infection is more contagious than both MERS and SARS (Zhang and Holmes 2020). Infection can spread even if an individual is asymptomatic or in presymptomatic conditions. Individuals infected with

SARS-CoV-2 develop mild-to-moderate illness; however, older people and those with chronic medical complications are more likely to develop serious illness (Chen et al. 2020; Li et al. 2020; World Health Organization, clinical management of COVID-19: Interim Guidance 2020).

In December 2019, the COVID-19 pandemic outbreak originated in Wuhan city, Hubei province of China. The first cluster of cases of "pneumonia of unknown cause" was reported in late December 2019 (Wu et al. 2020a). Thereafter, the contagious SARS-CoV-2 infection quickly spread globally. The first laboratory-confirmed novel coronavirus case recorded outside of China was reported on 13th January 2020 by the Ministry of Public Health in Thailand (Yan et al. 2020). The World Health Organization (WHO) declared the infection a pandemic on 11th March 2020 (Zhang et al. 2020). According to WHO reports, confirmed cases of COVID-19 are increasing exponentially worldwide. Globally, as of 04:02h CET, 4 March 2021, there have been 114,853,685 confirmed cases of COVID-19, including 2,554,694 deaths, reported to WHO (<https://covid19.who.int/>). However, these numbers are likely to be higher than reported because of the frequent exclusion of mild or asymptomatic cases.

Currently, no therapeutic options are available for COVID-19. However, an insight gained on the SARS-CoV-2 RNA genome and crystal structures of

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*Aditya Tiwari*

Has successfully completed *ARIES Training School in Observational  
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Kuntal Misra

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Dr. Kuntal Misra  
Co-ordinator ATSOA-2021

Date: 10<sup>th</sup> June, 2021



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Date : 10<sup>th</sup> June, 2021

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This is to certify that,

*Saloni Singh*

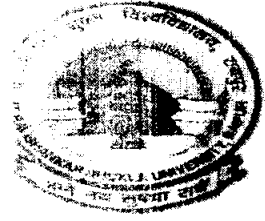
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*Kuntal Misra*

Signature

Dr. Kuntal Misra  
Co-ordinator ATSOA-2021

Date : 10<sup>th</sup> June, 2021



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UNESCO Chair in Community based  
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## Proposal for Research Project

# Study of Maternal Health Care: A Community Perspective

A

Research proposal submitted to

Social Sciences and Humanities Research Council  
(SSHRC)

Bridging Knowledge Cultures Partnership Development Grant

### RESEARCH TEAM

Prof. Reeta Venugopal  
Prof. Priyamvada Shrivastava  
Ms. Nandita Bhatt  
Dr. Anuradha Chakraborty  
Aniksha Varoda

Research Centre

SANGWARI CBPR HUB

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Chhattisgarh 492010  
India  
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12 May 2021

TRANSFER OF FUNDS AGREEMENT

BETWEEN

UNIVERSITY OF VICTORIA (UVic)  
Office of Research Services

AND

PT. RAVISHANKAR SHUKLA UNIVERSITY (RECIPIENT INSTITUTION)

Principal Investigator	Dr. Budd Hall
UVic Reference	51288-54250
Funding Agency	Social Sciences and Humanities Research Council
Funding Agency Reference	890-2019-0061
Overall Project Period	22 March 2020 to 21 March 2022
Project	Bridging Knowledge Cultures: The Knowledge for Change Global Consortium on Training of Community-Based Participatory Research

TRANSFER DETAILS:

Investigator	Dr. Reeta Venugopal
Use of Funds Period	1 April 2021 to 21 March 2022
Amount	\$3,000.00 Canadian – two instalments

Principal Investigator is collaborating with Investigator of Recipient Institution on the above named project. Principal Investigator has requested that funds be forwarded to Recipient Institution for the benefit of the



investigator as stated above. The UVic will transfer funds to the Recipient Institution under the following provisions:

CONDITIONS:

- ❖ The Principal Investigator at the UVic specifies that the funds provided to the Recipient Institution be used towards expenses for the purposes of this project as outlined in the attached Appendix A
- ❖ Funds will be transferred in two instalments: 90% immediately and the balance upon receipt of a financial statement, as noted below.
- ❖ The Recipient Institution will not issue a sub-grant of this award.
- ❖ Any unused funds at the end of the Overall Project Period stated above must be returned to UVic
- ❖ UVic accepts no responsibility or obligations for funds expended in excess of the amount quoted above.
- ❖ If applicable, any equipment purchased from this grant shall be the property of the Recipient Institution.
- ❖ The Recipient Institution agrees that grant funds must contribute towards the direct costs of the research for which the funds were awarded, and the benefits should be directly attributable to the grant. Therefore, Indirect Costs are deemed ineligible by the granting agency and therefore may not be charged against these funds.

GENERAL TERMS AND CONDITIONS:

- ❖ The Recipient institution must administer the funds for the benefit of each participating grant or award holder, co-investigator and/or collaborators of that institution in accordance with the Tri-Council Agreement on the Administration of Agency Grants and Awards by Research Institutions, and with any other relevant policies of the Agency, including those at:

[http://www.nserc-crsng.gc.ca/Professors-Professeurs/FinancialAdminGuide/GuideAdminFinancier/index\\_eng.asp](http://www.nserc-crsng.gc.ca/Professors-Professeurs/FinancialAdminGuide/GuideAdminFinancier/index_eng.asp)

The Recipient Institution will repay any funds which do not fully conform to applicable Tri-Agency regulations, policies and requirements.

- ❖ The Recipient Institution must administer the funds must comply with TCPS 2 – Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (<http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/Default/>) and the Tri-Agency Framework: Responsible Conduct of Research (<http://www.rcr.ethics.gc.ca/eng/policy-politique/framework-cadre/>), and may not disburse funds on behalf of the grantee until all specified certificates, such as biohazards, animal care, human ethics, etc., have been met.
- ❖ Intellectual property developed under this project solely by researchers at one institution shall be governed by the applicable intellectual property policies and/or collective agreements of that institution. Intellectual property developed under this project jointly by researchers at different institutions shall be jointly owned by those institutions, and any commercialization of such joint intellectual property shall be in accordance with an agreement to be entered into between the institutions.

**FINANCIAL REPORTING:**

- ❖ A full accounting of the project signed by the relevant financial officer at the Recipient Institution must be provided on or before 30 April 2022 for the period ending 31 March 2022. Upon receipt of the final statement, the holdback will be sent. The signature of the financial officer certifies that the funds were administered on behalf of the Recipient Institution according to the Funding Agency's applicable regulations. The UVic has the right and responsibility to withhold or withdraw approval of expenditures proposed by the Recipient Institution that contravene Funding Agency's regulations. Please forward the statement with reference to UVic's Reference number to:

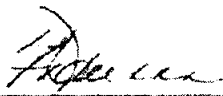
Ms. Helena Filmer, Assistant Manager  
Research Accounting  
University of Victoria  
P.O. Box 3040, Victoria, BC V8W 3N7  
hfilmer@uvic.ca


- ❖ The Recipient Institution agrees to maintain the relevant supporting documentation on file in accordance with the transfer letter, supportive documentation for all expenditures and Form of Receipts. The Recipient Institution must be able to provide the UVic with copies of documents that describe transactions involving the funds so that they are readily available for review during any time that is requested at the UVic.

If you are in agreement with this arrangement, please have authorized individuals sign this document and return a copy to us email. Upon receipt, Research Accounting will be advised to transfer the letter to the Recipient Institution. Should you have any questions, please do not hesitate to contact me.

Sincerely


Agreed

  
Debra C. Anderson, Manager  
Research Finances

  
8.6.21  
Registrar  
P.L.S. UNIVERSITY  
RAIPUR (C.G.)  
On behalf of Recipient Institution

Request for transfer on file in  
UVic, ORS

Principal Investigator, UVic

  
Investigator at Recipient Institution

p.c. Principal Investigator, UVic  
Ms. H. Filmer, Assistant Manager, Research Accounting

## **Collaborative Research (Study of Maternal Health Care: A Community Perspective)**

**Subject:** SSHRC Bridging Knowledge Cultures Partnership Development Grant

Dear Friends,

We hope that you and your families and friends are doing well. We are moving forward now with the next steps in the Bridging Knowledge Cultures project. Thanks very much for the very good contributions made to the working paper. Please find two attachments. The first is an explanatory letter to each of you outlining the next steps in the project including expectations, timelines and financial matters. The second is our evolving analytic framework which we hope will help us move forward. There is one more practical set of guidelines that we will send you next week with more details about what you can look for in terms of both academic and community knowledge cultures. This is being drawn from the information that you have provided us in the regional working papers.

We have tried to strike a balance between giving you more clarity on what we looking for but want to respect the diversity of each of your hub locations, contexts, partnerships and visions. We want the stories of your hub's exploration of the differences between the ways that knowledge is understood with some of your academic partners and the ways that knowledge as change and agency happens within community, social movement or Indigenous partnerships.

We will schedule a zoom webinar mid-March to check in with everyone, but please reach out to either our Victoria or New Delhi team with questions. Walter Lepore is our Project Director.

Cheers,

Budd and Rajesh

Co-Chairs UNESCO Chair in Community-Based Research and Social Responsibility in Higher Education  
Web site: [Http://www.unescochair-cbrsr.org](http://www.unescochair-cbrsr.org)

We acknowledge with respect the traditional territories of the Lekwungen speaking peoples, the Esquimalt, the Songhees and the WSÁNEĆ  
First Nations on whose land I live and work and whose relationship to the land continues today.

"Hold fast to your dreams, for without them life is a broken winged bird that cannot fly" Langston Hughes



# Exploring the Relationship Between Character Strengths and Meditation: a Cross-Sectional Study Among Long-Term Practitioners of Sahaja Yoga Meditation

Tommy Hendriks<sup>1</sup> · Joshua Pritikin<sup>2</sup> · Rajeev Choudhary<sup>3</sup> · Chad Danyluck<sup>4</sup>

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## Abstract

A growing body of research has associated the practice of meditation with the development of character strengths. Sahaja Yoga (SY) is a spiritual practice designed to help people develop a set of character strengths. The primary goal of the current work is to determine whether practitioners of SY meditation endorse signature strengths. Using the VIA Inventory of Strengths 120, we conducted a survey to measure the character strengths among 310 daily practitioners of SY meditation and compared them to a matched sample from the database of the VIA Institute on Character. Practitioners of SY meditation endorsed seven signature strengths, relative to non-meditators: spirituality, awe, compassion, gratitude, self-regulation, teamwork, appreciation of beauty, and love. Findings suggest that the practice of SY meditation may be related to a more and broad set of character strengths. The findings pave the way for research identifying signature strength development in other group contexts.

**Keywords** Character strengths · Meditation · Sahaja Yoga · Kundalini · Spirituality

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**RASHTRIYA RAKSHA UNIVERSITY**  
**An Institution of National Importance**  
**Pioneering National Security and Police University of India**



RRI, Bhopal - 471001 (M.P.)

Friday, December 17, 2021

To,  
**Dr. Rajeev Choudhary,**  
Professor in Physical Education,  
Head, School of Welfare,  
Head, School of Education in Law,  
The Rashtriya Raksha University,  
Bhopal - 471001 (M.P.)

Email: choudharyrajee@pmzil.com

**Sub- Appointment as Adjunct Faculty**

Dear Sir,

I have the honor to refer Dr. Gaurav Singh Kushwah, Dean, RRI, conversative with you regarding your contribution in the School of Physical Education, Sports and NCC.

*Rashtriya Raksha University*, pioneering security and police university of India is an Institution of National Importance and Central University under Ministry of Home Affairs, Government of India. The mission of this University is to offer interdisciplinary learning, research and training to in-service and retired personnel and civil society participants in the fields of national security and police matters.

Your experience and contribution to the nation in Sports Education as well as in conjunction with various institutions and experts in similar domains will greatly help the School of Physical Education, Sports and NCC (SPESN) in furthering the cause of inter disciplinary education, research and training. Accordingly, we are pleased and honored to have you as an **Adjunct Faculty** for the academic year 2021-22. As Adjunct Faculty, you will contribute by engaging and providing your expert guidance in undergraduate/ postgraduate academic lectures along with other academic and administrative activities to be undertaken as an active part for the growth and development of the university.

The University shall be glad to offer you the remuneration for your services and expertise through your involvement into lectures and services rendered; ensure comfortable boarding and lodging facilities and so and fro travel during your engagements at the RRI.

Looking forward to your kind acceptance of the same.

Thanking you

With kind regards

  
**Dr. P. V. Ravi Kumar**  
Dr. Pro-Vice-Chancellor

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No./1457/Reg./2020  
To,

Raipur, Date: 24.12.2020

Sh. K. V. Ravi Kumar  
I/c Pro-Vice-Chancellor  
Rashtriya Raksha University  
(An Institution of National Importance)  
At Lavad - Dehgam 382 305, Gandhinagar-Gujarat, India  
Email: pro-vc@rru.ac.in  
Mobile No. +91 70690 74879

**Subject:** NOC of Dr. Rajeev Choudhary regrading his appointment as an Adjunct Faculty.

**Ref.** RSU/Pro VC/AF/2020/131 dated December 18<sup>th</sup>, 2020.

Dear Sir

Dr. Rajeev Choudhary has been working as a Professor in School of Studies in Physical Education, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh since 21.11.2012.

With reference to your Letter: RSU/Pro VC/AF/2020/131 dated December 18<sup>th</sup>, 2020. "No Objection Certificate" is issued to Dr. Rajeev Choudhary, Professor, School of Studies in Physical Education for his appointment as Adjunct Faculty at Rashtriya Raksha University Gandhinagar, Gujarat.

This is for your kind information and necessary action.

Registrar

Raipur, Date: 24.12.2020

End. No./1458/Reg./2020

Copy to

1. The Head, School of Studies in Physical Education, Pt. Ravishankar Shukla University, Raipur Chhattisgarh-492010
2. Dr. Rajeev Choudhary, Professor, School of Studies in Physical Education, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh-492010

Deputy Registrar