

# **National Conference on Circular Bioeconomy and Bioengineering Approaches for a Clean Environment and Health**

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**Organized by**

Department of Biotechnology

Vignan's Foundation for Science, Technology and Research

(Deemed to be University)

Vadlamudi, Guntur - 522 213, Andhra Pradesh

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**Published by**



## **National Conference on Circular Bioeconomy and Bioengineering Approaches for a Clean Environment and Health**

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## About the Conference

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The term “bioeconomy” refers to the development and use of biological resources, products, and technologies to supplement fossil fuels and/or deliver goods and services sustainably. Circular bioeconomies have the potential to aid in the transition to more sustainable, low-carbon societies, but their sustainability may be compromised by a decrease in the number of people involved, problem/solution framings, and value types highlighted. For more equitable, resilient, and communally reliable circular bioeconomies that fulfil common cultural, environmental, and economic sustainability goals, it is necessary to broaded expertise and stakeholder input, encourage multiple visions and implementations, and pluralize the values shaped and derived from biotechnology. All of these things are necessary for meeting the goals of sustainability. Keeping the above features in view, the virtual conference is mainly focused on biofuels and Biorefinaries, Biomedical applications for health, Circular bioeconomy, Environmental engineering and management, Microbial bioprocesses, and waste biovalorization related to circular bioeconomy.

### Conveners



Prof. T.C. Venkateswarulu,  
HoD, BT



Prof. D. John Babu

### Organizing Secretaries



Dr.A. Ranganadh Reddy



Dr.A. Venkata Narayana



Dr.K. Chandrasekhar



# Acknowledgments

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The Department of Biotechnology and Conveners and Organizing Secretary's of the National Conference entitled "Circular bioeconomy and bioengineering approaches for a clean environment and health" earnestly acknowledge the Scholars, Faculty, HoD, Department of Biotechnology, Dean, R & D, Registrar and Vice Chancellor for rendering the help in the successful conduct of events by providing umpteen number of facilities. Over and above, the liberal financial help rendered by the University to organize the National conference is immensely acknowledged. Our special thanks to our beloved Chairman and the Vice Chairman of Vignan's group of Institutions for persistently encouraging us to organize the national and international events so as to build the knowledge base in the Department of Biotechnology.

**Conveners & Organizing Secretary**

**Prof. T.C. Venkateswarulu, HoD, BT**

**Prof. D. John Babu**

**Dr.A. Ranganadh Reddy**

**Dr.A. Venkata Narayana**

**Dr.K. Chandrasekhar**



## **About VFSTR**

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Vignan's Foundation for Science, Technology and Research (VFSTR) has made it, as its mission to prepare globally acceptable, readily deployable and industry - ready skilled professional to navigate towards the socio-economic transformation of the region. It provides quality education in a diverse and intellectually stimulating environment. It imparts value addition training to students to make them competent and inspired engineers. The Institute celebrates the power of knowledge, cultivates vision and builds awareness about the self and society around. The Institution is known for its unique practices and ethical value systems since its inception.

## **About the Department of Biotechnology**

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Department of Biotechnology has well qualified and experienced faculty and scientists who are specialized in the areas of Bioprocess Engineering, Bioinformatics, Environmental Biotechnology, Plant Biotechnology, Biochemical Reaction Engineering, Genetic Engineering etc. The Department attributes its success to the creative and innovative outlook of the students strongly supported by highly qualified and well trained faculty. Department of Biotechnology is supported by DST-FIST since 2015 and several sponsored projects from DST and MoEF, Govt. of India.

All the various facets of teaching-learning process such as state of art infrastructure, innovative teaching methodologies and regular counselling sessions are in practice which serves as powerful catalyst to metamorphosize an average student into a confident, highly employable engineer who is abreast of the latest and fast changing technological trends in the market. Currently the Department of Biotechnology is offering UG programmes in B. Tech Biotechnology, B. Tech Bioinformatics, and PG programme in M. Tech Biotechnology. Apart from these Ph. D programme is also offered.

The Department of Biotechnology is having equipment related to enzyme technology, bioprocess engineering, animal cell culture and plant tissue culture. In addition, the department is endowed with BSL-II and Clean Room facility. Further, the department is maintaining a medicinal herbs and flowering plants garden with in the campus with a total number of 30 endemic and exotic species. The Center of Excellence in the department is focussing research activities on the various aspects of recent advances in biotechnology such as vaccine development, redox enzymes, Phyto pharmaceuticals, molecular phylogeny, biotransformation of food waste etc.

**Prof. T.C. Venkateswarulu,**

**Head, Dept. of Biotechnology, VFSTR.**





# Vision & Mission of the Department of Biotechnology

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## **Vision**

- To be a Centre of Excellence in the field of Biotechnology with high quality academic and State-of-the-art research to produce multifaceted, internationally accepted employable professionals.

## **Mission**

- M1: Providing state of the art curriculum with skill-based practices in teaching and learning to pursue career opportunities in biological and bioprocess related fields.
- M2: Offering adequate laboratory facilities with conducive research vicinity to make students ready for industry and update to pursue higher education, research and consultancy.
- M3: Transforming into committed professionals with sense of belonging, leadership abilities, managerial competencies, team participation, social awareness, human values and ethics.



## Message from Higher Officials

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### **Dr.L. Rathaiah**

I congratulate the Department of Biotechnology and Prof. T.C. Venkateswarulu, Prof. John Babu, the Conveners' and Dr.A. Ranganadh Reddy, Dr.A. Venkata Narayana, and Dr.K. Chandrasekhar the Organizing Secretary's of the National Conference on the "Circular bioeconomy and bioengineering approaches for a cleaner environment and health" scheduled to be held during 9<sup>th</sup> to 10<sup>th</sup> September 2022. It is quite interesting and amazing that six eminent invited speakers, Indian delegates, and many students and research scholars have contributed research abstracts to this conference for both oral and poster sessions. I appreciate this Department for taking a keen interest in organizing this conference. I am sure that the program of the National Conference with experts from the Industry, R&D institutes, and Academia would offer insights into the recent trends in the circular bioeconomy in the direction of waste valorization, clean environment, and health that are confronting mankind.

**Dr.L. Rathaiah**

**Chairman, Vignan Group.**





## **Sri L. Sri Krishna Devarayalu**

It gives me great pleasure to note that the Department of Biotechnology is organizing a National Conference on the theme related to the contemporary interest entitled “Circular bioeconomy and bioengineering approaches for a cleaner environment and health”. I appreciate Prof. T.C. Venkateswarulu, Prof. John Babu, Dr.A. Ranganadh Reddy, Dr.A. Venkata Narayana, & Dr.K. Chandrasekhar and all the members of the faculty who are actively involved in various teams to organize the conceived event which is a first of its kind at Vignan and many eminent experts are participating in delivering their findings in this forum. I wish students, scholars, and faculty would benefit from interacting with distinguished delegates to achieve long-term goals.

I wish you all a grand success.

**Sri L. Sri Krishna Devarayalu**

**Vice-Chairman, VFSTR.**

**Member of Parliament (Lok Sabha).**





### **Dr.P. Nagabhushan**

The Department of Biotechnology is always in the fore front through it's excellent performance in teaching, research and extension activities. Faculty, staff, and students of Biotechnology have brought many laurels to the University through their commitment & involvement with a sense of belonging. Indeed, I strongly believe that it is the collective responsibility of all members of the faculty, scholars and students that upkeeps the name and fame of the Department of Biotechnology. It is an opt time that the Department of Biotechnology is organizing a National Conference inviting several experts from R&D labs and academia to discuss the route map and the latest happening in the fields of Biofuels and bioproducts from organic waste, Waste valorization, and Biorefinery approaches towards Circular bioeconomy. I assure to extend all the support in all endeavors' of the Department of Biotechnology.

**Dr.P. Nagabhushan**

**Vice-Chancellor**





# Message from Conveners & Organizing Secretary

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## CONVENERS



## ORGANIZING SECRETARY



Dear Delegates & Participants

Warm Greetings !!!

On behalf of Department of Biotechnology, Vignan's Foundation for Science, Technology & Research, we would like to cordially welcome you to the National Conference on "Circular bioeconomy and bioengineering approaches for a cleaner environment and health". The goal of the conference is to bring together leading Indian and global experts on biofuels and waste valorization on a single platform to share their research experience and vision on how to design hybrid bioreactor and developing integrated approaches for process enhancement in the direction of circular bioeconomy. Today we see the need of circular bioeconomy and integrated approach in biology field and most widely infiltrated in to biofuels production. This conference with the theme of circular bioeconomy is the right platform to bring various interdisciplinary researchers to bring under one roof to discuss the recent methodologies they are employing to produce biofuels. Through this conference we will put all our effort to spread the latest technology used in waste valorization, value-added product recovery from fermentation effluents and also the circular bioeconomy. The thematic talks and the question & answer sessions will drive you through the multidisciplinary emergence in the biological world. This could be the first conference of its kind in our region where everyone could have opportunity to showcase and present their ideas, thoughts, developments that could lead to a development of biofuels production from organic waste. We are trying our best to ensure that your fixed time schedule and other things during the conference would go smoothly and become one of the most memorable events. We heartily inviting you all to participate in the national conference and gain the maximum out of it and finally, We thank each and every one of you who are contributing to the success of the national conference.

**Best Wishes**



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## **Circular Bioeconomy: Approaches for a Clean Environment & Health in India**

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**ABSTRACT:** In the current era of global challenges to combat climate change resultant of anthropogenic activities, there is an ever increasing emphasis on circular bioeconomy. Circular bioeconomy is the latest and trending economic model which focusses on the utilization of renewable biological sources of energy, thereby minimizing the carbon footprints of conventional sources of energy with simultaneous reduction in waste generation. India being a developing economy has an ample scope for implementation of various strategies under the said model. In this context, biofuels like bio-ethanol, bio-diesel are receiving a major impetus from the government of india in its support for a circular bioeconomy to ensure a sustainable future in the energy sector, discouraging the reliability on the oil imports. Industrial scale production of bioethanol has picked up in this endeavor for a sustainable development. Further, domestic waste water in tandem with industrial effluents pose a major environmental health hazard demanding extensive and large scale treatment infrastructure and newer technologies.

In this prevailing scenario, there is a renewed interest on algae based biofuels as a renewable source of energy and an alternative wastewater treatment technology. However, limited number of studies from an indian perspective and huge quantum of effluent generation from wide variety of industrial / domestic sectors makes the algae based bioenergy a vital source of renewable energy, complementing the india's efforts for a clean environment and fight against global warming. Research and development studies are required to understand the umpteen variety of algae locally available in the country as a source of bioenergy and the capability of bio-engineered algal strains to maximize the biofuel production and wastewater treatment capability. Scale-up of lab scale and pilot scale studies for industrial scale applications would be an interesting intervention to meet the india's ever-increasing green energy requirements.

**KEYWORDS:** Biofuels, Circular Bioeconomy, Green Energy, Sustainable Technologies.

## **Promises(s) of Mesenchymal Stem Cells Isolated from Human Placental Tissue in Averting Diabetes - A Preclinical Approach**

Dr. Vijayalakshmi Venkatesan, Former Director, National Institute of Nutrition (ICMR), Jamai-osmania P.O. Hyderabad, India.

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Dr.J. Samuel, National Institute of Nutrition (ICMR), Jamai-Osmania P.O. Hyderabad.

**ABSTRACT:** Circular bioeconomy and bioengineering concept for a clean environment and health is an important. Concept for better living, for good health and its logistics. A disruption in this chain leads to sequelae of changes to alter the ecosystem which has an important bearing on health.

Diabetes and obesity (Diabetes) constitute important metabolic syndrome and strongly complement each other. Their increased prevalence across the globe, more so in Asian countries like India underlines the causative factors to be either genetic, environmental, lifestyle changes including Nutritional and more recently epigenetic. Metformin is the most widely used medication for treating T2D, wherein it lowers the liver glucose production and improves insulin sensitivity in skeletal muscle and in white adipose tissues in addition to DPP-4 inhibitors, Sulfonylureas and Meglitinides etc. However, their long-term use has been documented with varied side-effects which necessitated for alternate treatment strategies to explore. Adipose tissue, skeletal muscle, liver, and to a lesser extent brain form major depots of fat accumulation. Indeed, excess free fatty acids present in the obese condition contributes to the insulin resistance observed in all these tissues and is the most important confounding factor to develop frank diabetes.

Mesenchymal stem cells (MSCs) have been very promising in the field of Bioengineering and Biomedical research due to their inherent immunomodulatory, anti-inflammatory, secretome and multipotent functions and aids in regeneration and repair process in situ of target organs. Interestingly, our findings with Placental derived Mesenchymal stem cells (P-MSCs) demonstrated beneficial effects to negate diabetes in preclinical model using Mutant rats which interfaces (Obesity with diabetes) akin to human subjects presenting Obesity with diabetes. We report for the first time for the feasibility and efficacy of P-MSCs to ameliorate Impaired Glucose Tolerance, correct lipid profiles and activate the insulin signalling pathway to restore insulin sensitivity vis a vis

induce remodelling of cytokines with upregulated anti-cytokines being predominant both in the serum and in the tissues (skeletal muscle, and adipose tissues) of Mutant rats treated with P-MSCs.

Determinants to modify energy imbalance by activating the browning process or induction of non-shivering thermogenesis has been a newer approach to combat adiposity and diabetes. We show that P-MSCs therapy not only aids in restoring the energy imbalance by modulating mitochondrial biogenesis and mitochondrial uncoupling pathways in the white adipose tissues, but also facilitates the browning of white adipocytes. Our findings open up newer avenues and approaches of P-MSCs to address the clinical management of Obesity allied T2D.

**KEYWORDS:** Diabetes and Obesity, Mesenchymal Stem Cells, Precilical Model, Mutant Rats.

## Glucans (Linear and Cyclic) – Bioprocess Development and Purification

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**ABSTRACT:** Beta glucans are one of the most popular microbial polysaccharides. These glucans are homopolymers characterized by beta glycosidic linkages between D-glucose units. They have been associated with immunomodulation, and anti-tumor, cholesterol reduction and anti oxidant activities. In the food industry they are approved by US Food and Drug Administration (FDA) as stabilizer and thickener. <sup>2</sup>-(1, 3) linear glucan, also known as curdlan, is a high molecular weight water insoluble extracellular polysaccharide produced by fermentation using *Agrobacterium* under nitrogen limiting conditions [1,2]. Cyclic <sup>2</sup>-glucans have been exclusively found in the bacteria of the Rhizobiaceae family [2]. One of these cyclic glucans is characterized by <sup>2</sup>-(1,3) and <sup>2</sup>-(1,6) glycosidic linkages. This is a water soluble polymer and because of the presence of a cage like structure, it can be an effective drug carrier. The inner cavity diameter of cyclic glucan is of the order of 1.5 nm. This periplasmic glucan is found to be secreted into the extracellular medium especially in the stationary phase. This talk will focus on the preparation, characterization and purification of <sup>2</sup>-(1, 3) linear and <sup>2</sup>-(1,3) and <sup>2</sup>-(1,6) cyclic glucans.

**KEYWORDS:** Beta Glucans, Curdlan, Periplasmic Glucan, Process Development and Purification.

## LC-MS/MS Assessment of Monoclonal Antibody Stability: Monitoring Tryptophan and Methionine Oxidation

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**ABSTRACT: Introduction:** Monoclonal antibodies (mAbs) are highly complex biomolecules comprising of a long chain of amino acids maintained in their desired conformation over a defined period of time to retain stability, efficacy, and to comply with regulatory requirements. Protein oxidation is a deleterious and irreversible post translational modification known to occur on multiple residues including methionine, tryptophan, lysine, cysteine, or histidine. Methionine or tryptophan oxidation in the complementarity-determining regions (CDR) can reduce the antigen binding and potency of mAbs<sup>1</sup>. Here we report a rapid digestion assisted LC-MS/MS based method to identify site-specific mAb oxidation located in the CDR domain.

**Methods:** A canine monoclonal antibody was used in this study. Reference mAb, 100 ug, was subjected to forced oxidation treatment conditions involving 10% AAPH and 0.075% H<sub>2</sub>O<sub>2</sub> for tryptophan and methionine residues, respectively. Our rapid digestion approach involved the denaturation of oxidised mAb using freshly prepared 8 M urea, reduction with 10 mM DTT, followed by proteolytic digestion with trypsin at 37°C for 15 minutes. Resulting proteolytic peptides were desalted using 3M Empore® C18 discs. Mass spectrometry analysis was performed using a reverse-phase analytical column (Waters CSH C18, 2.1mm x 150mm, 1.7µm) for 140 minutes with liquid chromatographic separation on an Agilent 1200 LC system coupled in-line with a Xevo-QTOF MS (Waters) equipped with a standard microflow source.

**KEYWORDS:** Monoclonal Antibodies, Complementarity-determining Regions, LC-MS/MS Assessment.

## **Enabling Environmental Resilience through Circular Bioeconomy**

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**ABSTRACT:** The mounting climate issues are posing a series of threats to ecological services and prompting to chart a novel path towards adapting sustainable production and consumption strategies. The current linear economic model is not sustainable with less than 9% recovery rates. Resource depletion, waste generation and climate change issues pose a serious threat to the environment and ecosystem services. In this context, adopting the closed-loop approach that enables resource recovery by adopting nature based solutions (NBS) is being considered one of the sustainable strategies that help to accelerate the transition to resilient and self-sustainable ecosystems. Therefore, focus on green technologies/process that can be considered for waste valorization by implementing 'circular loops' that strategically directs the flow of resources, their use, and extracting value in the form of nutrients, energy and materials is much needed. Optimized integrations of unit operations across closed loops are much-needed with a process intensification strategy to qualify their nutrient influx in a larger context. The ongoing research at CSIR-IICT on biorefinery systems employing closed-loop and self-sustainable design with a multi-product portfolio will be discussed.

**KEYWORDS:** Climate Change, Ecosystem, Sustainable Strategies, Waste Valorization.



## Microbial Bioremediation of Polychlorinated Biphenyls

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**ABSTRACT:** Polychlorinated Biphenyls (PCBs) are persistent organic pollutants (POPs) and have hazardous impact on human health and the environment. These are having wide applications in electrical and mechanical industries as capacitors, transistors, transformers, lubricants and plasticizers. The commercial production of PCBs started in the year 1929 and has been widely used across the world between 1930 and 1980. However, PCBs are still found in the environment after 40 years. They have been found in human's tissues, blood, and breast milk and are entered through the consumption of meat, fish, and dairy products. As a result, these have been associated to adverse health effects in humans such as immune system damage, decreased lung function, bronchitis and intercede with hormones leads to cancer.

Polychlorinated biphenyls are group of substances consisting of a biphenyl molecule with or without aryl substituent, in which one or more than one chlorine atom is substituted in biphenyl ring at 10 different positions. These forms 209 congeners and 10 homologs. Based on the position of chlorine atoms, physical and chemical properties of PCBs changes. The present study is focussed on isolation of potential organisms from contaminated sites and their characterization for effective removal of PCBs from waste soil and water. Further, optimized nutrient media composition and conditions through one factor at a time (OFAT) method and statistical approaches to maximize percentage degradation of PCBs.

**KEYWORDS:** Polychlorinated Biphenyls, Bioremediation, Health Effects and Optimization.

## **Study on Production and Characterization of Uricase from Newly Isolated Bacteria**

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**ABSTRACT:** Uricase is a diagnostic and therapeutic enzyme used to detect the levels of a purine end product namely uric acid in serum samples and urine. It favours the conversion of uric acid to a soluble product. Excess uric acid in the human body form urate crystals and can lead to various diseases that includes gout and hyperuricemia. There is no permanent solution to maintain constant levels of uric acid in the human body which varies from individual to individual and there is a need for the isolation of more sources for uricase production. This study aimed to isolate, characterize the uricase producing strain isolated from drain water near dairy industry and further optimize the conditions to enhance uricase production. Here extracellular uricase producing *Escherichia sp.* and *Pseudomonas sp.* were isolated and identified using 16S rRNA sequencing. Biochemical characteristics of the isolated bacteria were determined. The effects of medium components on uricase production were studied. The enzyme was purified by ammonium sulphate precipitation followed by dialysis and chromatography. Kinetic properties for the resulted enzyme were studied.

**KEYWORDS:** *Escherichia*, *Pseudomonas*, Uricase, Urate, Uric Acid, Gout.

## Production of Alpha-Galactosidase from Various Microbial Sources

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**ABSTRACT:**  $\alpha$ -Galactosidase is an exoglycosidase that target galactooligosaccharides such as raffinose, melibiose, stachyose and branched polysaccharides like galactomannans and galacto-glucomannans by catalysing the hydrolysis of  $\alpha$ -1,6 linked terminal galactose residues.  $\alpha$ -Galactosidase has a wide range of applications in several industries such as paper and pulp, food, and feed and sugar industry for the elimination of stachyose and raffinose. It has major applications in the medicinal field by converting 'B' to 'O' blood group which is a universal donor and used for Fabry's disease treatment.

Our present research work primarily aiming at isolation and screening of better  $\alpha$ -Galactosidase producing microorganisms and further focusing on purification and high yield enzyme production by adopting various technical pathways and methods. Various soil samples (fruit pulp industrial area & biopharma industrial area) screened for selection of microbes by using zone of activity. The screening experiment showing majorly from these following microbial sections i.e., fungi; bacillus and actinomycetes.

Among the isolated & screened cultures- actinomycetes is showing better activity. There are no prominent scientific reports observed till date on production of  $\alpha$ -Galactosidase from Actinomycetes. Molecular identification of the species is ongoing. Strain improvement and media optimization activities were planned by using standard methods. Response surface methodology (RSM) was used to enhance the production of  $\alpha$ -Galactosidase in submerged fermentation. Screening of variables to find their relative effect on  $\alpha$ -Galactosidase production was done using Plackett-Burman design and optimized by central composite design. After statistical optimization(s), the  $\alpha$ -Galactosidase production was increased from 22 to 60 U/mL in the shake flask. The next major challenge is purification and it's scaleup. Initial experiments designed for enzyme purification by Molecular weight cut off studies (using cross flow filtration); Size exclusion

chromatography; ion exchange chromatography and mixed mode chromatography. The Molecular weight of the enzyme was about 75kDa and was confirmed by SDS-PAGE and the activity of  $\alpha$ -Galactosidase was routinely determined using p-nitrophenyl  $\alpha$ -d-galactopyranoside. At present substrate selection and optimization of Bioprocess steps like purification cum enzyme stability was on going to enhance the enzyme activity, yields and feasibility for industrial scale. The Bioprocess results of  $\alpha$ -Galactosidase production at laboratory scale are encouraging and worth to focus on scale-up. All the process flow and results will be are presented further.

**KEYWORDS:**  $\alpha$ -Galactosidase, Plackett-Burman Design, Bacillus and Actinomycetes.

## **Isolation of CEF Cells from Specific Pathogen Free Eggs for Production of Yellow Fever Vaccine**

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**ABSTRACT:** Yellow fever is a viral haemorrhagic fever caused by Yellow Fever Virus. Endemic to 32 countries in Africa and 13 countries in Central and South America. The yellow fever virus is a single-stranded RNA and transmitted through mosquitos (*Aedes aegypti*). Symptoms are Fever, Chills, Muscle pain and fatigue, Headache, nausea or vomiting, Loss of appetite and Yellow skin and eyes. Yellow fever vaccine should not be given to an individual who has experienced a serious allergic reaction to eggs or egg products. CEF monolayer is preferred over Direct egg inoculation to achieve Higher Productivity and less Allergic reactions. Fertile eggs with optimally grown embryo are key for CEF cells establishment. Studies are conducted for achieving optimal embryo growth; SPF eggs were incubated at different positions; one with uprightly incubated and air sac pointing upside, another one incubated inversely with air sac pointing down. Eggs pointed upside showed healthy embryos with adequate growth compared to air sac pointing downside. SPF eggs are incubated for 10 days with different RH set points of 40, 60, 80. Embryos incubated at RH SET point of 60 showed healthy embryos. SPF eggs are incubated for different days 7, 8,9,10 and 11. Embryos are not developed fully on day 7 & 8 whereas Embryos on day 11 showed over growth. Embryos harvested on day 9 & 10 showed healthy embryos. Different Media's were used for screening the suitable media for CEF cells in the study, CEFs seeded in m199 medium +10% FBS yielded highest number of CEFs on day 3 is 142000cells/cm<sup>2</sup> compare with MEM and DMEM. 5mL of Trypsin is sufficient for the trypsinisation process and to achieve higher cell counts per embryo ( $9.13 \times 10^7$  cells/embryo). MOI and suitable stabilizers needs to be evaluated in this study.

**KEYWORDS:** Fever Vaccine, CEF Cells, Vaccine Production.

## **Enzyme Mimicking Activities of Titanium Dioxide (TiO<sub>2</sub>) Nanoparticles**

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**ABSTRACT:** Researchers are interested in finding out more about the impact of TiO<sub>2</sub> nanoparticles (NPs) on various biological systems due to the widespread use of these particles in day-to-day life (especially in biomedical applications) with their significant photoactivity and reactive oxygen species (ROS) generation. It is known that heme-enzymes work with ROS to drive redox reactions in living systems. As a model heme-enzyme from the peroxidase family, horseradish peroxidase (HRP) was thoroughly examined for enzymatic changes after interaction with TiO<sub>2</sub> NPs under physiologically relevant pH and irradiation conditions. Based on this, an analysis on the peroxidase reaction process was carried out to explore the mimicking activity of titanium dioxide nanoparticles at various buffers (Phosphate, Acetate, and Citrate) with different concentrations of TiO<sub>2</sub> (i.e., 1, 10, 100 μM/ml, and 1 mM/ml) involving Guaiacol, ABTS, and TMB in the presence of hydrogen peroxide at Light, Dark, and UV conditions of Nanoparticles. The reaction is monitored using time resolved ultraviolet - visible absorption spectrophotometer. It is shown that the enzyme mimetic activities of the TiO<sub>2</sub> nanostructures were determined by the exposed facets. The results provide new insight into the enzyme-mimicking activities of TiO<sub>2</sub> nanostructures, as well as the design and synthesis of other inorganic nanomaterials-based artificial enzymes.

**KEYWORDS:** Titanium Dioxide, Nano Particles, Enzyme Mimicking.

## **Studies on Characterization and Production of Probiotic Bacterium Isolated from Palm Wine**

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**ABSTRACT:** Probiotics are now being focused a lot as they are bringing health benefits to humans and enhancing the activity of intestinal microflora by turning into microbial adjuncts. They are of great use to humans as they also provide cytotoxic activity against cancer cell lines, anti-diabetic activity and anti-oxidant and proteolytic activity. Probiotics provide essential metabolites and ensure a proper maintenance of gut health through complex interactions. In the present study we focused on the characterization and production of a probiotic bacterium isolated from palm wine. A total of ten isolates were isolated from palm wine using de Man Rogosa and Sharpe (MRS) media through pour plate method. Four of the isolates were found to be catalase negative and gram positive. Among the four isolates, one of the isolates showed potential growth was selected for further work. On studying the morphological characters, the isolate is found to be gram positive, catalase negative, oxidase positive and all other biochemical tests (IMVIC) showed negative result along with starch and gelatin hydrolysis. The carbohydrate test was done and it showed positive result for fructose and maltose. The physiological conditions were monitored and the isolate has shown salt tolerance from 0.5 – 2, pH 2-7 and from temperatures 25°C-45°C. The growth curve for the isolated sample is also monitored. The genotypic identification is done by sequencing of 16S rRNA gene and the strain showed maximum similarity of 99% with *Fructobacillus fructosus*.

**KEYWORDS:** Probiotics, Palm Wine, Catalase, De Man Rogosa and Sharpe Medium, 16s rRNA Sequencing.

# Statistical Analysis of Industrial-Scale Biogas Production from Food Waste

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**ABSTRACT:** This study focuses on the statistical analysis of biogas production data by anaerobic digestion of waste in biodigester. This analysis helps to predict the output data using experimental data produced from biodigester or industrial scale biogas production. Statistical Analysis such as descriptive analysis, regression analysis helps to validate and segregate the data available. Artificial Neural Networks are inspired by the way the biological neural networks. A database was also built using values presented in the literature to develop a numerical model using ANN. Along with regression analysis and ANN, ANOVA is employed to predict the output data as well as test the data whether the given data can be used for prediction of biogas production under given process parameters.

**KEYWORDS:** Anaerobic Digestion, Food Waste, Biomethanation, Regression Analysis, ANN.



## **Extrapolation of the Concept of Bio-Economy to the Domestic Waste Decomposition Bin**

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**ABSTRACT:** Biological resources are multifaceted. They are being associated with the agricultural harvest, food manufacturing industries, biofuels, forest, nutrients, flora, fauna, soil, water, minerals, partly digested fecal matter, food waste *etc.* As a result, these resources are ubiquitous and keep undergoing changes in their physical form in a cyclic manner from one state to the other within the prevailing environmental situation of sun light, temperature, wind, oxygen, humidity, altitude and microbial interaction. Keeping this in background, the domestic model for decomposing the fruit and vegetable scrap designed in our laboratory is taken into consideration to extrapolate the principle of circular bio-economy. An indoor device of 3 to 4-liter capacity developed for recycling the fruit and vegetable scrap contains in the predetermined proportion the following components namely saw dust, yeast, cow dung, moisture and thermophilic bacteria from soil. These constituents are conditioned for a period of 15 days by regular mixing to increase the bacterial colony (resource for carbon, nitrogen and phosphorus) allowing them to feed on the cellulose (carbon resource) from saw dust. The bacterial colony recycles the scrap. 200 g. of fruit and vegetable scrap (carbon, potassium, phosphorus resource) on a daily basis generated from the kitchen waste is fragmented into small pieces of 0.5 cm size and put in the indoor recycling bin closed with a perforated dish meant for indoor greens such as mint and coriander to grow. In a duration of 20 days with a periodic stirring, the vegetable scrap is no longer seen in the device. It is observed that there is a complete decomposition of the fruit and vegetable scrap in the bin into an organic manure wherein the carbon, potassium, nitrogen, phosphorous appeared as recycled in an organic form suitable as a plant nutrient mixture and thus economized bio-resources for further recycling.

**KEYWORDS:** Vegetable and Fruit Scrap, Indoor Device for Recycling, Carbon, Potassium, Nitrogen, Phosphorus, Organic Manure.

# **Optimization of Pectin Extraction from *Neolamarckia Cadamba* Fruit Peel Waste Using Response Surface Methodology and its Application in Colloid Preparation**

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**ABSTRACT:** Pectin is predominantly extracted from citrus peels, apple pomace and other fruit wastes but these sources are unable to meet the increasing demand of pectin. In the present study, fruit peel of *Neolamarckia cadamba* was used as a source of pectin and its extraction process was optimized using Central Composite Design based Response Surface Methodology. Maximum pectin yield of 15.89% (w/w) was obtained under pH 2.05, 90°C and 60 min. Further, Fourier Transform Infrared Spectroscopy (FTIR), Liquid Chromatography Mass Spectroscopy (LC-MS) and Nuclear Magnetic Resonance (NMR) analysis were done for structural characterization of the extracted pectin. Extracted pectin was used as gelling agent in mixed fruit jam preparation which exhibited high protein ( $3.5 \pm 0.41$  g) and minerals content; and low sugar ( $42.65 \pm 0.46$  g) content and energy ( $226.6 \pm 2.51$  kcal). Thus, *N. cadamba* was identified as a potential source of pectin which has enormous applications in food industry.

**KEYWORDS:** Acid Extraction, Food Industry, Mixed Fruit Jam, *Neolamarckia Cadamba*, Pectin, Response Surface Methodology.

## **Optimization of Process Parameters for Anthocyanin Extraction from Waste Gladiolus Flowers**

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**ABSTRACT:** Gladiolus (*Gladiolus grandiflora* Hort.) is one of the major cut flower producers across the globe which expresses orange, purple to blue due to anthocyanin flower pigments. These flowers are mostly used for decoration purpose and turns as waste after the event. The present work focuses upon the optimization of the process parameters responsible for extraction of high anthocyanin content from waste gladiolus flowers. The Response Surface Methodology (RSM) coupled with Central Composite Design (CCD) optimized the process parameters such as methanol HCl in 1.25:1.25 mL ratio, temperature: 40 °C, time: 8 h and solid loading: 10 % (w/v) that resulted maximum anthocyanin content of 20.63 g<sup>-1</sup> DW. LC-MS studies of gladiolus flower (Yellow stone) extract revealed the presence of major anthocyanins like pelargonidin, peonidin, cyanidin, and delphinidin and petunidin with minor concentrations. Antioxidant capacity of gladiolus flower extract was found to be 46.21 % which indicates that the flower extract can be used not only as a colorant but also as a potent nutraceutical in food industry.

**KEYWORDS:** Anthocyanins, Colourant, Gladiolus, Nutraceutical, Response Surface Methodology.

## **Cresiding Coal-fired Thermal Power Plants**

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**ABSTRACT:** The operation of the coal-fired thermal power plant (TPP) emits a large amount of particulate matter (PM) which contains harmful air pollutants. Recent scientific literature entails that exposure to PM emitted from the thermal power plant may cause respiratory disorders. Therefore, this study was aimed to assess the respiratory health risk of the population residing in the vicinity of TPP. Primary data collected from 1126 subjects were processed using indigenously developed (epidemiological based health risk assessment) software. The case-control study design was used to understand the association of respiratory illness with other variables including PM concentration. Different variables such as age, gender, years of stay, socio-economic status, body mass index (BMI), diet, respiratory illness, smoking tobacco, passive smoking, cooking oil, and occupational exposure were taken into consideration during the statistical analysis. Compared to control, univariate and multivariate analysis showed higher odds ratios in smokers, occupational workers, subjects with a family history of respiratory disorders in cases and subjects with higher and lower BMI. Univariate analysis revealed a marginal increase in odds ratio (OR; 1.26) in the subjects with an intake dose level of particulate matter  $>35 \mu\text{g}/\text{kg}\text{-day}$  than those with cut off value of  $\leq 35 \mu\text{g}/\text{kg}\text{-day}$ . Multivariate analysis showed that other variables taken in the study had hardly any effect on source-specific intake dose.

**KEYWORDS:** Body Mass Index (BMI), Occupational Exposure, Particulate Matter (PM<sub>10</sub>), Environment.

## **Removal of PAHs through Microbial Bioremediation**

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**ABSTRACT:** PAHs are aromatic hydrocarbons with two or more fused benzene rings with natural as well as anthropogenic sources. Polycyclic aromatic hydrocarbons (PAHs) are a class of organic priority pollutants that are of critical environmental and public health concern due to their toxic, genotoxic, mutagenic, and/or carcinogenic properties, as well as their widespread occurrence and resistance. The growing awareness of the various negative effects of PAHs on ecosystems and human health have resulted in a significant increase in research aimed at removing PAHs from the environment. Although PAHs can be neutralised by a variety of processes, including adsorption, volatilization, photolysis, and chemical oxidation, the primary ecologically acceptable method is transformation by microbes. The metabolic capability of the bacterial community and the bioavailability of PAHs can both be improved by the addition of bacteria that produce bio surfactants and light oils. Microbial degradation of PAH is influenced by a variety of environmental factors, including fertilisers, number and type of microorganisms, as well as the nature and chemical makeup of the PAH being diminished. Both aerobic and anaerobic conditions have been used to study the biodegradation of PAHs, and preparation of contaminated soil with physical or chemical agents can speed up the process.

**KEYWORDS:** PAHs, Microbial Degradation and Bioremediation.

## **Composting of Solid Waste with Microbial Additives**

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**ABSTRACT:** One of the main concerns in the current situation is environmental sustainability and protection. Municipal solid waste (MSW) is a major problem that is increasing at an alarming rate in the world's megacities as a result of overpopulation, urbanisation, industrialisation, and the careless disposal of waste. Composting is a natural process that results from microbial succession and marks the stabilisation and decomposition of organic waste material. Any biodegradable material that originates from a plant or an animal is referred to as organic waste. The utilization of microbial additives during composting is thought to be very effective and is expected to increase the production of various enzymes, improving the rate of waste degradation. Composting has become a crucial method in less developed countries for recycling biodegradable waste and creating a valuable product. The waste products can either be composted immediately or homogenised before secondary waste treatment processes like landfilling, depending on its nature. But one of the biggest obstacles to the process' economics has been its often expensive downstream processing. Analyzing the behaviour of efficient microbial additives will be useful, despite the fact that fundamental technique and contemporary approaches are understood in key aspects of the procedure through several studies. This study demonstrates the influences on compost quality, composting speed, and composting from microbial sources.

**KEYWORDS:** Municipal Solid Waste, Microbe Additives, Environmental Management, Environmental Science, and Composting.

## **Bioremediation of Chromium Metal by Using *Pseudomonas Aeruginosa* and Estimation of Chromium Reduction by Qualitative Analysis**

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**ABSTRACT:** chromium is one of the most important heavy metal pollutant which is released from industries that pollutes water bodies. The hexa valent of chromium, usually in the form of chromate and dichromate which. Posses significantly higher levels of toxicity than other valence state. *Pseudomonas aeruginosa* plays a vital role in bioremediation of chromium hexavalent pollution as it resists to a high concentration up to 60 mg/l. In this study the tolerance for the distribution of Cr(VI) was investigated to know the cells adaptation and survival by using 1,5-diphenylcarbazide. The reduction of chromium is know by the changes in colour from yellow to dark pink based on chromium reduction by taking O.D values from spectrometer for 10, 20 and 30 days respectively. From the data it was concluded that the removal efficiency for 20mM, 0mM, 40mM is 75.5%, 45%, 42.8% respectively. It was found that extracellular sequestration is the main removal mechanism of this strain, which accounted for more than 50% of the total removal. As a future work, a detailed study will be conducted to elucidated the role of biosurfactants in Cr(VI) removal in *P.aeruginosa*.

**KEYWORDS:** Bioremediation, Chromium, *Pseudomonas Aeruginosa*, Qualitative Analysis.

## **Indian Shot (*Canna Indica*) and Soft Rush (*Juncus Effusus*) are Used to Treat the Common Wastewater from the Educational Institution**

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**ABSTRACT:** There are numerous ways in which water is essential to our daily lives. Water treatment is necessary due to the scarcity of pure water. Phytoremediation is the greatest approach to naturally treat water for the elimination of toxic or hazardous components because it is less expensive than other traditional methods, simple to apply and maintain, and doesn't require the use of expensive equipment. The study made use of widely accessible plant species as Indian Short (*Canna indica*) and Soft rush (*Juncus effusus*). The goal of the current study is to examine the best conditions for removing heavy metal deposition on plants as well as organic and inorganic pollutants from the environment. Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray Analysis (EDX), X-ray powder diffraction (XRD), and Fourier-transform infrared spectroscopy (FTIR) were used to evaluate the accumulation of inorganic pollutants and heavy metals on the plants.

**KEYWORDS:** Phytoremediation, Indian Shot (*Canna Indica*), Soft Rush (*Juncus Effusus*), Organic, Inorganic, Heavy Metals.



## Green Synthesis of Nanoparticles and Its Application - Critical Review

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**ABSTRACT:** Many novel nanoparticles were developed due to current improvement in nanoscience and nanotechnology. Synthesis of nanoparticles by chemical processes is expensive and releases toxic substances into the environment. Nanomaterial synthesis by physical processes requires high energy and generates more waste. So biological sources are the best alternative for nanomaterial synthesis. Synthesis of nanomaterial by plant parts is required as it is eco-friendly and sustainable. Phytocompounds of plant extracts like polyols, terpenoids, polyphenols are used as metal ion bio-reduction agents for synthesis of nanoparticles. Several plant parts of *Saccharum officinarum*, *Helianthus annuus*, *Capsium annuum*, *Magnolia Kobus*, *Azadirachta indica*, *Diopyros kaki*, *Terminalia catappa*, *Cinnamomum camphora*, *Curcuma longa*, *Catharanthus roseus*, *Ocimum sanctum*, *Musa paradisiaca*, *Cuscuta reflexa*, *Pinus resinosa* etc. are used to synthesize silver, gold, copper, platinum nanoparticles. Green synthesized nanoparticles are applied in treatment of waste, drug delivery system, cancer therapy, used as biosensors, multicolour optical coding, photoimaging, tissue engineering and bioengineering. Much research is carried out on green synthesis of nanoparticles and its applications in various fields due to its cost effectiveness and eco-friendly approach. So it is also required to check the long-term effects of these nanomaterial synthesis on animals and human health in the future to control the problems. In this critical review extraction of nanoparticles from green plants and its parts, synthesis of nanoparticles and its role in various fields were highlighted.

**KEYWORDS:** Plant Extracts, Synthesis of Plant Extracts, Nanomaterial Synthesis, Applications of Nanomaterials.

## **Evaluation of Phytochemicals in *Memecylonlushingtonii* Gamble Leaves Ethyl Extract by GC-MS Analysis**

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**ABSTRACT:** *Memecylonlushingtonii* Gamble (MLG) are small trees or large shrubs belongs to the *Melastomataceae* family. This family has a wide range of Pharmacological activities such as anti-microbial, anti-cancer, antioxidant, anti-inflammatory, hepatoprotective and nephroprotective etc. Various species of this family are used in Siddha and Ayurveda medical system and by the tribals to treat herpes, chickenpox, skin infection, stomach disorders, leucorrhoea, bacterial infection, menorrhagia and polyuria. *Memecylonlushingtonii* Gamble (MLG) leaves has been reported as an effective post-coital contraceptive. Other than this activity, no other biological activities were not yet reported. The present study is undertaken to identify phytochemicals in MLG leaf ethyl acetate extract (EAE). Preliminary phytochemical screening was carried out by standard methods using various solvent extracts of MLG leaves. Based on the results, Ethylacetate extract was used for GC-MS (Shimadzu QP2010). Silica column packed with Elite-5ms (5% Diphenyl 95% Dimethyl polysiloxane, 30mm\* 0.25mm\*0.25 microns df was used for GC-MS and analysis was carried out using NIST 107 and WILEY. The results indicated 40 phytochemicals.

Among these, twenty similar compounds were identified in *Memecylon* species like *M. umbellatum*, *M. edule*, *M. malabaricum*, *M. sisparensis* and *M. randerianum*. This 20 compounds have biological activities like anti-bacterial, anti-fungal, anti-cancer, skin infection nephroprotective, hepatoprotective and anti-viral.

**KEYWORDS:** Ethyl Acetate Extract, GC-MS, *Memecylon*, Phytochemicals.

## Emerging Technologies in Food Waste Management

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**ABSTRACT:** According to scarce data available, India is ranking in 94/107 in Global Hunger Index. Each person is wasting 50kg of food every year while 14% of India is malnourished. Different technologies have been initiated to utilize this food waste *i.e.*, fermentation techniques for value added compounds, production of biofuel, production of biogas, reactor development, pre-treatment strategies etc. The food can be preserved before getting wasted. The biochemicals that contain plant hormones sends strong signal to fruit that it is not yet to ripen. Based on this we can preserve the fruits and vegetables by coating. Edible coating is done on fruits that help them to ripen on different days. Following fermentation strategies can also help in producing value added byproducts like lactic acid. The lactic acid can be produced from date palm waste or through bioconversion of cocoa by products using enzymes that converts the polysaccharides through yeast fermentation. The biofuels can be produced from waste cooking oil through process like transesterification, saponification by using acid, base and lipase catalyst. Companies like Annaskethra, Jaipur started a unique style of saving food from luxurious parties and serving them to poor. It is also estimated that 30-50% food is wasted even before reaching into consumers tables. Since people bite more food than they can chew, it is very important to save it for sustainable development and country's economy development.

**KEYWORDS:** Biofuels, Fermentation Technologies, Lactic Acid, Reactor Development, Trans Esterification, Waste Management.

## **Ethyl-acetate Extract from Green Waste Showed Potential Antimicrobial Activity against Selected Bacterial Strains (*P. Aeruginosa*, *S. Aureus*, and *E. coli*)**

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**ABSTRACT:** One of the key goals of the (SDGs) is to significantly reduce waste creation through prevention, reduction, and recycling by 2030 in order to protect the environment and public health. Another issue of concern is the misuse and overuse of antimicrobials which are main drivers in the development of drug-resistant pathogens. The green waste was segregated and consisted of the flora of various families, extracted with three solvents, and the antibacterial activities through the disc diffusion method were observed on three most common pathogenic strains. Plant waste materials extracted with solvents manifest various degrees of antibacterial activities; ethyl acetate extracts draw the most promising results against the selected bacterial strains. The ethyl acetate extracts of *Alstonia scholaris*, Floral waste, *Azadirachta indica*, *Plumera rubra*, *Lantana camera*, and *Euphorbia hirta* illustrated a significant antimicrobial activity for *S. aureus* by depicting the zone of inhibition of 21.8 mm, 23.9 mm, 23.8 mm, 19.4 mm, 18.2 mm, 18.2 mm (100 µg/mL) ( $p < 0.01$ ), respectively. For *P. aeruginosa* the ethyl acetate extracts of *Alstonia scholaris*, Floral waste, *Azadirachta indica*, and *Ocimum sanctum* depicted the zone of inhibition of 28.86 mm, 29 mm, 26.03 mm, 18 mm (100 µg/mL) ( $p < 0.01$ ), respectively. Whereas for *E. coli*, the ethyl acetate extracts of *Alstonia scholaris*, Floral waste, *Azadirachta indica*, and *Euphorbia hirta* delineated significant activity with the zone of inhibition of 20.33 mm, 19.36 mm, 20.03 mm, 18.1 mm (100 µg/mL)

( $p < 0.01$ ), respectively. The MBC of the tested bacteria of *Alstonia scholaris*, Floral waste, *Azadirachta indica*, *Plumera rubra*, *Lantana camera*, and *Euphorbia hirta* extracts in the case of *S. aureus*, mean concentrations of 32.40mg/ml, 44.2mg/ml, and 32.40mg/ml, 48.30 mg/ml, 33.21 mg/ml respectively. The MBC values for the bacteria *E. coli* were found to be 13.88mg/ml, 23.14mg/ml, 59.21 mg/ml, 97.22mg/ml, respectively. Whereas the MBC value of *P. aeruginosa* of ethyl acetate extracts of *Alstonia scholaris*, Floral waste, *Azadirachta indica*, and *Ocimum sanctum* was found to be 30.12mg/ml, 31.23 mg/ml, 48.87 mg/ml and 57.65 mg/ml. The preliminary antimicrobial investigation concludes, given a scope of considerable research for green waste, the phytochemicals present can probably set off as one of the potential alternatives to the synthetic drugs and multidrug-resistant pathogens, and a way to reduce waste generation in the environment.

**KEYWORDS:** Antibacterial Activity, Disc Diffusion Method, Green Waste, Multidrug Resistant Pathogens.

## Preparation of Bio Plastics Using Coconut Shells

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**ABSTRACT:** Plastic is manufactured in excess of 330 million tonnes per year around the world and are used in the packaging (40%), construction (20%), and automotive (8%) industries, and in the fabrication of household items. The vast majority of industrial plastics are not biodegradable, results increased solid waste. Studies have been made to develop biodegradable materials such as bioplastics to address this environmental issue. Bioplastics are defined as bio-based, biodegradable, or both. Bioplastics are made wholly or in parts from renewable biomass sources such as sugarcane and corn or from microbe such as yeast. Some bio-plastics are biodegradable or even compostable, under the right conditions. The objective of the present study is to find out a solution for the plastic pollution by preparing bioplastic from coconut shells. Coconut shells are separated from endosperm and epi carp and coconut shells are grinded to fine powder using mixer. 2 to 5 ml of water or distilled water was added to 2 gm of fine powder and allowed to boil at 100<sup>0</sup> C until it turns in to a fine paste form followed by addition of 1.5 gm of corn starch and allowed to boil at 100<sup>0</sup>C. Then 0.5 gm of honey and wax was added to obtain a perfect shape. The prepared bioplastic was filled in the moulds and allowed to set for 48 h to get perfect shape. The bioplastic produced from the coconut shells turned out to be slightly flexible compared to the normal plastic.

**KEYWORDS:** Bio-degradable, Bioplastic, Coconut Shells, Plastic Pollution, Renewable Biomass, Solid Waste.

## **Simple Molecular Detection of Shrimp Diseases by Loop Mediated Isothermal Amplification Technique with Accurate, Cost-effective, Room Temperature Stability Reagents Using Heating Block for Best Shrimp Culture**

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**ABSTRACT:** Aquaculture is breeding, raising, and harvesting fish and shrimp, aquatic plants farming in water. In aquaculture, shrimp farming plays major and crucial role because shrimp is the fastest growing, high demand and food producing sectors in developed countries. During shrimp farming, animals affected by diseases mainly caused by opportunistic pathogens it results in huge economic losses and it also affects to present and in future. In this study, identify two major diseases which are most affected shrimps during purchase of seed and farming i.e. *White Spot Syndrome virus (WSSV)* and *Enterocytozoon hepatopenaei (EHP)*. For molecular testing, develop and optimize single tube extraction buffer for nucleic acid extraction from shrimps. For WSSV and EHP detection by *Loop mediated isothermal amplification (LAMP)* by using single tube extracted DNA. Now a days, all LAMP reagent were stored at defreezer and maintained cold chain cycles. But in our study, we are developing room temperature stable reagents for LAMP testing and it also cost effective for hatcheries and formers. We are planned to evaluate real time study in shrimp culture and farms with associate of farmers.

**KEYWORDS:** Single Tube Extraction Buffer, *Loop Mediated Isothermal Amplification (LAMP)*, Room Temperature Stable Reagents, Cost-effective.

## **Sustainable Biogas Production by Small Scale Anaerobic Digesters Using Cattle Manure towards Uplifting the Economical Status of Farmers**

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**ABSTRACT:** With a current scenario of ever raising prices of all sorts of fossil fuels, the affordability and comfort of cooking using LPG cylinders have been a rare fruit to enjoy for the people of down trodden communities. This work focuses on improvising the livelihood of rural communities and supporting them with sustainable solution with a most basic need of cooking gas at a luxury of being produced by their own efforts. This work focuses on the very roots of the problem of economic crisis and gifted them with small scale self-sustainable biogas units which can be operated without manpower requirement. By cooking using self-produced biogas, there is no need for the home makers to search for firewood for cooking purposes. The biogas units provided to the farmers with a plan to implement waste management system by using them as feed for the production of biogas as a result of anaerobic digestion. The Small scale digesters with 8 cu. m. capacity can produce biogas for cooking for five hours per day. The unit occupies just a mere 150 cu. ft. space with robust technology with minimal running and maintenance cost. The proposed work will be combination of many technologies implemented and networked together for getting the best of the services adopting the state-of-art technologies for self-sustained rural environment.

**KEYWORDS:** Solid Waste Management, Biogas, Cattle Waste, Anaerobic Digestion, Sustainable Energy Production.



## **Botanical Bioinsecticides – An Approach for Toxic Free Environment**

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**ABSTRACT:** Essential oils are degradable, eco-friendly, non toxic, aromatic, volatile liquids, extracted mostly from aromatic plants and also from other plants. They can be obtained from any part of the plant. The phytochemicals present in these oils are very beneficial to plant themselves for protecting from biotic and abiotic factors and also to humans for treating diseases. By using these essential oils as pesticides in crop fields, we can eliminate toxic residue in the soil. Based on their benefits essential oils have lot of applications in various fields like cosmetic, aromatherapy, perfume industries, food preservation process, as essences in food, therapeutic purposes. Essential oils have also had many useful applications in agriculture like Bio insecticides, Repellents, fumigants, antifeedant, and antimicrobials. In the present study we did different bioinsecticides cocktails with cinnamon, cedar wood, geranium, clove, lemongrass, thyme by varying concentrations. Bioinsecticides show effect only on target pest, due to this we can save the non-target pests which are useful for ecosystem e.g., Butterflies, honey bees, dragon flies, etc. So it is very beneficial to implement these natural based degradable biopesticides in crop field for toxic free food and environment.

**KEYWORDS:** Bioinsecticides, Crop Plants, Essential Oils, Target Pests.

## **Bioactive Compounds and Pharmacological Activities of *Mucuna Pruriens* L.**

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**ABSTRACT:** *Mucuna pruriens* is a tropical legume commonly known as velvet bean or magic bean. It is an annual climbing shrub reaches up to 15m length. *M. pruriens* plant belongs to the family Leguminosae which is widely distributed in tropical and subtropical countries. Every part of the plant has medicinal value used as antiparkinsonian, antioxidant, anti-inflammatory, antidiabetic, sexual enhancing, antimicrobial, antiviral, anticholesterolemic and also acts against nerve disorders. The seed is the excellent source of dopamine precursor L-Dopa which is L-3,4-dihydroxy phenyl alanine. The legume consists of high amount of lipids, carbohydrates, minerals, amino acids and fibre. The legume is used as multipurpose for many applications. The mucuna plant is also used as green manure, fixes atmospheric nitrogen and improves soil fertility. Due to the presence of micronutrients, it is used as a vegetable for nourishment. The chapter discusses the geographical distribution of *M. pruriens* plant, bioactive compounds and its chemical structures. Further it emphasized on various pharmacological activities, nutritional value and medicinal value of the plant. The bioactive compounds present in the plant can be used as a source for the development of potential lead molecules to treat the different ailments.

**KEYWORDS:** Alkaloids, Antimicrobial, Antioxidant, Antiviral, Dopamine, L-Dopa, *Mucuna Pruriens*.

## **Microbial Production of Critical Enzymes of Lignolytic Functions**

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**ABSTRACT:** The lignocellulosic waste produced globally are in massive amounts that leads to landfills. The biomass is underutilized and results in generation of waste in the environment. In nature, the lignocellulosic biomass is the most abundant renewable source for production of value-added compounds. Lignolytic enzymes are used as a sustainable biological method for the pretreatment of lignocellulosic biomass. After this process the valuable end products produced are chemicals, feed materials, biofuels and organic acids. The enzymes are economical and environmentally friendly used for degradation of lignocellulosic biomass. The enzymes have more applications related to textile industry for the degradation of dyes, waste water treatment, solid waste management, sewage water treatment, food industry, pharmaceuticals and biofuel industries. The enzymes are produced by microorganisms having the ability to degrade the biomass into valuable end products due to its multienzyme complex system. Further, research is required to explore the potential lignolytic microorganisms among the microbial communities for the breakdown of lignocellulosic biomass and its lignin content. The chapter deals with the sources of lignolytic enzymes, different classes of lignolytic enzymes, *in-silico* approaches, industrial applications in various fields and future prospects.

**KEYWORDS:** Biofuels, Extremophiles, Laccase, Lignin Peroxidase, Manganese Peroxidase, *In-Silico* Approaches, Lignolytic Enzymes.

## **Phytochemical and Bioactive Potential of *Gloriosa Superba* L.**

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**ABSTRACT:** *Gloriosa superba* L. is a flowering plant in the family colchicaceae. It is a perennial climber commonly called as flame lily. The plant is used as an ayurvedic medicinal herb due to its potential bioactive compounds. The bioactive compounds present in whole plant parts such as tuber, flower, stem and roots are widely used for its biological activities. The toxic alkaloids present in the plant are colchicine and gloriosine. It is used for treating various diseases such as gout, arthritis, infertility, sexually transmitted diseases, leprosy, kidney problems, typhus, open wounds and snake bite. The plant is entered in IUCN red data book due to its over exploitation for colchicine alkaloids. This chapter discusses the wide distribution of *G. superba* plant, its taxonomical features for identification of plant, bioactive compounds and its structures. This chapter also provides updated information related to phytochemical classes of bioactive compounds and their pharmacological activities. Further, it emphasized on pharmacological activities of *G. superba* plant due to its great interest for the development of potential bioactive compounds as lead molecules in drug development.

**KEYWORDS:** Alkaloids, Antimicrobial, Antioxidant, Colchicine, *Gloriosa Superba*, Phytochemicals, Medicinal Plant.

## **Phytochemistry and Pharmacological Activities of *Andrographis Paniculata* (Burm.f.) Nees**

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**ABSTRACT:** *Andrographis paniculata* is a popular medicinal herb in Ayurvedic system of medicine and also called as king of bitters. It belongs to the family Acanthaceae and is widely distributed in tropical Asian countries. The plant is used for treating various diseases such as diabetes, cancer, cold, diarrhoea, fever, leprosy, ulcers and influenza. The plant contains bioactive components such as diterpenoids, poly phenols, flavonoids, xanthenes and miscellaneous compounds. The diterpenoid bioactive compound andrographolide is the major one abundantly present in the leaves of the plant. The andrographolide and its analogues showed wide biological properties such as immunostimulatory, anti-inflammatory, anti-infective, antihepatotoxic, antiviral and anti atherosclerotic. The chapter highlights the information related to geographical distribution of the plant, phytochemical compounds and their structures. Further, the updated information about the pharmacological activities of the plant was highlighted to assist the researchers in isolation and characterization of potential bioactive compounds.

**KEYWORDS:** *Andrographis Paniculata*, Andrographolide, Antioxidant, Diterpenoids, Phytochemicals, Medicinal Plant.

## **Enzymatic Digestion of Agro-waste to be Used as Alternative Feed to SSAD for the Production of Biogas**

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**ABSTRACT:** Due to its high cellulose content, rice husk can be used as a pre-treatment to remove lignin. Lignin may be inhibiting the production of biogas because the bacteria find it difficult to decompose rice husks. Waste obtained from agriculture field is highly nutritious which helps in the growth of microbes. Agricultural wastes predominantly comprise of Ligno-cellulose large fraction of Polysaccharides. Agricultural wastes are often pre-treated before using them for fermentation so as to improve the yield of enzymes. Agro-waste includes crop residues weeds, leaf litter, sawdust, livestock waste etc. Hydrolytic enzymes especially Amylase is one of the most important biocatalyst for anaerobic digestion of organic waste in biogas production. Major enzymes used for biogas production includes Formylmethanofuran transferase [FTR] and Methyl-CoM reductase [MCR]. A combination of several glycosidic enzymes consisting of dextranase and cellulose can be tested for the production of biogas from farm wastes. This provides a commendable solution for the solid waste management systems in the agricultural based country like India, therefore avoiding the hazardous environmental pollutions generated through improper methodologies adapted for farm waste disposal.

**KEYWORDS:** Anaerobic Digestion, Farm Waste Management, Biogas Production, Rice Husk, Enzymatic Digestion.

## ***Zingiber Officinale* Mediated Silver-Copper Bimetallic Nanoparticles Synthesis, their Characterization and Application for Degradation of Methyl Orange**

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**ABSTRACT:** Metal nanoparticles have great potential in the biomedical, agriculture, environment, drug delivery, cosmetic, and healthcare industries. The properties of these nanoparticles vary according to their shape, size, and synthesis method. In the present study, Ag-Cu bimetallic nanoparticle (Ag-Cu BMNPs) synthesis was done by *Zingiber officinale* aqueous extract, and employed for dye degradation. Dye is a type of synthetic organic substance that is used extensively in the textile industry. These dyes create ecological threat as they persist and pollute environment. The main concern is removal of non-biodegradable organic compounds from the environment. The synthesized bimetallic nanoparticles were characterized using FT-IR spectroscopy, UV - visible spectroscopy, Zeta potential, and TEM analysis. The phytochemical screening data of ginger extract was supported by the peaks corresponding to various functional group observed from Ag-Cu BMNPs FT-IR spectra. Ag-Cu BNPs were found to have Zeta potential of -26.9mV and size range from 17.6 to 31.2 nm by TEM. The maximum degradation of methyl orange dye by Ag-Cu BMNPs was 75.2% after 3hr of treatment.

**KEYWORDS:** *Zingiber Officinale*, Silver, Copper, Bimetallic Nanoparticles, Synthesis, Characterization, Methyl Orange Dye, Degaradation.

## **Molecular Pathways Involved in the Genesis of Alzheimer's Disease**

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**ABSTRACT:** Alzheimer's disease (AD) is a progressive neurodegenerative aging disorder that damages memory and other functions in brain cells, such as thinking, personal ability, and others. It is caused by an increase in oxidative stress and protein misfolding. In this scenario, the entire brain size declines—tissues gradually lose nerve cells and connections, as well as specific molecular pathways that are involved in this study. These include Wnt signalling, 5' adenosine monophosphate-activated protein kinase (AMPK), mammalian target of rapamycin (mTOR), Sirtuin 1 (Sirt1, silent mating-type information regulator homology 1), and peroxide proliferator-activated receptor  $\gamma$  co-activator 1- $\alpha$ . So, these are the latest treatments to halt and lessen the progression of Alzheimer's disease (AD). In this study, we are analysing the healthy brain cell sample of a patient (AD) using microarray techniques. These samples will then be uploaded to a DNA spot and subjected to cell culture techniques, followed by isolation of RNA, reverse transcription (cDNA), and ultimately the addition of different fluorescent dyes to differentiate cells. Both samples will be used to hybridize cDNA probes from oligonucleotide microarray sequences for graphical representation of the color-coded dyes. Using this technique, we conclude that A.D cells have grown more than normal cells. To normalize the data and produce the feature counts, or reads using *deseq* and statistical analysis, NGS studies must be performed. In parallel, we are investigating the effects of Alzheimer's disease treatments on patients using studies of the interactions between different drugs and proteins. For example, if a patient with Alzheimer's disease is taking Donepezil, it is crucial to know whether the medication is slowing the disease or creating abnormal changes in the body, as well as the drug's interaction with any other drugs except Alzheimer's protein. Aducanumab is an injection, and its efficacy in diseased patients, as well as the presence of adverse events, will all be considered in our investigations.

**KEYWORDS:** Alzheimer's Disease (AD), Pathways, Microarray, *Deseq*, Statistical Analysis, Donepezil and Aducanumab.



## **Zero Waste Management Technology for Managing the Vegetable Wastes by *Hermatia Illucens* L.**

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**ABSTRACT:** Management of municipal solid waste is the most crucial and significant environmental issue facing by urban governments in low and middle income nations. Although organic waste constitutes the vast majority of all municipal waste created, recycling of this material is still quite limited in low and middle income nations. *Hermatia illucens* L. is native to the Neotropical realm and belongs to stratiomyidae. The cultivation of these insects on a variety of organic wastes offers the chance to produce nutrient-rich animal feed, fuel, organic fertiliser, and biobased goods. Conversion of biowaste by insect larvae, black soldier fly (BSF) larvae is a unique method for dealing urban organic municipal waste from different sources. The larvae were fed with vegetable waste collected from University boys hostel. The results indicated that the food waste was efficiently utilized by the larvae. Further work has to be carried out to determine the insect waste as fertilizer.

**KEYWORDS:** *Hermatia Illucens*, Municipal Solid Waste, Organic Fertilizer, Waste Management.

## **Development of Commercially Scalable O : 2 Antigen Production by Optimising the Fermentation Parameters**

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**ABSTRACT:** There are licensed vaccines against *S.typhi*, but they do not offer protection against enteric fever caused by *S. paratyphi A*. There are no licensed vaccines against *S. paratyphi A* infection. In this study, the effect of various growth factors of fermentation medium and fermentation conditions on bacterial growth as well as production of polysaccharide was evaluated by one factor at a time optimization. The effect varying pH, temperature, different concentration of carbon source, different alkalies, effect of hysoy, yeast extract, nicotinic acid and tryptophan on *S.paratyphi A* growth was studied. Utilization of glucose in the medium was more at 30°C. Without tryptophan and MgSO<sub>4</sub> in the medium shown no growth of culture. Nicotinic acid present in the medium influencing the utilization of glucose in the medium and increasing the production of polysaccharide. Yeast extract and hysoy is enhancing the growth and minimum concentration required is 3g/L and hy soy 20g/L. Glucose and lactic acid was monitored during fermentation using YSI analyser. Glucose feeding strategy during fermentation increased the polysaccharide production, Optimum concentration glucose in the medium is 2g/L. polysaccharide extraction during hydrolysis was studied, minimum time for complete extraction was 2 hrs. In the present study the maximum polysaccharide production was achieved under optimal conditions of glucose, yeast extract, hysoy 20g/L, 3g/L and 2g/L respectively at pH 6.7±0.3 temperature 30±2°C. Polysaccharide production was achieved using these parameters was 150-200 mg/L of fermenter broth after purification.

**KEYWORDS:** Antigen, Production and *S. Paratyphi A*.

## Emerging Technologies in Food Waste Management

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**ABSTRACT:** According to scarce data available, India is ranking in 94/107 in Global Hunger Index. Each person is wasting 50kg of food every year while 14% of India is malnourished. Different technologies have been initiated to utilize this food waste *i.e.*, fermentation techniques for value added compounds, production of biofuel, production of biogas, reactor development, pre-treatment strategies etc. The food can be preserved before getting wasted. The biochemicals that contain plant hormones sends strong signal to fruit that it is not yet to ripen. Based on this we can preserve the fruits and vegetables by coating. Edible coating is done on fruits that help them to ripen on different days. Following fermentation strategies can also help in producing value added byproducts like lactic acid. The lactic acid can be produced from date palm waste or through bioconversion of cocoa by products using enzymes that converts the polysaccharides through yeast fermentation. The biofuels can be produced from waste cooking oil through process like transesterification, saponification by using acid, base and lipase catalyst. Companies like Annaskethra, Jaipur started a unique style of saving food from luxurious parties and serving them to poor. It is also estimated that 30-50% food is wasted even before reaching into consumers tables. Since people bite more food than they can chew, it is very important to save it for sustainable development and country's economy development.

**KEYWORDS:** Biofuels, Fermentation Technologies, Lactic Acid, Reactor Development, Trans Esterification, Waste Management.

## **Nanorobots in Biomedical and Health Care**

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**ABSTRACT:** Biomedical nanotechnology is a rapidly developing field, which includes a diverse collection of disciplines. The applications of nanotechnology are gaining overwhelming response in almost all the fields. Especially in healthcare sector, tremendous developments have been achieved. For example, cancer treatment for diagnosis, monitoring of microorganisms in tissues and cells, gene therapy, precision surgeries, medical implants, target drug delivery, tissue engineering and regenerative medicine, treatment of diabetes, etc. In the coming years, the developments in this field are expected to flourish and lead to several lifesaving medical technologies and treatment methods. Generally, they are chemically inert and non-toxic to the human. It can move easily through the blood stream through Brownian motion. Microbivores are nanorobotic artificial mechanical phagocytes acts as an artificial white blood cell.

**KEYWORDS:** Nanotechnology, Nanorobots, Microbivores, Medicine, Health Care.

## **Circular Bioeconomy: A Sustainable Tool**

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**ABSTRACT:** A circular bioeconomy is an economy powered by nature. It is a new economic model that emphasizes the use of renewable natural capital and focuses on minimizing waste, replacing the wide range of non-renewable, fossil-based products currently in use. As the main phenomenon which was involved in this process is mainly the biological resources are renewable, sustainably managed, recovered and reused as much as possible where sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. It sounds complicated, but the circular bioeconomy is really based on three simple principles: design out waste and pollution; keep products and materials in use; regenerate natural systems. The advantages of circular bioeconomy are: it reduces waste and pollution like plastics in our ocean, utilizes fewer finite sources and leave a better earth for generations to come. The bioenergy has a critical role in bioeconomy. Developing the bioeconomy offers a significant opportunity to achieve sustainable development goals. The bioeconomy expanded from biotechnology centric vision to an economic activity which includes agriculture, forestry, food, fisheries, industry and waste management. The circular bioeconomy can increase the sustainability of biobased, food and energy systems in the current situation after post pandemic era.

**KEYWORDS:** Circular Bioeconomy, Waste Management, Biological Resources, Sustainable Development Goals, Biotechnology.

## **Isolation and Characterisation of Exopolysaccharide Producing Bacteria from Soil Samples of Chilli Fields**

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**ABSTRACT:** Microbial extracellular polymeric substances enhance the aggregation of soil particles, benefits the plants by maintaining moisture content, traps the nutrients and supply the nutrients to plant. Microbial polymers are involved in tolerance to salt stress and drought conditions. In the current study, we elucidated the role of exopolysaccharide producing bacterial strain in the plant growth. Isolation of exopolysaccharide producing bacteria from the soil sample collected from chilli fields was performed. Screening for the potential EPS producers was done by using Jensen medium and biofilm assay. Among the 9 isolates, one of the isolates showed high amount of EPS production was selected for further studies. The EPS production was estimated by Phenol-Sulphuric acid method. Further, the isolate was characterized by studying morphological, biochemical and physiological aspects. The EPS producing isolate was further grown in the presence of carbon sources like glucose, lactose, maltose and sucrose to determine the best utilizable carbon for their growth. The most utilizable carbon source for maximum growth of EPS producing isolate was determined to be sucrose with 2% concentration. The morphological and biochemical tests identified the organism as gram positive and rod-shaped bacteria. The strain reacted positive for indole and methyl red tests and negative for voges proskauer, citrate utilization and catalase tests.

**KEYWORDS:** Exopolysaccharides, Tube Assay, Biofilm Screening, Glucose Estimation, Characterisation of EPS.

## **Role of Exopolysaccharide Producing Bacteria on Seed Germination and Plant Growth**

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**ABSTRACT:** The extracellular polymeric substances (EPS) are produced by several strains of microorganisms. The EPS is mainly composed of polysaccharides, proteins and DNA. In the current study, the role of exopolysaccharide producing bacterial strains in seed germination and plant growth was evaluated. Seed inoculation with exopolysaccharide producing bacteria is an ideal tool to supply the soil with high density of beneficial microorganisms. Different treatments were given to the seeds at different conditions such as, under osmotic stress (PEG (8000), treatment with water and with exopolysaccharide producing bacterial strain. As the maintenance of viable microorganism is difficult during seed treatment and storage, the bacteria were immobilized by calcium alginate method. The immobilized bacterial culture also evaluated for seed germination.

The exopolysaccharide producing strain enhanced the physiological properties of plants. The seed germination using different treatments were performed for one week duration followed by pot experiment was done. The seeds were sown in the pot and continued with different treatments same as done in the germination of seeds. The treated plants were kept under observation for 1 month. Finally, plant growth is measured by taking the parameters such as root length, shoot length, number of leaves, length of the plant and chlorophyll estimation.

**KEYWORDS:** Exopolysaccharide, Biofilm, Polyethylene Glycol, Immobilization, Seed Germination.



## **Cultivation of Azolla and Identification of Bioactive Compounds Using GC-MS Analysis**

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**ABSTRACT:** Azolla is a free - floating fresh water fern that fixes the atmospheric nitrogen. It is a main stem growing at the surface of the water, with alternate leaves and adventitious roots at regular intervals along the stem. Azolla fronds (leaves) are triangular or polygonal. The leaves float on the water surface individually or in mats and also known as duckweed ferns. Azolla can be used as an animal feed, as human food, as medicine and water purifier. It may also be used for the production of hydrogen fuel, production of biogas and also for the control of mosquitoes. In the present study, azolla was collected from Sangam dairy located in Vadlamudi, Guntur (Dt.), A.P, India. The collected azolla was grown in trays with different water to sand ratios. In a tray soil was covered at half inch depth. In each tray water was added at different ratios 1:1, 1:2, 1:3, 1:4 and 1:5 respectively. Later growth media was added. The composition of growth media is 1% FeSO<sub>4</sub>, 1% MgSO<sub>4</sub>, 5% ZnSO<sub>4</sub> added for 100 ml of distilled water. Freshly collected azolla was added in the tray after measuring wet weight and it was inoculated in every tray by measuring volume. After the growth of azolla, it is dried under sunlight and collected for bioactive compounds isolation and identification. The dried powder was prepared and the compounds are extracted with methanol by using Soxhlet extraction. The extract is evaporated and used to identify the compounds using GC-MS analysis. From the GC-MS analysis data, the compounds identified are tetra decanoic acid, 1,19-eicosadiene, hexadecanoic acid methyl ester, hexadecanoic acid, phytol, 9-octadecanoic acid, oleic acid and myristoyl chloride.

**KEYWORDS:** Hexadecanoic Acid, Phytol, Azolla, Octadecanoic Acid, GC-MS Analysis.

## **Isolation and Identification of Probiotic Bacteria from Palm Wine**

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**ABSTRACT:** Palm wine is the rich source for lactic acid bacteria that acts as probiotics. The palm wine is produced by the fermentation of palm tree sap. The bacteria present in palm wine serves as potential bacteriocin producers. The purpose of the study is to isolate, identify and characterize the probiotic bacteria from palm wine. The palm wine sample was serially diluted and spreaded on MRS (De Mann Rogosa Sharpe) media agar plates. The colonies with different morphology were selected and streaked on MRS plates for development of pure cultures. The isolated colonies of pure cultures were collected and stored for further process. 15 bacterial strains with different morphology were screened for catalase production. Among the selected isolates, 4 colonies showed catalase negative. Out of 4 colonies one colony was selected for further studies. The morphological and biochemical features such as gram staining, catalase and oxidase tests were performed. The isolate was identified by using the 16srRNA sequencing and showed the highest similarity with *Leuconostoc mesensteroides*.

**KEYWORDS:** Lactic Acid, MRS, Palm Wine, 16srRNA, Probiotics.

## **Production of Ethanol from Potato Peel Waste (PPW) by Using Micro-organisms**

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**ABSTRACT:** Ethanol is an important industrial chemical, it is used as a solvent, in the synthesis of other chemicals, and as an additive to gasoline. It is also used in the manufacturing of Pesticides, Polishes, Cosmetics, and Lacquers. Therefore, the production of ethanol (ethyl alcohol) comes under more demand in various Chemical, Pharmaceutical, and fertilizer industries. Ethanol from starch-containing food materials like Corn, Cane sugar, and Potato can be produced. The production of ethanol from potato peels powder by using enzymes was examined. The Enzymatic hydrolysis of PPW under the process of liquefaction and saccharification has been done to convert it into starch and then the Fermentation process was introduced to convert prepared starch into ethanol followed by the Filtration and Distillation process. The alcohol content and pH of the ethanol were examined by the Hydrometer test and pH scale test. The maximum alcohol content was found to be 10.638 gm/lit (72%) at the pH of 5.8 for the 300 gm (30 %w/v) of potato peel powder. The result demonstrates that potato peel powder is a potential, economical food waste material for the production of ethanol.

**KEYWORDS:** Potato Peel Waste, Enzymes, Yeast, Ethanol.

## **Higher Strength Formulation Development for Biologics**

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**ABSTRACT:** Higher strength formulation of biologics is need of hour due increase in resistance for drug product. The therapeutic dose requirement is higher for patient who have large BMI ratio (body mass index ratio). Due to high molecular weight of protein therapeutic Biologic formulation are complex in nature. To stabilize higher strength protein formulation different stabilizers such as Polysorbate 80 / 20, amino acids, Various buffering agents such as phosphate, osmotic agents such as NaCl, preservative such as M-cresol, benzyl alcohol etc. are useful. Manufacturing process also plays vital role in stability of higher strength formulations. Physicochemical parameters such as pH, temperature, mixing speed need to be optimized. Upon successful optimization of manufacturing process formulation need to be tested for stability at accelerated and real time condition for generation of impurities and aggregates, etc. Various therapeutic proteins such as Insulin, Lispro, Glargine, Adalimumab, Rituximab, and Bevacizumab need to be developed in higher strength.

**KEYWORDS:** Biologics, Therapeutic Proteins.

## **Assessment of Ambient Air Quality in Jeedimetla Industrial Area in Hyderabad City, India**

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**ABSTRACT:** In the present era, air pollution is one of the greatest problem. Air pollution is defined as the release of hazardous pollutants into the atmosphere. Air pollution is increasing day by day due to rapid industrialization and urbanization. As per WHO reports, 46% of urban people are suffering from acute respiratory and cardiovascular, COPD, bronchiolitis and skin diseases. The present study focus on the estimation of key pollutant concentrations in the industrial clusters of Jeedimetla, Hyderabad. Finally determined air quality index (AQI) as function of concentrations of key pollutants such as particulate matter, SO<sub>2</sub> and NO<sub>2</sub>. Based on AQI values predicted the air quality and concerned health effects.

**KEYWORDS:** Air Quality Index, Jeedimetla, Air Pollutants, PM10 and Health Effects.

## Huperzine for Treatment of Neurological Disorders

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**ABSTRACT:** *Huperzia serrata* (Thunb. Ex Murray) Trev. is a member of the Huperziaceae family, also known as Huperazon, Lycopode Chinois, Licopodio Chino, Lycopodio Chinois, Lycopodium serrata, Qian Ceng Ta, and Toothed Club-moss. It is a perennial herbaceous plant (15–40 cm) related to ferns and is used for the treatment of acetyl-choline-deficient dementia, which includes Alzheimer's disease. Huperzine A (HupA), Triterpenes such as Serrat-14-en-3 $\beta$ , 21 $\beta$ , 29-triol, flavones such as 5,5'-dihydroxy-2', 4'-dimethoxyflavone-7-O- $\beta$ -D-(6''-O-Z-p-coumaryl)-glucopyranoside, Phenolic acids, Caffeic acid, and Ferulic acid are the bioactive compounds reported in this plant. Among these HupA is effective for cerebrovascular dementia and other neurodegenerative disorders and other kinds of cognitive impairments. Its value was described for organophosphate poisoning, schizophrenia and myasthenia gravis treatment. Many pharmacological properties are responsible for the HupA activity, which are anti-inflammatory, anti-nociceptive, and anti-convulsant. For its memory-improving qualities, an extract of this plant dubbed NSP01 (an abbreviation from NeuroSys Plants N0 1), created using a green one step technique, was utilised as an aqueous infusion.

**KEYWORDS:** Alzheimer's Disease, Dementia, *Huperzia Serrata* Trev., Huperzine A, and Pharmacological Properties.

## Preparation of Meat in Lab Using Cells

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**ABSTRACT:** Traditionally, meat is obtained through animal sacrifice. This is regarded as one of the greatest protein sources. Globally, there is an increase in the demand for meat. It may not have the capacity to meet this demand for meat in the future. In order to meet the demand for proteins, it is imperative to find alternatives as soon as possible. Clean meat production is one of the best methods to use as a replacement for traditional meat. When meat from animals is said to as "clean," it means that it was not horrifyingly murdered before being consumed. Because of this, it is created by isolating a single cell and growing it in a medium and under controlled growth conditions that mimic the in vivo environment. Although the methods for creating clean meat that resembles actual flesh are not brand new, they have recently undergone technical advancement. Since the past five years, numerous businesses have promoted clean meat products internationally. Additionally, it has been noted that customer reactions to its acceptability are conflicting. Concerns about the environment, animal welfare, human and consumer health implications of animal production, the use of antibiotics in the animal industries, and food security are the key motivations behind clean meat production. As a new method of producing meat, there are several obstacles to overcome, including differences in the nutritional value, flavor, shape, and structure of the product compared to genuine meat.

**KEYWORDS:** Clean Meat, In Vivo, Antibiotics, Mimic, Isolation.

## **Waste to Wealth by Adding Value to the Product from Step to Step**

### **Theme: Circular Bioeconomy**

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**ABSTRACT:** Bioeconomy is an economic activity where one can make money from Bioproducts. Its main goal is to develop value-added products from existing biomass through biotechnological processes. Circular bioeconomy is also an economic activity based on bioproducts but it mainly focuses on the 4R's which stand for Reduce, Reuse, Recycle and Reproduce. Bioeconomy exploits nature in order to benefit economically from it whereas Circular bioeconomy protects nature by trying to extend the shelf life of bioproducts and minimizing the waste production. The objective of present work is to develop products whose value is improved from step to step. Agricultural waste was collected from Banana fields and cellulose was extracted from it through Organic acid pulping method. The extracted cellulose is then converted into nano-cellulose by acid hydrolysis of cellulose. Nanocellulose, due to its water holding capacity acts as a very good absorbent and can be used as superabsorbent in hygiene products like sanitary napkins, diapers etc., The waste generated after the usage of these hygiene products are collected and pre-treated with disinfectants. The pre-treated waste can further be sent to Biogas plant or Composting units in order to produce Biogas and compost respectively. The Biogas can further be converted to Single cell protein which can be fed to cattle, where as the compost can be directly applied to plants as fertilizer so as to improve its growth. By this way life time and value of bioproducts can be improved by minimizing the waste generation.

**KEYWORDS:** Acid Hydrolysis of Cellulose, Bioeconomy, Circular Bioeconomy, Organic Acid Pulping Method, 4r's.



## **Herbal Wine Preparation from Ocimum Tenuiflorum by Yeast Fermentation**

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**ABSTRACT:** In the present study, herbal wine using leaf extract of *Ocimum tenuiflorum* and grapes as primary raw materials was prepared through a fermentation process using yeast. The clarification of wine was performed and wine was bottled. The herbal wine was prepared and its flavor is evaluated through survey method. Further, the percent of ethanol in the wine is calculated and found to be 13%.

**KEYWORDS:** Herbal Wine, Fermentation, *Ocimum Tenuiflorum*.

## **Biofuel Production from the Corncob and Rice Bran**

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**ABSTRACT:** This study invented a new way of production of biofuel from agriculture waste (corn cob and rice bran) and a mixture of particles of corn starch binder. A quantitative and experimental design was adopted for production. Mixture of corn cob, rice bran and starch binder are used as substrate for the production of biofuels which intern reduce carbon footprint by replacing fossil fuels. The compounds containing high amount of cellulose are then pulverized and converted into starch by *Trichoderma* and *clostridium* in which a cell-free biosystem composed of a synthetic enzymatic pathway that can transform solid cellulose into amylose. This process is called simultaneous enzymatic biotransformation (hydrolysis) and fermentation and it is formed of two steps: cellulose hydrolysis and amylase synthesis. The carbonisation starch performed with the addition of  $(\text{NH}_4)_2\text{HPO}_4$ . The addition of  $(\text{NH}_4)_2\text{HPO}_4$  promoted the dehydrogenation reaction of starch and further improved its carbonization behaviour of the corn starch. By increasing the temperature, more stable heterocyclic aromatic moieties, which boosted the growth in cyclization and the size of the polyaromatic units. The fragments into graphitic crystalline, facilitated the preservation of the natural microsphere morphology. In any mixing ratio corn starch binder enhances the efficiency of biofuels.

**KEYWORDS:** Biofuels, *Trichoderma*, Carbonization, Pulverization, Fermentation.

## **Development of Vaccine Candidate Using Envelope Recombinant Protein of Sars-CoV-2**

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**ABSTRACT:** COVID-19 is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) with global mortality report as per WHO estimates suggest an excess mortality of at least 3,000,000. The COVID-19 caused global health emergency and its economic and social impacts have disrupted nearly all aspects of life for all groups in society. SARS-CoV-2 has four structural proteins, known as the S (spike), E (envelope), M (membrane), and N (nucleocapsid) proteins; the N protein holds the RNA genome, and the S, E, and M proteins together create the viral envelope. Around the world, several vaccine platforms were developed to treat this pandemic which are ranging from mRNA to Subunit Vaccines addition to traditional attenuated whole virus vaccine (Covaxin, Covishield). However, inherent issues like stability and storage (mRNA vaccines), cost (sub unit vaccines) and antigenicity issues (whole cell virus vaccines) are main road blocks. All present vaccines are spike protein based however, the Positive evolutionary selection of mutations within the spike protein has led to the genesis of new SARS-CoV-2 variants escapes from vaccine radar. In view of the above-mentioned factors, we are proposing economically viable, highly conserved Envelope protein based Covid 19 vaccines. In this proposed research work, we aim to design a novel envelope candidate using synthetic biology for completely folded protein secretion from host, antibody epitope analysis software to identify suitable, strong epitope selection during design of vaccine candidate. To mitigate the risks of E proteins associated poor immunogenicity due to their small ectodomains and small molecular sizes we would be applying chimeric protein methodology. The proposed research works opens up plethora of new opportunities of economically viable vaccine on less mutated and highly conserved regions of E protein of Covid 19 virus.

**KEYWORD'S:** SARS-CoV-2, COVID-19, Vaccines, Immunogenicity, Envelope Protein (E), Spike Protein (S).

## **Antibiofilm Activity of Methanolic Extract of *M. Fragrans* against *Pseudomonas Aeruginosa***

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**ABSTRACT:** Bacteria which are naturally present in our body are beneficial to human health. They digest food, provide nutrients and vitamins and also protects from other bacteria which are harmful to us. Bacteria gain this power because of coordinating or communicating behavior to become multicellular. This multicellular behavior is called quorum sensing. Quorum sensing plays an important role in biofilm formation, solubilization, and biotransformation of pollutants. Biofilm is one of the phenotype in bacteria regulated by quorum sensing. Biofilm causes several diseases, pulmonary infections in human's body and also promotes eco-restoration by removing pollutants present in the environment through biodegradation. Quorum sensing bacteria involved in several wastewater treatment systems, aquaculture and other environmental related problems through biodegradation or transformation pathways. In one way they are keeping our life away and in another way they are keeping us alive. The aim of our study focuses on the natural treatment ways to inhibit bacterial biofilm of *P. aeruginosa*, a Gram-negative opportunistic pathogen that cause several infections in human's body. Plant extracts, which can interfere with the regulatory proteins of quorum sensing will inhibit the production of signalling molecules from bacteria and stops quorum sensing signalling mechanism. In this way researchers can develop new treatment therapeutic strategies against chronic bacterial infections.

**KEYWORDS:** Quorum Sensing, Biofilm, *P. Aeruginosa*, *M. Fragrans*, Exopolysaccharide Substance (EPS).

## **Extraction and Processing of Bio Fibres from Roselle**

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**ABSTRACT:** Our aim with this paper is to study Bio Fibres that are obtained from Hibiscus Sabdariffa which is commonly called Roselle. Due to environmental concerns, synthetic fibres requires replacement with Biofibres which are eco-friendly, cost effective and relatively easy to process. The extraction processes, Morphology and properties of Roselle fibres, treatment methods of Roselle fibres to enhance properties to manufacturing of natural fibre reinforced polymer composites and manufacturing process of Roselle has covered. Roselle which is generally cultivated for it seeds and leaves, The stems are usually considered waste product, using this stem also reduces the Bio-wastage.

**KEYWORDS:** Bio-Fibres, Roselle-Fibre, Morphology, Processing.

## BIOSOAPS

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**ABSTRACT:** Soap is a substance used with water for washing and cleaning, made of compounds of natural oils or fats with sodium hydroxide or another strong alkali and typically having perfume and color. It is prepared by saponification process. Synthetic soaps contain toxic chemicals like Triethanolamine, Triclosan, parabens and phenols which are absent in bio soaps. Bio soaps are made using the natural plant extract along with essential oils and soap base. These soaps are affordable with no side effects and eco-friendly when compared to chemical-based soaps. These does not require patent rights as skin is the external source of body.

The aim of our project is to design bio soaps using herbs like leaf extracts of neem, Wrightia tentoria and Catharanthus roseus; Aloe Vera gel and turmeric powder. The herbs are collected from Herbal Garden, VFSTRU, Vadlamudi. The herbs are macerated with sufficient quantity of water and liquid extract was collected by filtration method which was followed by addition of 5-6 drops of lavender and rose essential oils. Then this mixture was added to soap base to get a perfect shape. Parameters like solubility, pH, foam appearance, dirt removal and moisture content are conducted using standard methods. The results indicated that the bio soap is water soluble, basic in nature (ph: 9.5-9.8), foam positive, removes dirt and oil and has moisturizing properties. Further work is to test the bio soaps on psoriasis and other skin diseases.

**KEYWORDS:** Bio Soaps, Essential Oils, Herbs, Psoriasis, Saponification.

## **Circular Bioeconomy for Citrus Peel Waste in Role for Sustainable Management of Essential Oils**

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**ABSTRACT:** Essential oils extraction from citrus peel waste included data from various citrus Species. However citrus peel has valuable lignocelluloses for bioethanol production. Citrus has many beneficial roles in medical purposes as antimicrobial, anticancer, anti-inflammatory etc., as well as cosmetics and preservations. Some techniques as cold pressing and hydro distillation and microwave hydro distillation. However, steam distillation is most common method for extraction of essential oil by enzymatic action through fermentation process and we get high yield in short extraction time. As technologies is cascading production for economy, as a potential source of D-limonene, citrus peel waste often used for extraction. Various extraction methods are available to extract D-limonene from citrus peel waste, however, we need to choose efficient one to make the process economically viable.

Citrus aurantium is mostly used species for medical purposes. Steam distillation also widely used for the extraction process. However, researchers need to investigate new and cost-effective extraction methods to make overall process economically viable.

**KEYWORDS:** Circular Economy, Essential Oil, Limonene, Cold Pressing, Hydrodistillation, Fermentation.

## **Waste to Wealth and Ecofriendly Bioplastic from Opuntia Ficusindica**

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**ABSTRACT:** The present study of bioplastic from opuntia ficus-indica indicates a suitable solution to usage of environmentally unsafe plastic materials. Since, the plastic became a world wide concern many people are working on the production of bioplastics. Many products till date are made of some food and agricultural waste or some other biomass, but the cactus plant which is treated as Xerophyte of no use, proves that useful products can be obtained from this plant as well, based on some studies, which includes bioplastics. This bioplastic is created with a juiced cactus leaves and mixing them with some non-toxic formula composed of glycerol, proteins, colorants, and natural waxes layering on a hot plate kept for drying. This bioplastic is considered ecofriendly due to its biodegradable nature since, it degrades in soil in few months and when mixed with compost or water it takes few days. Now this is where the great advantages come into life, this bioplastic can be used to make shopping bags, cosmetics, jewelry and toys and modifications may lead to variable attractive products. This opuntia ficus-indica grows with a little amount of water and in dry conditions without any fertilizers and also helps to cut the use of fossil fuels since it is a carbon neutral plant. Thus, it is economically benefitable and safe product.

**KEYWORDS:** Waste to Wealth, Bioplastic, Opuntia Ficus-indica, Ecofriendly, Biodegradable, Economic Benefit, Carbon Neutral Plant, Xerophyte.



## **Respiratory Health Risk Assessment of the Central Indian Population Residing Coal-fired Thermal Power Plants**

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**ABSTRACT:** The operation of the coal-fired thermal power plant (TPP) emits a large amount of particulate matter (PM) which contains harmful air pollutants. Recent scientific literature entails that exposure to PM emitted from the thermal power plant may cause respiratory disorders. Therefore, this study was aimed to assess the respiratory health risk of the population residing in the vicinity of TPP. Primary data collected from 1126 subjects were processed using indigenously developed EpiHRA (epidemiological based health risk assessment) software. The case-control study design was used to understand the association of respiratory illness with other variables including PM concentration. Different variables such as age, gender, years of stay, socio-economic status, body mass index (BMI), diet, respiratory illness, smoking tobacco, passive smoking, cooking oil, and occupational exposure were taken into consideration during the statistical analysis. Compared to control, univariate and multivariate analysis showed higher odds ratios in smokers, occupational workers, subjects with a family history of respiratory disorders in cases and subjects with higher and lower BMI. Univariate analysis revealed a marginal increase in odds ratio (OR; 1.26) in the subjects with an intake dose level of particulate matter  $>35 \mu\text{g}/\text{kg}\text{-day}$  than those with cut off value of  $\leq 35 \mu\text{g}/\text{kg}\text{-day}$ . Multivariate analysis showed that other variables taken in the study had hardly any effect on source-specific intake dose.

**KEYWORDS:** Body Mass Index (BMI), Occupational Exposure, Particulate Matter (PM<sub>10</sub>), Environment.

# **The Biomethane Production Potential of Different Agriculture Waste Biomass was Compared Using Alkali Pretreatment Techniques**

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**ABSTRACT:** In light of the depletion of fossil fuels and the negative environmental and social effects of their extraction, more and more people are searching for alternative natural resources. Biofuel is becoming known as a potential alternative energy source worldwide due to the need to reduce greenhouse gas emissions while still fulfilling the expanding energy demands. Biomass energy has become one of the crucial elements of a green power network in recent decades due to its vast availability, renewability, and environmental benefits. Biomass represented the third most significant source of renewable electricity in 2017 after hydropower and wind, contributing 70% of the world's total renewable energy consumption.

As a result, the bioconversion of lignocellulosic biomass (LCB) into biofuels such as biogas, bioethanol, biodiesel, and others has many positive environmental effects as well as the potential to reach carbon neutrality and reduce greenhouse gas emissions. Anaerobic digestion is perhaps the most exciting process for producing biofuels while being among the most efficient methods due to its greater energy potential than liquid biofuels. It has been extensively studied and has shown promise as a starting substrate for manufacturing biofuels and biopolymers. LCB serves as a possible carbon-rich feedstock. To improve methane output, pretreatment of Lignocellulosic waste biomass is necessary due to the complexity of its structure, which inhibits the biodegradation of the embedded holo-cellulosic sugars. This study aimed to examine the effects of alkaline treatment on the methane production potential of various lignocellulosic waste biomass.

**KEYWORDS:** Lignocellulosic Waste Biomass, Biofuels, Substrate Conversion Efficiency, Biomethane, Anaerobic Digestion.

## **Biofuel from Microalgae: A Win-Win Approach Involving Greenhouse Gas Mitigation and Biofuel Production**

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**ABSTRACT:** Use of fossil fuels (coal, oil, natural gas) is not sustainable and contributes to climate change through generation of greenhouse gases (GHGs). Alternate/renewable energy sources are being explored by several nations including India, with the aim of developing sustainable energy system. Production of biofuel from photosynthetic microorganisms called microalgae is one such alternative, third generation approach to produce clean energy. Microalgae utilises CO<sub>2</sub> and other greenhouse gases (SO<sub>x</sub> and NO<sub>x</sub>) for their growth and large amounts of microalgal biomass can be produced by growing these microbes in either photo-bioreactors or raceway ponds supplied with greenhouse gas emissions from industrial gas outlets. The resultant biomass can be used not only for biofuel production but also as animal feed, fertilizer or even nutraceutical production, based on the type of algal species selected.

This method has the advantage of fixing GHGs and reducing environmental emissions while generating economically important products like biofuel and nutraceuticals. Also, it does not compete with land use for food crops as these microbes can be grown using simple systems and resources. Some examples of microalgae that can be used for this process are *Chlorella* sp., *Scenedesmus* sp., *Haematococcus pluvialis* etc. Nutraceutical pigments like lutein (important to eye health) and astaxanthin (important carotenoid used in salmon farming) can be produced from *Chlorella* and *Haematococcus* respectively. More research into this topic and cost analysis of the method is needed to evaluate the efficacy of this method.

**KEYWORDS:** Biofuels, *Chlorella*, Fossil Fuels, Greenhouse Gases, Microalgae, Nutraceuticals.

# **Serotonin Receptor Gene Polymorphisms as a Predictive Biomarker for Risperidone Induced Prolactin Elevation in Patients with Schizophrenia**

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**ABSTRACT: Background:** Schizophrenia (SCZ) is a severe psychotic illness; risperidone is one of the widely used atypical antipsychotic drug in treatment of SCZ, acts by binding to dopamine and serotonin receptors. Antipsychotic induced hyperprolactinemia commonly seen in patients with on risperidone treatment, however, there are biomarkers to assess the therapeutic efficacy of risperidone or its associated adverse effects in patients with SCZ. Due to the lack of biomarkers, patients are prone to develop severe side effects that lead to treatment relapse or discontinuation of the medication.

**Objectives:** To study the influence of Serotonin receptor gene polymorphisms on risperidone-induced prolactin elevation in patients with SCZ on risperidone treatment. **Methods:** A cohort study was conducted in patients with schizophrenia (n=109) as per DSM-V criteria for diagnosis. Newly diagnosed patients with SCZ with no history of antipsychotic medication for the last 30 days and who initiated treatment with risperidone 4-8 mg/day for a minimum of 4 weeks were included in the study, patients who were on other antipsychotic drugs were excluded from the study. Serum prolactin levels estimated by Chemiluminescence at baseline and after four weeks of risperidone treatment and genotyping was performed by Real-Time thermocycler. **Results:** Serotonin receptor gene variants 5HTR2A rs6311 [n=99, CC=33, CT+TT=66, OR 95% CI 1.0 (0.28-3.6), p=1.0] and 5HTR2A rs6313 [n=99, CC=31, CT+TT=68, OR 95% CI 0.70(0.18-2.80), p=0.61] did not show any

association with risperidone induced prolactin elevation in patients with schizophrenia on risperidone treatment.

**Conclusion:** Serotonin receptor gene variants 5HTR2A rs6311 and rs6313 were not associated with risperidone-induced prolactin elevation in patients with schizophrenia on risperidone treatment.

**KEYWORDS:** Risperidone, Schizophrenia, Genetic Polymorphism, Weight Gain, Serotonin Receptors (5HTR).

## **Estimation of the Selected Fungal Substrate DDT - Contaminated Soil Environmental Bioremediation**

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**ABSTRACT:** The most important ecological problem on the planet is that pollution has become one of the natural resources such as air, water, and soil due to heavy metals. The pollution of the environment with synthetic organic compounds has become a major problem worldwide. The white-rot fungi are quite different and well-established methods from other bioremediation technology. Estimate the analysis of enzyme activity of fungal substrate in Manganese peroxidase activity, Lignin peroxidase activity, and Laccase activity. The lignin potential of these enzymes is well documented and has x enobi oti c degradati on. To eval uate the f ungal substrate f rom L. edodes degraded to DDT (dichlorodiphenyltrichloroethane). Two grams of the dry weight of soil were autoclaved (121 ÚC 10 min), then the sterilized (SL) soil was put into 100 ml flasks and artificially contaminated with 50 µL of 5 mM DDT in DMF (final amount: 0.25 µmol) The mixture (moisture content 66%) was incubated statically for 28 d at 25Ú C. The samples were tested with the analytical method in GC analysis. The action mechanism of the fungal substrate of L. edodes naturally the degrading ability of DDT chemicals in the soil of the environment. The fungal substrates are caused by the higher ligninolytic enzyme activities. The fungal substrate was significantly better at degrading DDT.

**KEYWORDS:** Biodegradation, DDT, DMF, Lentinus Edodes, Contaminated Soil.

## **Extraction of Neuroprotective Compounds from Seeds of *Mucuna Pruriens***

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**ABSTRACT:** *Mucuna pruriens* commonly called as velvet bean which is a legume plant belonging to Fabaceae family. It is native to Africa and tropical Asia. It has been shown that the seeds of *M. pruriens* are known to have many health benefits. The ancient Indian medical system, Ayurveda has used *Mucuna pruriens* to treat various diseases like Parkinson's. It is a herbal drug used for the management of male infertility, nervous disorders, and also as an aphrodisiac. *M. pruriens* is also known to have antimicrobial, anti-cancer, anti-venomous and neuroprotective effects. In the current study, we are making an attempt to identify the presence of phytochemicals like Glycoprotein Muc (gpMuc) and L-Dopa which are having potent anti-venomous and neurotransmitter effects. The seeds of *Mucuna pruriens* were collected and were grounded into powder. The powder form was kept for Soxhlet extraction using methanol as a solvent. After 10 cycles the crude extract was collected and evaporation was done using rotary evaporator to remove the methanol. The obtained crude samples were evaluated for the presence of dopamine using HPTLC technique. The bioactive compounds were identified using GCMS analysis.

**KEYWORDS:** *Mucuna Pruriens*, Phytochemicals, Antivenomous, Neurotransmitter.

## **Bioactive Compounds Analysis in Tuber and Seed Extracts of *Gloriosa Superba* Using GC-MS and HPTLC Analysis**

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**ABSTRACT:** *Gloriosa superba* is a herbaceous perennial that grows from a fleshy rhizome. Its growth is compatible with multiple habitats mainly tropical jungles, thickets, woodlands, grasslands, and sand dunes. This plant is best cultivated in countries like Namibia, Zimbabwe, tropical Africa, Southeastern Asia, and India. Tamil Nadu is known for its high commercial cultivation and exporting from India. The toxicity of the plant causes human and animal fatalities. The toxicity is mainly observed in tuberous rhizomes. Being a member of Colchicaceae it has high colchicine levels along with another alkaloid gloriosine. Multiple toxic syndromes are observed due to their poisonous nature. Longterm exposure is seen to cause peeling of the skin and prolonged vaginal bleeding. In contrast to its toxic nature, this plant has been used in traditional medicine. Treatment of diseases like gout, infertility, snake bites, ulcers, kidney problems, cancer, and STDs. In the current study the tubers and seed samples are collected and biochemical compounds are extracted using Soxhlet extraction. The biochemical compounds identified in seeds and tubers are 2,6-Dimethyl-3-(methoxymethyl)-pbenzoquinone, Morpholine-4-carboxylic acid, 3-formyl-6-methoxyphenyl ester, n-Hexadecanoic acid, 9-Octadecenoic acid, Linoelaidic acid, Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester, Phytol and Vitamin E. The HPTLC analysis identified the colchicine and gloriosine compounds in both seeds and tuber extracts.

**KEYWORDS:** *Gloriosa Superba*, Hexadecenoic Acid, Phytol, Vitamin E, Octadecanoic Acid.



## Secondary Structure Prediction of Hypothetical Protein of *Porphyromonas Gingivalis* W83

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**ABSTRACT:** *Porphyromonas gingivalis* is a gram-negative oral anaerobe. It plays a significant role in the development of periodontitis in humans. This is an inflammatory illness that damages the gum tissue. This infection ultimately leads to tooth loss. Further, *P. gingivalis* evades the host defence mechanism. Due to its importance in oral hygiene, one of its proteins involved in pathogenicity is considered in this study. This is highly conserved and unclassified and named as hypothetical protein. Its primary and secondary structure are elucidated using KEGG, Uniport, GOR4, ProtParam, Swiss Model online tools to assess its pathogenicity. This hypothetical protein has id Q7MXY7 (UniProt) and AAQ65263 (NCBI). The length of this protein is 384 aa. Its molecular weight is 43774.08 Da. Its estimated half-life is derived as 30 hrs in mammalian reticulocytes. This protein is found to be stable and its instability index is shown as 39.81. The aliphatic index is 105.31 which indicates its high thermostability and GRAVY score is 0.124. In continuation, the secondary structure of this hypothetical protein is evaluated using GOR4. The same revealed that there are 163 aa in the  $\alpha$ -helix, 60 aa in the  $\beta$ -pleated sheet and the rest 161 aa in the random coil. In addition, the validation of the secondary structure is done by PROCHECK software. The derived Ramachandran plot displayed the distribution of the residues in the most favoured region between  $-45$  to  $-95^\circ$  on X-axis and  $0$  to  $-50^\circ$  on Y-axis revealing that half of the residues contributing to  $\alpha$ -helix formation.

Similarly, the values obtained in Ramachandran plot  $-45$  to  $-150^\circ$  on X-axis and  $110$  to  $180^\circ$  on Y-axis are revealing equal predominance of  $\beta$ -pleated sheet. Further, more than 90% of the residues appeared in the most favoured region of Ramachandran plot. The primary and secondary structural features of *P. gingivalis* reveal that the hypothetical protein is found to be more stable and hence this has become an obligate anaerobe causing periodontitis.

**KEYWORDS:** *P. gingivalis*, Hypothetical Protein, Ramachandran Plot, Periodontitis.

## **In Silico Optimization of Anthocyanin Extraction from Clitoria Ternatea Flower**

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**ABSTRACT:** Anthocyanins are vacuolar pigments whose color and stability vary depending on their structure, temperature, pH, light, intramolecular connection with other chemicals, and intermolecular association. These are polyphenols with antioxidant property which significantly lower blood pressure, inflammation, oxidative stress, cancer, diabetes, and other chronic diseases including Alzheimer's. Additionally, it has antimicrobial properties and can also be utilized as a dye, natural food colorant, or food additive. In the present work, the Response Surface Methodology (RSM) was used to optimize the parameters influencing the extraction of anthocyanins from Butterfly pea (*Clitoria ternatea*) flowers. The parameters methanol: 52 %, temperature: 30 °C, incubation time: 4.42 h and solid loading: 7 % (w/v) resulted in maximum anthocyanin content of 45.38 g-1 DW which is in proximity with the predicted anthocyanin content of 45.83 g-1 DW. Qualitative tests have been performed with the Butterfly pea flower extract and found that this miraculous herb has got many potential bioactive compounds which can cure many ailments. Besides, DPPH (2,2- diphenyl-1-picrylhydrazyl) free radical scavenging assay of the extract revealed that it possessed 65.63 % antioxidant activity. Hence, Butterfly pea flower extract can be used as colorant as well as nutraceutical in food industry.

**KEYWORDS:** Antioxidant Activity, Anthocyanin, Bioactive Compounds, Butterfly Pea Flower, Response Surface Methodology.

## **Waste to Wealth: The Role of a Modern Chemist**

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**ABSTRACT:** The concept waste to wealth literally means moving waste from a platform of exhausted utility to valuable & desirable levels. Waste management is a systematic control of generation, storage collection, transportation, separation & disposal of solid waste. The knowledge of chemistry has helped in the recovery & re-use of solid waste & its procedure due to human activity such as when factories extract & process of raw material. Waste management is the generation, prevention, characterization, monitoring, treatment, handling, reuse & residual deposition of solid wastes. The waste to wealth mission brings scientific processing of waste to the forefront to build a zero landfill and zero waste nation.

**KEYWORDS:** Waste to Wealth, Solid Waste, Factories Extract, Zero Waste Nation.

## **Internet of Medical Things: Remote Healthcare and Health Monitoring Perspective**

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**ABSTRACT:** The Internet of Medical Things (IoMT) makes machine to machine communication and real-time intervention options possible, which in the near future will fundamentally alter the accessibility, and affordability of healthcare. Increased patient participation in decision-making will also increase compliance with healthcare services. This will increase the rate of technology adoption. In the upcoming years, this industry will expand to reach \$156 billion by 2025. IoMT will advance individualised care and a high level of life by giving each patient with a customised data-driven treatment plan and devices that are tuned for their physiological needs.

A linked health ecosystem and reasonably priced medical equipment are also expected to result from recent research in the sensor, networks, cloud, mobility, and big data sectors. The architecture of the Internet of Things (IoT) ecosystem is extremely complicated, with several components interacting with one another to enable a range of end-user solutions. This interconnected system makes it possible to govern end user applications through analytics, real-time data collecting, device connectivity, and data transfers. IoT offers a connected environment made up of cyberphysical systems, which enables data driven decision making and blends human intervention with computer-based systems. Along with other sectors of the economy like manufacturing,

construction, and power distribution, healthcare is also ready for an IoT transformation. A network of interconnected devices that continuously perceive important data is referred to as the Internet of Medical Things (IoMT), a healthcare use of IoT technology. IoMT improves human-machine communication, which benefits real-time health monitoring systems and patient participation in decision-making. IoT makes it possible to maintain health records, register data, and monitor health in real-time to support data-driven decisions. These could offer the patient a customised health regimen. While IoT-based medical technology applications are still in a nascent stage of development, the implementation of connected devices could significantly improve healthcare delivery.

**KEYWORDS:** IoMT, Healthcare, Human-machine Communication, Medical Technology.

## **The Application of Bioelectrochemical Cells as a Source of Bioenergy for the Treatment of Wastewater**

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**ABSTRACT:** The steady rise in the global population, which is supported by the expansion of both industry and the economy, is responsible for the persistent worsening of environmental conditions. The inexorable depletion of natural resources and rising environmental concerns are the primary motivating factors behind the rising need for environmentally friendly fuel generation, chemical manufacturing, and efficient reuse of nutrients and metals. In recent years, seeking solutions to fuel shortages has been trendy. Carbon dioxide emissions are mostly driven by energy consumption, with global carbon dioxide emissions from fossil fuel burning reaching 33.1 gigatonnes in 2018. As a result, finding a sustainable substitute for fossil fuels will be important in reducing global carbon dioxide emissions. This cleared the way for the development of ecologically friendly, economically viable, and long-term solutions to address the energy crisis in a more environmentally sensitive manner. Recent review publications have helped establish the study's key focal areas, covering electron transfer, electrode engineering, high redox catalysts, biofilm role and formation, and implementations. No systematic evaluation has compared and assessed bioelectrochemical cells as green power sources to extract energy from waste/wastewater. Electrochemical water and wastewater treatment are cost-effective.

Bioelectrochemical cell energy can power electrochemical therapy. This study examines bioelectrochemical cells linked energy systems, variables impacting bioelectrochemical cells' efficiency, and scaling-up problems for long-term efficiency.

**KEYWORDS:** Bioelectrochemical Cells, Biofilm, Power Generation Efficiency, Biofuels, Anaerobic Digestion.

## **The Preparation of Fatty Acid-based Ammonium Ionic Liquids and their Use in the Recovery of Co(II) and Ni(II) Metal Ions from Aqueous Medium**

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**ABSTRACT:** Water pollution has become a serious problem as a result of industrialization, urbanisation, and population growth, particularly in developing nations. According to a recent WHO research, water shortage will be a serious worry by 2050, and the availability of clean drinking water may affect one billion people. Chemical mining, metallurgical, and lithium-ion battery development sectors routinely discharge organic and inorganic contaminants into most aquatic streams. Heavy metal contaminants, such as cobalt, nickel, copper, chromium, mercury, and arsenic, are hazardous to human health. Furthermore, the present demand for lithium-ion batteries has increased in recent years due to the growing vehicle and energy storage sectors. Lithium-ion batteries are mostly made up of cobalt, nickel, and lithium as desirable metals. Several investigations have shown that hydrophobic ionic liquids have been replaced as a distinct feature for interaction with heavy metals and may be extracted via liquid-liquid extraction. Fatty acids are easy to synthesize ionic liquids, have a long alkyl chain that confers hydrophobicity, and are stable through acid stripping and regeneration. Because the protonation of oleate and lineolate acids consist of long alkyl chains in an anion formed from fatty acid, it has no effect on their water immiscibility. Several investigations have demonstrated that tertiary amines and quaternary ammonium salts can engage in anion exchange or adduct formation. This work aimed to create biocompatible methyltrioctyl ammonium cation and fatty acid anions using low viscosity ionic.

**KEYWORDS:** Cobalt, Nickel, Cations, Ionic Liquid, Stripping, Fatty Acids, Solvent Extraction.

