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ABSTRACTS

HERBAL PHARMACOVIGILANCE: PROSPECTS AND CHALLENGES

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Use of herbs and its herbal derivatives is being majorly used to treat ailments, diseases, and body disorders for a long time, especially in the Indian subcontinent where Ayurveda plays a very significant role not only for medicinal practices but culturally too. Though herbal medicine is relatively safer than highly processed drugs, indiscriminate and random use of herbal medicines without consulting specialists under the assumption that herbal medicine is completely safe is not only causing side effects and questioning of its efficiency but is also causing disappointment among people. This calls for the need of strict regulating authorities for qualification-quantification of distribution of herbal medicines in the market, certification of distributor and most importantly awareness among people about judicious usage of herbal medicines. The national, as well as international health authorities are taking great efforts in devising parameters for cultural medicinal practices and ensuring its implementation.

Keywords:

Ayurveda, herbal medicine, ailments, health authorities, regulation, culture

ROLE OF HCMV miRNAs TO INHIBIT CELLULAR APOPTOSIS IN HEK293T CELLS BY TARGETING THE 3' UTR OF PRO-APOPTOTIC GENES

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Every living cell regulates its different cellular mechanisms either through proteins or through stretches of nucleotide i.e., small RNAs. As far as regulation of the different cellular mechanisms is concerned, a small tiny non-coding RNA molecule (s) encoded by the cells of plants, viruses, or humans is involved known as MicroRNA. The miRNAs are about 18 to 25 nucleotides long and play a devastating role in post-transcriptional regulation of gene expression and it is reported to be involved in normal and pathological processes. Human Cytomegalovirus is one of the pathogenic virus which causes life long latency inside the host body. Primary HCMV infection is generally asymptomatic, but if this virus reverts to its lytic phase, it shows deleterious effects on the host and can cause severe and sometimes fatal disease (s) especially in immunocompromised individuals. Several reports pertaining that the HCMV encoded miRNAs helps in its survival inside the host. We reported the inhibitory role of HCMV miRNAs in cellular apoptosis. Our *in-silico* studies revealed that HCMV encoded miRNAs target the cellular pro-apoptotic genes i.e., MOAP1, ERN1 and PHAP1, which are involved in the mitochondrial induced apoptosis.

Further, our *in vitro* experiments using HEK293T cells shows that hcmv-miR-UL70-3p and hcmv-miR-UL148D are targeting the MOAP1 (Modulator of Apoptosis-1) gene by binding to the 3' UTR. Further studies shows that these miRNAs i.e., miR-UL70-3p and hcmv-miR-UL148D can downregulate the H₂O₂ induced apoptosis which is evaluated microscopically and through flow cytometry. The extent of inhibition of apoptosis was found to be 11%, and this study shows that the HCMV uses its miRNAs machinery for regulating the cellular apoptosis for its prolonged survival inside the host cells.

Human Cytomegalovirus (HCMV), Modulator of Apoptosis (MOAP1), Endoplasmic Reticulum Nuclei-1 (ERN1) hcmv-miR-UL70-3p, hcmv-miR-UL148D

MOINA: A PROSPECTIVE MODEL ORGANISM FOR PARKINSON'S DISEASE

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Model organisms are those with the wealth of biological data that make them attractive to study the natural phenomena that are more difficult to study directly. More and more of them are being employed in investigating the pathophysiology, diagnosis and cure of the disease(s). *Moina*, called water fleas, belonging to the family of crustaceans, have combined characteristics of any other vertebrate MO such as rodents, primates, fishes, and that of invertebrates MO like *Drosophila melanogaster*, *C.elegans*. Additionally, it offers convenience with its easy culture conditions, small size, high reproductive capacity, and genetic similarity with humans.

The proposal for a new model system can be seen in *Moina* for studying PD (Parkinson's Disease) which is one of the progressive incurable neurodegenerative disorder/disease, and is caused due to the degeneration of dopaminergic neurons and marked by deficits in movement and locomotion including hypokinesia (slowness in movement), bradykinesia (decrement in movement), akinesia (no movement) etc. Besides being free from ethical issues, these water fleas not only have transparent body for easy viewing of internal organs, characteristic quantifiable movement patterns and similar human behaviour induced deficits, but most importantly the existence of dopaminergic neurons, making them preferable prospective animals for modeling in movement disorders.

GREEN SYNTHESIS OF ZINC OXIDE (ZnO) NANO-PARTICLES AS AN EFFICIENT ALTERNATIVE MICRONUTRIENT USING AQUEOUS LEAF EXTRACT OF *FICUS RELEGIOSA*

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Nanoparticles have wide range of applications in fields of biological, chemical and physical sciences. Zinc oxide nanoparticles have shown antimicrobial, antibiofilm, anticancer and antidiabetic activities. Other than these activities, they may be effectively used for the regulated release of Zn in the soil for the better growth of plants. There are various reported methods of synthesizing nanoparticles, but this work mainly focused on “green synthesis”, which makes use of reducing agents from plants in the form of aqueous solutions, instead of harsh chemicals. Zinc oxide nanoparticles were synthesized from *Ficus religiosa* leaf extract under variable pH conditions. It has been found that pH-12.39 was optimum for synthesizing zinc oxide nanoparticles. UV-Vis spectroscopy and Dynamic light scattering (DLS) studies were used to identify and characterize these nanoparticles. The UV lambda max was observed at 374nm and size estimated by DLS was 213.6nm. These nanoparticles may have huge potential in various biomedical, bioengineering and agricultural applications.

Keywords:

Zinc oxide nanoparticles, Green synthesis, UV-Vis spectrophotometry, Dynamic light scattering (DLS)

ANTIMALARIAL AGAINST BOTH LIVER AND BLOOD STAGES OF INFECTION IN *PLASMODIUM FALCIPARUM*

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Over the past decade, effort in antimalarial drug discovery has generated a broad portfolio of new drug candidate. However, to reduce the potential emergence of resistance, a candidate molecule with a broad spectrum of activities including blood and liver stages are required. Rapid replication of parasite DNA is required to propagate *Plasmodium* species in both liver and blood stages of infection. Interestingly *plasmodium* species lack pyrimidine salvage enzymes, unlike humans, rely entirely on the *de novo* pathway to acquire pyrimidines for DNA and RNA synthesis. Therefore, these enzymes can act as potential target for designing antimalarial drugs. A key step in this pathway is catalyzed by dihydroorotate dehydrogenase (DHODH). DHODH is a flavin (FMN)-dependent mitochondrial enzyme that catalyzes oxidation of dihydroorotate to orotic acid in a two-step reaction that requires Coenzyme Q (CoQ) for reoxidation of FMN. There are two types of DHODH. Type I is a cytosolic enzyme found in *Saccharomyces* and certain protozoa and requires fumarate or NAD^+ as electron acceptor. *P. falciparum* and humans' express type II DHODH, a membrane-bound protein linked to ubiquinone (CoQ) as the electron acceptor. Malarial and human DHODH reside in the outer side of the inner mitochondrial membrane. The first half of reaction catalyzed by *P. falciparum* and human DHODHs involves oxidation of DHO to orotate coupled with electron transfer to FMN. The electron pair is then transferred to CoQ in the second half of reaction, with concomitant recycling of FMNH_2 to FMN. Furthermore, DSM265 is a potent inhibitor of the *Plasmodium* enzymes *Pf* DHODH and *P. vivax* DHOD with excellent selectivity versus human DHODH. In the present study, we took DSM265 as lead compound to design newer analogues with better selectivity and least toxicity.

Keywords: Antimalarial drugs, Enzyme inhibitors, Virtual Screening and Molecular Docking

COMPUTATIONAL ANALYSIS OF AVAILABLE ANTI-THYROID DRUGS FOR THE DESIGN OF NEWER ANALOGS

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Thyroid hormones (T4 – Thyroxine and T3 - Triiodothyronine) are very essential hormones required for the development and maintenance of the body systems. Thyroid related problems –hyperthyroidism and hypothyroidism are common in India, especially among women. The currently available drugs for hyperthyroidism though are effective in keeping the hormone levels under control, there is a high chance of recurrence of the disease condition which forces the patients to be on long and repeated courses of the drug. Thyroid hormone synthesis is done by an enzyme called – Thyroperoxidase (TPO) is inhibited by the currently available drug Methimazole (MMZ). This project aimed at analysing the interaction of the drug MMZ with TPO using computational tools. TPO structure was modelled using ‘Swiss Modelling server’ and MMZ structure obtained from DrugBank. The structures were docked together using open source docking tools and were observed in PyMol. The site of drug docking and the known active site residues were compared. The interaction between drug and enzyme was studied using ‘PyMol’ and & ’LigPlot’. The available knowledge and data obtained would be used to compare with other potential molecules which will be obtained by virtual screening, and thus aid in designing an anti-thyroid drug that can provide better and faster treatment to hyperthyroid patients.

Keywords:

Hyperthyroidism, Thyroperoxidase (TPO), Virtual Screening and Docking

HOW EPIGENETICS ORCHESTRATES CELLULAR AGEING

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Cellular ageing, a slow degradation of physiological processes is a natural phenomenon that is caused due to several reasons which include chromatin condensation, epigenetic markers, oxidative stress, telomeric attrition, stem cell depletion, etc. It is important to understand what we exactly mean by ageing and senescence. Biological age can be estimated by analyzing DNA methylation levels, and these have been termed epigenetic clocks. We wish to explore and understand how cellular ageing works. After a brief and comprehensive introduction to both cellular ageing and epigenetics, we move on to describing the complex multidimensional equation they have. We explain the various factors involved in ageing and how epigenetics orchestrates all of them, which helps in slowing them down and finding solutions to a number of diseases associated with ageing. As a fitting end, quite a few different interventions like caloric restriction and novel anti-ageing compounds found to circumvent the effects of ageing have been discussed as well.

Keywords:

Ageing, Epigenetics, DNA methylation

IN-VITRO SAFETY ASSESSMENT OF AYURVEDIC HERBO-MINERAL PREPARATIONS

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In Ayurvedic system of medicine, the formulation prepared with minerals & metals are called as herbo-minerals preparations or *Bhasmas*. A *Bhasma* means an ash obtained through incineration; the starter material undergoes an elaborate process of purification and this process is followed by the reaction phase, which involves incorporation of some other minerals and herbal extract. The potential of Ayurvedic medicine needs to be explored further with modern scientific validation approaches for better therapeutic leads. Cell based *in vitro* safety assessment are fast, cost effective and high throughput for toxicity screening. The present study was aimed to evaluate the cytotoxicity profile of herbo-mineral preparations by using liver cancer cell line HepG2 & liver microsomes or S9 fraction using Trypan blue , MTT, LDH and caspases 3 assays.

Keywords:

Liver microsome, S9 Fracion, In-Vitro

SYNTHESIS AND CHARACTERIZATION OF SCHIFF BASES (3-AMINO-2-NAPHTHOL AND AROMATIC ALDEHYDE) AND THEIR COMPLEXES WITH CU (II), NI (II), ZN (II)

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Metal complexes of Schiff Bases have occupied a central role in the development of coordination Chemistry. A number of varieties of stable chemical species have been synthesized, containing transition metals and multifarious ligands. Metal complexes also find a wide application in the field of Industrial Chemistry, Analytical Chemistry, Pharmaceutical Chemistry, Agricultural Chemistry and Bioinorganic Chemistry.

Recently, heterocyclic Schiff bases and their metal complexes are frequently used as anticancers, herbicides, bactericides, plant growth regulators and anticonvulsants. The end result of this reaction is a compound in which C = O is replaced by a C = N.

This study reported the synthesis of the new ligands formed by 3-Amino 2-Naphthol 4-Sulphonic Acid with Furon-2 Carbaldehyde, Thiophene-2 Carbaldehyde and Pyrrole-2 Carbaldehyde. These formed Schiff base type ligands respectively obtained Furan-2 Aldimine-2-N-3 Hydroxy-1-Sulphonic Acid Nephthalene, Pyrrole-2 Aldimine-2-N-3 Hydroxy-1-Sulphonic Acid Nephthalene, Thiophene-2 Aldimine-2-N-3 Hydroxy-1-Sulphonic Acid Nephthalene.

The above synthesized Schiff bases were then condensed with CuSO₄, NiCO₃, Zn (II) Acetate, [Cu(II) By CuSO₄, Ni(II) By NiCO₃, Zn(II) Acetate] to get their complexes. The synthesized complexes have been analyzed and characterized with help of elemental analysis, conductance, magnetic susceptibility measurement, IR and U.V. visible spectroscopy. The complexes have been screened for their biocidal activity. The antifungal and antibacterial activity of all the synthesized Schiff bases and their metal complexes has been determined on *Aspergillus Flavous*, *Aspergillus Niger Fungi* and *Escherichia Coli*, *Staphylococcus Aureus* and *Bacillus Subtilis* bacteria by cup plate agar diffusion method.

The result of above investigation metal complexes of these Schiff bases, the Cu(II) metal complexes showed highest activity (in both antifungal and antibacterial) while Zn(II) metal complexes showed better activity than Ni(II) complexes. **Cu (II) > Zn (II) > Ni (II).**

POLYDOPAMINE AMINOGLYCOSIDE NANOCONJUGATES AS NOVEL BIOMATERIALS FOR MEDICAL APPLICATIONS

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Microorganisms have become a major source of nosocomial as well as drug resistant infections that have resulted in high mortality in recent decades. Unusual practice of using antibiotics among immuno-compromised patients has led to the development of drug resistant strains. Moreover, non-compliance with the treatment regimen has also inflated the frequency of resistant cases. The consequence of antimicrobial resistance (AMR) is the replacement of treatment regimens with expensive alternative drugs with infelicitous effects. For confronting this global issue of AMR, development of new classes of biologically as well as chemically synthesized compounds with profound anti-bacterial/antimicrobial activity, is the need of the hour. Keeping these points in mind, here, in the present study, we have tried to explore the potential of dopamine, a simple and economical source, to address the ever-growing concern regarding development of antimicrobial resistance without compromising on the cytocompatibility. Dopamine on oxidative self-polymerization under alkaline conditions yielded biomimetic polymer nanoparticles, polydopamine nanoparticles, with surface functionalities that were used for tethering aminoglycosides to obtain PDA-AG (PDA-G, PDA-K, PDA-N) using gentamycin (G), kanamycin (K) and neomycin (N). These nanoconjugates showed excellent biological activity not only against clinical isolates but also against resistant strains without exhibiting cytotoxicity. These results advocate the promising potential of these nanoconjugates to be used as biomaterials for tissue engineering, wound healing agents, delivery vectors, coating material to inhibit biofilms, cream-based materials for topical applications, etc.

Key Words: *Polydopamine, Aminoglycosides, Nanoconjugates, Antimicrobial activity, Cytotoxicity.*

ELICITOR MEDIATED ENHANCED PRODUCTION OF CITRAL AND GERANIOL IN LEMONGRASS FOR COMMERCIAL APPLICATION

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Aromatic plants possess odorous volatile substances which occur as essential oil, gum exudate, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit. The characteristic aroma is due to a variety of complex chemical compounds. The term essential oil is concomitant to fragrance or perfumes because these fragrances are oily in nature and they represent the essence or the active constituents of the plants. They are called volatile or ethereal oils as they evaporate when exposed to air at ordinary temperatures. Essential oils are highly concentrated, low volume, high value products. Aromatic plants are often considered as natural medicines as they contain many biologically active compounds, mainly terpenoids and polyphenolics, which have been found to possess antimicrobial, antioxidant, antiparasitic, antiprotozoal, antifungal, and anti-inflammatory properties. Lemongrass is a aromatic tall sedge which grows in many parts of tropical and subtropical South East Asia and Africa. Hence there is interest in lemongrass cultivation for production of essential oil .Major constituent of lemongrass essential oils are – Citral, Geraniol, Myrcene, Citronellal, Geranyl Acetate and Limonene. Citral and Geraniol are the major compounds and have been used as markers in quality control of lemongrass oil. Hence production of high yields of Citral and Geraniol in lemongrass is of commercial importance. Our main aim is high production of Citral and Geraniol in lemongrass. Numerous environmental factors also effect biosynthesis of essential oils . It has been reported in literature that some elicitors have been used for enhanced production of plant secondary metabolites. I propose to use some elicitors for enhancing the production of Citral and Geraniol in lemongrass.

CHALLENGES IN DENTAL HEALTH MANAGEMENT OF MEDICALLY COMPROMISED PATIENTS

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The oral and dental health is more important than one might realize. It has been a window to overall health of an individual. Oral cavity acts as a harbor to many pathogenic microbes. Their growth could be kept under control by good oral health care combined with natural defense system. However the pathogens in unhygienic buccal cavity may lead to oral infections such as thrush , tooth decay and gum diseases in any individual of any age. The infectious agents might swarm into digestive and respiratory tract to cause various disease conditions. Few Ayurvedic preparations have been shown to be primarily of preventive nature, however, may provide some relief to dental patients. Currently, the standardized general and specialized therapeutic and surgical procedures are available to treat the patients of gingivitis, caries, nerve desensitization or teeth replacement by putting implants.

Under compromised conditions, the oral and associated diseases may be more severe. Studied have suggested that the periodontitis induced by oral bacteria might be associated with some diseases such as diabetes, AIDS, endocarditis, cardiovascular disease, pneumonia, pregnancy disorders, osteoporosis and Alzheimer's disease. The dental health management of medically compromised patients has been quiet challenging. Such patients need pre-operative and spot modification in treatment strategies according to their medical condition. High level of precautions is required to be taken by the dentist when dealing with patients having diabetes, AIDS, cardiovascular disease, anemia bleeding disorders epilepsy. The peculiar cases of severe conditions managed will be presented.

A STUDY ON ANTIOXIDANT POTENTIAL OF *TINNEYVELLY SENNA* (*SENNA ALEXANDRINA* MILL) PLANT USING DIFFERENT EXTRACTION METHOD

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Tinnevelly Senna (*Senna alexandrina* Mill.) is earlier known as *Cassia angustifolia* belongs to the family Caesalpinaceae and the genus Senna. It is well known for their medicinal value. A number of bioactive constituents that contribute to a wide range of medicinal properties are evident to the species. Among these, the Sennoside is a major phytochemical present in the senna which is a potential laxative used in commercial drug. Although several studies are reported on the extraction of phytochemical there is no study has been undertaken to analyse the phytoconstituents using different extraction methods. The current research has been designed to access the phytochemical content and antioxidant property of the methanolic crude extracts of leaves, pods and seeds parts of field grown plants. The different extraction methods have been performed like UAE, ME, SE and SME to characterize the potent aliquot which has high antioxidant activity and phenolic, flavonoid and tannin content using methanol as a solvent. This study revealed soxhlet extraction method showed rich alkaloid in leaf $0.417 \pm 0.02 \text{mg/g}$ compared to pod and seed parts. The total phenolic, flavonoid and tannin content was high in seed maceration extract with the value of being $0.362 \pm 0.01 \text{mg/g}$, $0.142 \pm 0.02 \text{mg/g}$ and $0.448 \pm 0.07 \text{mg/g}$ respectively. Remarkable serial maceration extract showed the higher antioxidant activities in DPPH and FRAP method. which was determined by IC₅₀ value. The leave part exhibited very good antioxidant activity with an IC₅₀ value of $4.60 \pm 0.03 \mu\text{g/ml}$ in free radical reduction test DPPH and $51.94 \pm 0.52 \mu\text{g/ml}$ in iron reduction test (FRAP) respectively. This result can be attributed the importance in phytochemical value and are very good natural antioxidant. From this observation it was confirmed that maceration extraction method was found to be efficient compare to other extraction methods of our study.

Keywords:

Tinnevelly Senna, Ultrasonication assisted extraction, Maceration Extraction, Soxhlet extraction, Serial Maceration extraction method.

**NOVEL 1,3-BENZODIOXOLE TAGGED NOSCAPINE BASED
ANTICANCER IONIC LIQUIDS: SYNTHESIS TO *IN-SILICO*
AND *IN-VITRO* CYTOTOXICITY INVESTIGATION ON
HELA CELLS**

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Ionic Liquids (ILs) are emerging as a new class of anticancer compounds amongst the scientific community in the 21st century. Because of their high tunability and exceptional properties like, low flammability, high ionic conductivity, low volatility, high thermal and chemical stability etc, ILs have been widely applied to many areas from energy, electrochemistry, organic synthesis and catalysis to pharmaceuticals research. With proven efficiency of ionic liquids in the biological field, here an attempt has been made on an opium alkaloid anticancer compound noscapine. In this study, a library of novel Noscapine (Nos) based ionic liquids were synthesized and characterized using various techniques such as ¹H-, ¹³C- NMR spectroscopy and FT-IR. These novel Noscapine based ionic liquids were studied by *in silico* assays including molecular docking analysis, which showed the [Pip-Nos]OAc and [Pip-Nos]OTf derivatives of Nos-based ionic liquids have high molecular binding with docking score -336.19 kJ/mol and -326.71 kJ/mol, respectively, much higher than the parent compound noscapine (-267.06 kJ/mol). Furthermore, pharmacokinetics and pharmacodynamics properties analyses were performed and showed the favorable results with an efficient anticancer drug. The lead compounds were further employed and validated with *in vitro* anticancer cytotoxicity assay on *HeLa* cancer cell line. The *in vitro* cytotoxicity analysis depicted the high anticancer effectiveness of lead compounds with lower IC₅₀ of [Pip-Nos]OAc (23.5- μ M) and [Pip-Nos]OTf (17.2- μ M) IL derivatives than the parent compound noscapine (47.2- μ M). In conclusion, the present study paves the way to design and development of the potential anticancer drug.

NANOTHERAPEUTIC CONJUGATES OF *TERMINALIA ARJUNA* PLANT EXTRACTS WITH POTENTIAL IN MEDICAL APPLICATIONS

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Arjuna is a 40-60 feet tall tree found in sub-himalayan, central and southern part of India. It is among the most valuable plants used in Unani, Ayurveda, Tibetan and Homopathy medicine. Its bark is a rich source of flavonoids like arjunoline, arjunone, phytosterol, anti-oxidants as well as good source of minerals like copper, zinc, calcium. Its phytochemical constituents are effective in treating asthma, hypertension, ear infection, ulcer, liver problem and highly effective in LDL-cholesterol, ischemic heart diseases. A recent survey showed that 80% of world population is dependent on traditional herbal medicines especially India and China like developing countries. Different plant extracts of *Terminalia arjuna* has been used for the synthesis of different nanoparticles like gold nanoparticles, silver nanoparticles and magnetic iron nanoparticles. The study evaluate the potential of plant extract in combinations with different metal nanoparticle in treatment of different disease. The present presentation is meant to discuss various metal nanoparticles synthesis and their characteristics obtained using extracts of *Terminalia arjuna* and progress towards pharmacological properties evaluation in extract combinations which are effective for controlling various kinds of ailments.

CULTIVATION OF MEDICINAL PLANTS IN BUNDELKHAND REGION: AN INVESTIGATION ON NUTRITIVE AND MEDICINAL VALUES

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Medicinal plants are potential renewable natural resources and are generally considered to play a beneficial role in human health care. The medicinal values of these plants lie in some bioactive chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds are alkaloids, flavonoids, tannins and phenolic compounds. Moreover, medicinal plants are remarkably valuable for human health due to their nutritional values specifically ascorbic acid, protein, vitamins, and macro and micro nutrients content. Hence in the present investigation, five medicinal plants namely *Withania somnifera* (L.) Dunal, *Psoralea corylifolia* L., *Aloe vera* (L.) Burm. F., *Asparagus racemosus* willd., and *Tinospora cordifolia* (Wild) Hook. F. & Thoms were cultivated in Bundelkhand (Jhansi) soil amended with farm yard manure (FYM). These plants were selected on the basis of their regional demand and suitability of cultivation in Bundelkhand region. Subsequently, harvested medicinal plants were examined for their qualitative and quantitative chemical composition of bioactive compounds as well as some nutritional contents. Our observation revealed that these cultivated medicinal plants are very much rich with different nutrients. Consequently, different species also examined significantly different in their quantity of nutrient contents. It was observed that maximum ascorbic acid concentration was present in the leaves of *Psoralea corylifolia* (11.53 mg/100g). The maximum protein content was found in the leaves of *Withania somnifera* (13.70 %). Further, GC-MS analysis also revealed the presence of high concentration of bioactive compounds in the methanolic extract of these medicinal plants. These bioactive phytochemical compounds are known to have various medicinal properties. Hence, the results of our present investigation highly recommend for the usefulness (nutritive and medicinal values) and extensive cultivation of these medicinal plant to improve the economic benefits of farmers in Bundelkhand region.

EXPLORING NEW DIMENSIONS OF DIABETES THROUGH CIRCADIAN RHYTHM

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Circadian rhythm is a rough estimation of a 24 hour cycle of the body which might vary on individual level with environmental factors playing a big role. Almost every tissue system has its own rhythmicity. Food availability promotes the stimuli associated with food intake and its circadian rhythm is arranged with the predictable daily mealtimes. The timing of three-meal schedules indicates close association with the plasma levels of insulin and preceding food availability. Altered timings of food intake can result in losing synchronization between the central and peripheral clocks giving rise to metabolic disorders like obesity. Obesity is associated with higher levels of fat in the blood. More fat in the blood means less-efficient mitochondria. Mitochondria breaks down fat and sugar to produce energy and its dysfunction leads to insulin resistance. Further giving rise to type 2 diabetes. In the past years, *Drosophila* has proven to be a good Model organism for cluster of diseases involving insulin and insulin signaling pathways and this might help in checking similarities to human diabetes. Further results might help link irregularity in circadian rhythm to diabetes.

Keywords: *Circadian Rhythm, Insulin, Obesity, Diabetes*

CERIUM BASED CATALYST IN KNOEVENAGEL CONDENSATION REACTION

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Cerium is the most abundant earth metal (0.0046 wt % of the earth's crust) and its oxide form (cerium dioxide) is most commonly used as a catalyst or a non-inert support for metal nanoparticles and metal oxide nanoparticles. Ceria-based material has many application in various process (Three Way Catalysts (TWCs) Diesel Engines, Prototypes and Niche Applications, Solid Oxide Fuel Cells, Polymer Exchange Membrane Fuel Cells (PEMFCs), Emerging Applications, Reforming, Water-Gas Shift Reaction and Preferential Oxidation of CO, Oxidation of Volatile Organic Compounds (VOC), Partial Hydrogenation, Organic Reactions. The carbon-carbon, carbon-nitrogen bond play important role as intermediates for organic transformations. Imines formation has been reported in the literature using various methods. Herein, we have developed a new solid base catalyst i.e. Magnesium hydroxide and Cerium hydroxide carbonate (MgCe-HDC), which can perform knoevenagel condensations. MgCe-HDC was prepared using co-precipitation method and characterized by various techniques *viz.* Scanning electron microscope (SEM), X-Ray Diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), Differential thermal analysis (DTA), Thermo-gravimetric analysis (TGA).

MOLECULAR DOCKING AND ADMET STUDIES ON PHYTOCHEMICALS FROM SELECTED MEDICINAL PLANTS FOR THE IDENTIFICATION OF POTENTIAL ANTI-ASPERGILLUS MOLECULE

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Aspergillus species are common pathogens that cause a wide spectrum of infectious diseases in humans. *A. fumigatus* is accountable for more than 90 % of *Aspergillus* induced infections such as *Aspergillus*-mediated asthma and allergic broncho-pulmonary aspergillosis (ABPA), hypersensitivity pneumonitis, chronic pulmonary aspergillosis (CPA), invasive aspergillosis (IA) and aspergilloma. The severity of these conditions mainly depends on the magnitude and virulence of the inhaled strain and on the status of the host defence. IA is the late stage of infection and mostly lethal due to lack of effective treatment.

Antifungal drugs such as polyenes (amphotericin B, nystatin), echinocandins (caspofungin), and azoles (fluconazole, itraconazole, ravuconazole, posaconazole) have been developed for therapeutic intermediations. These currently available antifungals involve few targets in disrupting the metabolic pathways of the *A. fumigatus* such as cytochrome P450 14a-demethylase (CYP51) and β -1,3-endoglucanase (ENGL1) in fungal cell wall, ergosterol biosynthesis, homocitrate synthase in lysine biosynthesis and dihydroorotate dehydrogenase (DHODH) in pyrimidine biosynthesis pathway. The progress of resistance against currently available antifungals have compelled for the search of novel molecules with novel mechanism of action.

A number of medicinal plants have been reported to possess antifungal activity. The literature survey showed that the essential oil and extracts of *Allium sativum* (garlic), *Syzygium aromaticum* (clove), *Datura metel* (datura), *Solanum xanthocarpum* (eggplant), *Acacia catechu*, *Acacia nilotica*, *Foeniculum vulgare*, *Argemone mexicana*, *Eucalyptus globulus*, *Mentha spicata*, *Ocimum sanctum* and *Azadirachta indica* have shown very promising activity against *Aspergillus* species. Although a number of phytochemicals have been isolated and characterized from these plants, but no potential antifungal molecule(s) have been reported. We have used cheminformatics based, *in silico* approach to assess drug likeness of the reported phytochemicals of these plants. The molecules have been docked against the known targets of the currently available antifungals. Using Lipinski's rule of five and bio-availability and toxicity studies, potential molecules have been selected. The best prioritized molecules have been proposed for *in vitro* screening for confirming anti-*Aspergillus* potential.

Keywords:

Aspergillosis, medicinal plants, phytochemicals, molecular docking, ADMET

NON INVASIVE CALCIUM CHANNEL REGULATION USING MONSTIM1 FOR CALCIUM SIGNALING MANIPULATION IN BRAIN

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Brain utilizes Ca²⁺ signaling to regulate several functions including memory, emotion etc. Research suggests that abnormal Ca²⁺ regulation is correlated with brain dysfunctions such as neurodegenerative diseases. To study the exact role of Ca²⁺ signaling in brain functions, it is necessary to specifically control intracellular Ca²⁺ signaling using specific Ca²⁺ modulators that target Ca²⁺ release activated Ca²⁺ (CRAC) channels. These modulators are typically constructed from cytosolic domains of STIM1 (Stromal interaction molecule 1) protein, a CRAC channel regulator and a blue light responsive plant photoreceptor cryptochrome2 (CRY2). On the downside this optogenetic approach required the use of optic fibers for *in vivo* brain applications due to poor tissue penetration efficiency of blue light. Long term insertion of optic fibers introduces several issues including scar formation, thermal damage etc. Therefore a modified Ca²⁺ modulator, monSTIM1 (Monster STIM1) with ultra light sensitivity was derived which can be readily activated *in vivo* in the mouse brain through non invasive light illumination. monSTIM1 was derived by CRY engineering from previously derived optoSTIM1 and includes a mutation in CRY2, CRY2E281A and a superior clustering module CRY2Clust(A9). This was tested in laboratory mouse by transducing excitatory neurons of somatosensory cortex, astrocytes in dentate gyrus and thalamic regions of brain with lentiviral constructs of monSTIM1 (study group) and optoSTIM1 (control group), and exposing them to blue light in a light illuminating cage. These mice were observed for expression level of c-Fos a Ca²⁺ dependent immediate early gene where study group showed significant c-Fos expression compared to control group. Further mouse behavioural studies were conducted where Ca²⁺ dependent social fear learning were studied in the presence of monSTIM1 modulator which again proved the efficiency of the new approach. It can therefore be used in regulation of calcium signaling in a broad range of cell types, allowing fundamental roles of Ca²⁺ in brain functions to be studied.

Keywords:

Optogenetics, Ca²⁺ modulators, CRAC channel, CRY2

DECODING THE GENETIC PREDISPOSITION OF TYPE 2 DIABETES: A PRELIMINARY STUDY

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The reasons for occurrence of Type 2 Diabetes (T2D) are inherited, at least in part. Several studies have revealed that the first degree relatives of individuals with type 2 diabetes (T2D) have a significantly higher incidence for T2D, suggesting a genetic basis for T2D. As of now, over 50 candidate genes for T2D have been studied in various populations worldwide. Candidate genes are selected because they are thought to be involved in pancreatic β cell function, insulin action / glucose metabolism, or other metabolic conditions that increase T2D risk (e.g., energy intake / expenditure, lipid metabolism). However, results for essentially all candidate genes have been conflicting. Possible explanations for the divergent findings include small sample sizes, differences in T2D susceptibility across ethnic groups, variation in environmental exposures, and gene-environmental interactions. Owing to the prevailing dilemma, present study focuses on ascertaining the status of few of the most promising candidate genes like *PPAR γ* , *ABCC8*, *KCNJ11*, and *CALPN10* in the Indian population and assess the relative risk for sequence polymorphism which has been reported for other populations.

Results of the study showed that the relative risk for all genes except *KCNJ11* were in the same range as observed globally. However, for *KCNJ11*, it was enhanced two fold with reported values for American and European populations. The fact that the *KCNJ11* gene is associated with regulation of secretion of insulin and glucagon is suggestive of the metabolic aspect associated with T2D affected people in India.

Key words:

Type 2 Diabetes, Polymorphism, KCNJ11 gene, Relative Risk

COMPUTATIONAL STUDIES OF SULFONAMIDE ANALOGUES AS MICROTUBULE TARGETED AGENTS IN CHRONIC MYELOGENOUS LEUKEMIA

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Chronic myelogenous leukemia is a clonal myeloproliferative neoplasm leads to malignant transformation of stem cells. In the present work comparative Molecular Field Analysis, Comparative Molecular Similarity Index Analysis and pharmacophore mapping were performed for different statistics parameter and contour maps. Molecular docking study was performed for the identification of binding of molecule at the active site of protein. Cytotoxicity, cell cycle arrest and antitubulin activities were evaluated for synthesized compound. Three-dimensional quantitative structure activity relationship (3D QSAR) model was generated using 49 molecules reported in literature study of Sulfonamide analogues. The generated model for CoMFA and CoMSIA were statistically significant with correlation coefficient r^2 of 0.931 and 0.924 and q^2 of 0.810 and 0.827, respectively. Different regions *viz.* hydrophobic, acceptor, donor and negative centre have been identified by pharmacophore mapping. Molecular docking result revealed that most active compound bind to the active site of aromatase site. It binds to the active amino acid Ser 140, Thr 145, and Tyr 224 as of ligand incorporated in the protein. Designed compound showed potent cytotoxicity activity on K562 cells and not against normal cell lines. Synthesized compound also inhibits the normal formation of mitotic microtubules. The given data shows that molecular modeling studies could be used as effective tool in designing the new and more potent compounds for the treatment of different cancers and other diseases.

**PROTECTIVE EFFECT OF *ZINGIBER OFFICINALE* LINN ON
THE
SELECTIVE HEMATOLOGICAL AND BIOCHEMICAL TOXICITY
INDUCED BY MELATHIONE IN *CHANNA PUNCTATUS***

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The use of insecticides in croplands and in aquaculture for eradication of unwanted insects is increasing day by day which causes various kinds of harmful effects on the aquatic life. Malathione is an organophosphate insecticide which is vividly used in fish culture, exhibits Hematotoxicity and Biochemical toxicity in the fish. In this study we try to ameliorate the toxic effects of Malathione by using the aqueous extract of medicinally important plant, i.e, *Zingiber officinale*. In this study, we divided fishes into 3 groups (n=6); Control group A- was provided normal fish diet, Group-B was exposed to 10% melathione for 7 days with normal fish diet and Group C- was exposed with Malathione and treated with *Zingiber officinale* aqueous extract (0.5 ml/ 15 ml of water). The biochemical parameters such as Alanine transaminase (ALT) and Aspartate aminotransferase (AST) and the hematological parameters such as RBC count, concentration of Hb, WBC, TLC, Lymphocytes, Monocytes, Neutrophils, PCV,ESR, Plasma glucose, Plasma proteins were estimated. The results show the aqueous extract of *Zingiber officinale* significantly reduced the toxic effects caused by the Malathione (p<.001). Further studies are ongoing to isolate the active ingredient which is responsible for the protective effect on Malathione induced toxicity.

Keywords:

Biochemical toxicity, Channa punctatus , Hematotoxicity, melathione

QUALITY ANALYSIS OF DIFFERENT CULTIVARS OF *CYMOPOGON FLEXUOSUS* AND *CYMOPOGON MARTINII* IN BUNDELKHAND

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Medicinal and aromatic plants have cultivated mainly as an alternative source of income to small and medium farmers. Essential oil of lemongrass is one of the most important oils for commercialization. *Lemongrass (Cymbopogon)* is an important genus of about 120 species that grows in tropical and subtropical regions around the world. The strong lemony odor in *Cymbopogon* due to its high content of the aldehyde citral, which has two geometric isomers, geraniol (citral a) and neral (citral b). In addition to citral, the essential oil of *Cymbopogon* spp. consists of small quantities of geraniol, geranyl acetate and monoterpene olefins and limonene. Some species of the genera are commonly used in folk medicine for treatment of nervous and gastrointestinal disturbances, and as antispasmodic, analgesic, anti-inflammatory, anti-pyretic, diuretic and sedative. The other commercial uses of *Cymbopogon* oil are in perfumery and cosmetics.

Cymbopogon flexuosus and *Cymbopogon martinii* have been cultivated in irrigated and non irrigated soils in Bundelkhand region. The effect of water stress on growth of plant, biomass production, oil quantity and oil quality was estimated. The trials indicated that *Cymbopogon flexuosus* (CIMAP-Krishna) produced more biomass in irrigated as well as non irrigated conditions as compared *Cymbopogon martini* (Rosagras, CN-5 and CK-10).

The essential oil, chemical composition and citral contents were analyzed using Gas Chromatography-Mass Spectrometry (GC-MS) analysis and the percentage of major components are : **Lemongrass Krishna (8.05.19)** Geraniol (6.39%), Citral (46.5%), Geranyl acetate (3.01%), **Lemongrass Krishna (14.12.18)** Citral (34.28%), Citral (z) (22.55%), Geraniol (8.42%), Geranyl acetate (18.59%), **Rosa Grass CK-10 (11.05.19)** - Geraniol (56.21%), Geranyl acetate (22.29), 3-Cyclohexen-1-one 2-isopropyl-5-methyl (3.41%), trans-Isoeugenol (2.66%), Alpha-Ocimene (2.54%), **Rosa Grass CKP-25 (07.05.19)** - Citral (43.75%), Citral(z) (31.62%), Geraniol (4.53), Geranyl acetate (8.06%), **Rosa Grass CN-5 (8.05.19)** - Geraniol (47.6%), 3-Cyclohexen-1-one 2-isopropyl-5-methyl (4.96%), trans-Isoeugenol (2.19%), Geranyl acetate (30.07%), **Jammu Monarda (11.03.19)** - Isothymol (55.4%), Thymol (16.9%), Gamma-Terpinene (4.65%), Isothymol methyl ether (9.64%), O-Cymene (3.28%), Thymol acetate (2.12%), **Jammu Monarda (1.05.19)** - Thymol (68.9%), o-Thymol (8.09%), Gamma-Terpinene (5.20%), O-Cymene (5.02%), Thymol acetate (2.45%).

Keywords: *Aromatic crops, Cymbopogon flexuosus, Cymbopogon martinii, essential oil, GCMS*

SYNERGY OF BIOMEDICAL SCIENCE WITH AYURVEDA

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Ayurveda is not just a herbal medicine, but a science of life with a holistic approach to health and personalized medicine. As Ayurveda focuses on curing a disease by a medicine which have principle agent along with numerous constituents which may be not needed and hence Ayurveda emerge as a field with lack of scientific validation in many of the present principle on which Ayurvedic medicine work as a curative agent. Biomedical scientist can contribute in examining the active compound present in herbal extracts (being the soul of Ayurveda), extracting them and deeply study about pharmacokinetic and pharmacodynamic properties of that compound which help to provide correct therapeutic dose to people. Giving whole herb instead of only their active compound can lead to accumulation of other undesirable elements which can be toxic to human body. As Ayurveda has holistic approach for curing a person, hence the disadvantage in Allopathy can be overcome by bringing Ayurveda in front, as it can be understood by the concept of personalized medicine. Ayurveda focuses on one's mind, body, spirit and the surrounding factors, hence a good approach towards personalized medicine in collaboration with human genome research. Biomedical scientists using interdisciplinary approaches of molecular biology, medicinal chemistry and physiology, can help in finding the structure of active compound of herbal products, hence focusing on artificial synthesis by reproducing the active compound in lab rather than extracting and exploiting the ecological diversity at extremely fast rate and to reduce cost and enhance ease of production at the same time. There is growing need of synergism between Ayurveda and biomedical sciences. Biomedical science, being a research oriented stream and multidisciplinary course which includes basically all what relates humans with disease and it fluoresces with positive outcomes which are applied in reality and proved to come up with solutions of various problems till now. What connects Ayurveda and Biomedical science is that both aims towards better human health and here comes the forefront element: medicine. Ayurveda has its soul as herbal plants and now with progress in biomedical science, the importance of developing understanding of structure and function of the active principle in these herbal extracts and to devise ways of their feasible synthesis and extraction, has been well recognized. Therefore appropriate research methodology and research protocols should be carefully designed, involving experts from Ayurveda & biomedicine.

Keywords:

Pharmacodynamics, Pharmacokinetics, Therapeutic dose

PHARMACOVIGILANCE OF HERBAL DRUGS

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The usage of medicinal plants as medicine is dated back to thousands of years and is increasing in western countries also. Medicinal Plants have been the first choice of treatment for minor diseases and disorders. Traditional medicines are in use without appropriate insight of uses and underlying principles and practice of traditional medicines risks escapes the control. Many of the herbal drugs are very effective but may be associated with adverse effects; safety of herbal drugs therefore becomes a major concern to the Nations health authorities and the general public. Therefore, a continuous vigilance is required. As per WHO Pharmacovigilance is a science and activities related to detection, assessment, awareness and prevention of adverse drug related problems. The scope of Pharmacovigilance includes herbals, traditional and complementary medicines, blood products, biological, medical devices and vaccines. The aim of Pharmacovigilance is to enhance public health and safety by promoting education and clinical training and communication to public. The herbal medicines are mostly non prescription drugs. Therefore, it is a challenge to monitor the safety of these drugs. The National regulations and registration policies of herbal drugs vary from Nation to Nation; it becomes important to define the plant derived drugs to classify as prescription and non prescription drug. To sum up with the safety of Traditional drugs, like other medicinal agents used for human health care, herbal medicines should also be brought in the purview of drug regulation so as to ensure that they conform to the norms of safety, quality and efficacy. The patients should be motivated and educated about the importance of Pharmacovigilance. The establishment of Pharmacovigilance centres across the Nations can help overcome the safety issues and challenges of herbal medicines.

ANTI-QUORUM SENSING ACTIVITY OF SELECTED MEDICINAL PLANTS AGAINST CLINICAL ISOLATES OF *PSEUDOMONAS AERUGINOSA*

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Pseudomonas aeruginosa is a gram negative opportunistic bacteria and one of the causative agent of nosocomial infections. The pseudomonal infections are commonly treated with antibiotics which may leads some serious side effects in patients. As an alternative of antibiotic therapy medicinal plants extract and phytoconstituents may be used for safe and effect treatment of infections. Quorum sensing is a bacterial population density dependent and cell to cell communication mechanism regulates the virulence factor production contributes in pathogenesis of bacteria. Anti-quorum sensing (AQS) activity for inhibition of virulence factors formation at sub-MICs of antibiotics and plants extracts may be a better approach for the treatment as well as reduction in antibiotic resistance of pathogens as compared to growth inhibitory activity because the bacterial growth inhibition imposes the bacteria for development of resistance against antibiotics at higher dose. We screened the anti-quorum sensing activity of methanol extract of clove (*Syzygium aromaticum*) buds, eucalyptus (*Eucalyptus globulus*) leaves and ginger (*Zingiber officinale*) rhizome against clinical isolates of *P. aeruginosa* and found effective reduction in virulent factors formation at their sub-MICs. On the basis of results we suggest that the natural plants extract may be used as an alternative of antibiotics for the treatment of bacterial infection and also controlling the drug resistance problem.

Keywords:

Pseudomonas aeruginosa, nosocomial infections, anti-quorum sensing activity, virulence factors

ANTIBACTERIAL ACTIVITY OF SOLVENT EXTRACTS OF *EUPHORBIA HIRTA* ON UROPATHOGENS ISOLATED FROM TRIBAL WOMEN SUFFERING FROM UTI IN DISTRICT ANNUPUR, MADHYA PRADESH

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Introduction: Urinary tract infections (UTIs) are severe public health problem and are caused by a range of pathogens, but most commonly by *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis* and *Pseudomonas aeruginosa*. In tribal societies, the women are the main sufferers. They carry major burden of diseases due to multiple factors such as poverty, illiteracy and lack of awareness, malnutrition, unhygienic habitat and superstitions. To ensure appropriate therapy, current knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory.

Method: Total 200 urine samples were collected from the District hospital Anuppur, Madhya Pradesh among which 110 samples were found as UTI positive and 80 as UTI negative. *E. coli* is the most common pathogen constituting about the 42% of micro flora isolated from mixed culture. *P. mirabilis* (31%), *K. pneumoniae* (17%) and *P. aeruginosa* (10%) was found to be in mixed culture. In the present study, *E. coli* was found to be most prevalent bacteria in isolates isolated from mixed culture.

Results: Among the antibiotics tested, penicillin and rifampicin were found to be more resistant to the urinary pathogens and Gentamycin, Ampicillin, Tetracycline Kanamycin Norfloxacin and streptomycin, Nilidixic acid, Chloramphenicol, Ciprofloxacin and Amoxicillin were found to be effective for empirical treatment of UTI. The aqueous extract of *Euphorbia hirta* was found to be more effective than methanol and hexane extracts.

Conclusion: Some of the isolates were resistant to penicillin-G and rifampicin which are more frequently prescribed and indicates that increased consumption of a particular antibiotic leads to acquisition of resistance by the uro-pathogens. Resistance rates among common uro-pathogens continue to evolve and appear to be increasing too many commonly used antimicrobial agents and a continued surveillance of resistance rates among uro-pathogens is needed to ensure appropriate recommendations for the treatment of the urinary tract infections. The large zone sizes produced by the plant extract against the test bacteria, especially the aqueous extracts is an indication of the potency of the bioactive components of the plant against all the test bacteria. Furthermore, the aqueous extract of *Euphorbia hirta* may be used for the treatment of UTI.

Keywords: Tribal Women, UTI, Uropathogens, *Euphorbia hirta*, Solvent Extracts

QUALITY CONTROL OF HERBAL MEDICINE

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Quality control for efficacy and safety of herbal products is of utmost importance. Without proper quality control, there is no assurance that the herb contained in the package is the same as what is stated on the outside label. The source and quality of raw materials, good agriculture practices and manufacturing process are essential steps for the quality control of herbal medicine. Quality can be defined as the status of drug that is determined by identity, purity, content and other chemical, physical or biological properties. Identity can be achieved by macro and microscopically examination. Purity is closely linked with safe use of drugs and deals with factors such as ash values, foreign matter, heavy metals and pesticide residue. Due to the complex nature of the chemical content of herbal drugs, two approaches to quality control should be taken, that is quantitative determination of the selected marker compound (s) and metabolite profiling. A combination of chemical profiling and multivariate analysis is recommended as the quality control tool for the botanical identification method of herbs, extracts, herb materials, and herbal drug preparations. The World Health Assembly in resolutions WHA31.33 (1978), WHA40.33 (1987) and WHA42.43 (1989) has emphasized the need to ensure the quality of medicinal plant products by using modern control techniques and applying suitable standards.

MITIGATION OF ARSENIC TOXICITY BY AMALGAMATION OF NANO-MIADMSA AND NANO-CURCUMIN DRUG DELIVERY SYSTEM IN EXPERIMENTAL MICE - A NOVEL APPROACH

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Arsenic is one of the most common causes of heavy metal poisoning in many parts of the world, including India. Prolonged exposure of arsenic results in 'arsenicosis'. Oxidative stress is one of the major mechanisms behind heavy metal toxicity. Chelation therapy, antioxidant/herbal therapy are commonly employed strategies for the treatment. Alternate drug delivery carriers such as liposomes, micelles, nanoparticles etc. are being explored for enhancing the therapeutic efficacy of drugs and limiting its side effects. The present study was planned to establish if there is any significant difference in therapeutic efficacy between the nano-encapsulated drugs [curcumin encapsulated in chitosan nanoparticles (**Nano-curcumin**) and MiADMSA encapsulated co-polymeric nanoparticles (**Nano-MiADMSA**)] as compared to bulk drugs. We hypothesize that a combination drug delivery therapy will have more pronounced therapeutic effects compared to individual effects in the treatment of arsenic toxicity. An *in-vivo* study was conducted wherein arsenic as sodium arsenite (100 ppm) was administered in drinking water for 5 months to Swiss albino mice. This was followed by a treatment protocol comprising of *nano-curcumin* (15 mg/kg, orally for 1 month) either alone or in combination with *nano-MiADMSA* (50 mg/kg for last 5 days) to evaluate the therapeutic potential of the combination treatment. We observed that co-administration of both the drugs showed better therapeutic protection and recovery of all parameters of oxidative stress which are caused owing to arsenic intake. We also found that of all the treatment strategies employed the nanoformulation (**Nano-curcumin + Nano-MiADMSA**) was the best in removal of arsenic from the blood and tissues. This was followed by **Nano-MiADMSA** \geq (**Curcumin + MiADMSA**) $>$ **MiADMSA** $>$ **Nano-curcumin** $>$ **Curcumin** treatment strategies.

Keywords: DMSA monoester, nano-encapsulation, curcumin, arsenic, metal toxicity, oxidative stress, drug delivery.

CRISPR A NEW ADVANCEMENT IN SCIENCE

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Genome editing is a method in which a genetic material can be added, removed or altered at a particular location in the genome of an organism. One of the recent available gene editing technology is CRISPR- Cas9 i.e. Clustered Regularly Interspaced Short Palindromic Repeats and CRISPR associated protein9. These are the natural defense mechanism of bacteria against any foreign nucleic acid entering the cell. They are widely present in bacteria and archaea. The bacteria capture pieces of DNA from invading viruses and create DNA segments called CRISPR arrays. If the same virus invades again these arrays produce RNA segments consisting of the sequence from virus as well as the repeat. These RNA segments then bind to another RNA known as tracrRNA. This structure then binds to Cas9 protein and surveys the cell for DNA that matches the RNA, unwinds the sequence locally and introduce double stranded breaks in the RNA-DNA hybrids which leads to destruction of virus's DNA. This system can be used to facilitate genome editing in eukaryotic cells. The guide RNA in bacteria corresponds to phage sequences but this sequence can be replaced by a sequence of our interest and any gene can be specifically targeted in any organism. Once the DNA is cut the cell uses its own DNA repair mechanism to add the nucleotides and while doing so, mutations are common rendering gene inactivated. This technique is now being explored widely in treating various diseases like sickle cell anemia, cystic fibrosis, cancer, heart diseases and many more.

USE OF QUADRUPLEX BINDING LIGANDS AGAINST PRION DISEASES

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Human *PRNP* gene is known to encode a cell surface protein called PrP^C (cellular prion protein). PrP^C is involved in a large number of cell regulatory functions but once it gets misfolded, it causes neurodegenerative diseases. This misfolded protein triggers the misfolding of proteins in its vicinity and causes neuronal death. Recently, it has been shown that PrP^C significantly binds to G-quadruplex (GQ) motifs and a GQ motif (Q2) is present in promoter region of *PRNP* gene which is thus responsible for autoregulation. The dynamic interactions of Q2-PrP^C resolve Q2 thereby increasing *PRNP* gene expression. So, if we block this interaction by using GQ binding ligands, this will decrease the *PRNP* gene expression and hence progression of the neurodegenerative disorder. In this study we analyzed comparative binding of Q2 with different GQ binding ligands using biophysical (UV and CD spectroscopy) as well as bioinformatics tools (docking and simulation). We plan to study the thermodynamics of the interaction between Q2 and the ligands.

Keywords:

Prions, neurodegenerative diseases, GQ motifs, spectroscopy, thermodynamics.

ROLE OF HCMV miR UL 70-30p ON CELLULAR AUTOPHAGY

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Human cytomegalovirus (HCMV) is a beta-herpes virus, causes lifelong latent infection in human beings. It shows prevalence of 55-100% within the human population, depending on different socioeconomic and geographical factors. Primary infection of HCMV is asymptomatic in hosts but can cause severe and sometimes fatal disease (s) in immunocompromised individuals and neonates. HCMV is the leading infectious cause of congenital abnormalities, affecting 1-2.5% of all live births. HCMV intrauterine infection cause significant morbidity, inclusive of low birth weight, visual impairment, hearing loss, hepatosplenomegaly, microcephaly, and varying degrees of mental retardation. HCMV has co-evolved with humans for millions of years. During this time, it has acquired a number of different mechanisms that modulate and evade the human immune response such as apoptosis and autophagy. The recent discovery of viral miRNA's and their biological roles attracted us to investigate the role of HCMV miRNA's on the human antiviral mechanisms, particularly autophagy. HCMV may hijack the autophagic machinery for their own benefit. Autophagy is a well-described vacuolar degradative pathway which contributes to the homeostasis of the cell and to the response to cellular environmental stresses. Autophagy also plays a housekeeping role in removing misfolded or aggregated proteins, clearing damaged organelles, such as endoplasmic reticulum, mitochondria, peroxisomes and eliminating intracellular pathogens. Autophagy initiations by viral infections in humans were reported and many viruses shows evasion of autophagy by secreting the proteins. We initiated this study to know whether HCMV employ its miRNA's to counter cellular autophagy or not. By using various bioinformatics tools, we probed the HCMV miRNA's targets sites in the 3' UTR and 5' UTR regions of the autophagy genes. Our results show that HCMV miR- UL70-3p has potential binding sites in the 3'UTR of autophagy gene EIF2AK2, which may control fatty acid-induced autophagy. HCMV miR-US22-3p binds with 3'UTR of ATG4B which may mediates the cleavage of pro-LC3 and removes lipid conjugates from LC3 during autophagy. This study indicates that the HCMV targets autophagy by its miRNAs.

Keywords: *Human Cytomegalovirus, viral miRNA 's, Autophagy, 3' UTR.*

CULTIVATION OF MEDICINAL PLANTS AT DEGRADED LANDS OF JHANSI DISTRICT, UTTAR PRADESH, INDIA

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Bundelkhand region of Uttar Pradesh, India has very rich biodiversity specially the diversity of medicinal plants is very important. Ministry of Agriculture (2000), out of 328.7 million hectare of geographical area of India about 141 million hectares is net cultivated area, of this 57 million hectare (40%) is irrigated and remaining 85 million hectares (60%) is rain fed. In Uttar Pradesh this rain fed area is about 52%. Therefore scientists are emphasizing on upliftment of these rain fed areas and degraded land of India. In India due to high population rate there is extreme pressure on crop lands and simultaneously in recent years the demand of Indian medicinal plant species is increasing day-by-day. Therefore we have to explore the methods of implanting medicinal plants in degraded lands, most of the studies reveal that plantation of medicinal plants in degraded lands also help in reclaiming the degraded lands. In this connection a study was carried out in Jhansi district of Bundelkhand region of India. Some selected natural trees, shrubs and herbs were implanted in selected degraded lands of Jhansi district. The study resulted that *Bambusa bambos*, *Aegle marmelos*, *Azadirachata indica*, *Butea monosperma*, *Embelica*, *Punica granatum*, *Citrus medica*, *Cathranthus roseus*, *Rauwolfia serpentine*, *Calotrops procera*, *Evolvulus alsinoides*, *Solanun nigrum*, *Aloe barbedense*, *Euphorbia hirta* and *Occimum gratissimum* grew successfully and also upgraded organic matter of cultivated land.

Keywords:

Medicinal Plants, Degraded land

CULTIVATION AND PROCESSING OF LEMONGRASS AND ROSAGRASS IN BUNDELKHAND FOR ENHANCING FARMER'S INCOME

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Lemongrass is an important aromatic medicinal herb. It belongs to the family of Gramineae and genus *Cymbopogon*, which consist of more than 80 species. *Cymbopogon flexuosus* (CKP-25) is improved variety of lemongrass; the production of the essential oil from CKP-25 is higher up to 0.8%. Lemongrass is cultivated in eastern and southern part of India & also in other part like Bundelkhand due to its great demand. The monsoon span is characterized by higher oil content, while the winter and autumn by comparatively lower oil content. Maximum plant height was recorded during rainy season. The yield of oil fluctuates greatly with the season, condition of the plant material, moisture content and age of planting. Lemongrass flourishes in a wide variety of soil ranging from rich loam to poor laterite. Calcareous and water-logged soils are unsuitable for its cultivation. This study aim to evaluate the production of the lemongrass in Bundelkhand region and the composition of the oil also.

The sample were collected from Bundelkhand & used for the nursery preparation. After nursery preparation the child plants were transferred into the field. Planting were done in 100 square meter field. Plants were fertilized with nitrogen, phosphorus and potassium at a ratio of annually, 180 kg N, 80 kg P₂O₅ and 50 kg K₂O per hectare were used for plant fertilization. Isolation of lemongrass essential oil after 100 to 120 days of planting, the lemongrass herbs were harvested and sun dried for 24 hours to reduce the moisture. Then these herbs were used for the steam distillation, to isolate the essential oil. In one year total 4 harvesting was done. From these harvesting the total 400 Kg of lemon grass was collected. The lemon grass of Bundelkhand region contains total 0.77% oil.

Keywords:

Aromatic crops, Cymbopogon flexuosus, Essential oil

IN-VITRO VALIDATION AND CHARACTERIZATION OF MYCOBACTERIOPHAGE DERIVED RECOMBINANT AAA⁺ ATPASE

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Antimicrobial resistance is a global threat now, which can cost 10 million lives annually by 2050 and there is an urgent need for alternative solutions to antibiotics. In the emerging post antibiotic era, Phage Therapy is rapidly gaining attention and mandates discovery and characterization of novel bacteriophages on a continuous basis. This study describes two lytic Mycobacteriophages (phages infecting *Mycobacterium* spp.) isolated from soil samples with *M. smegmatis* (*mc²155*) as the bacterial host and characterization of an AAA⁺ ATPase protein encoded by a local mycobacteriophage. Plaques (3.6±0.3, 5.0±0.3 mm in size) obtained were clear with an expanding halo and their TEM analysis revealed Siphoviral morphotypes. From the high titer phage preparations (10¹² pfu/ml), gDNA was isolated followed by digestion with methylation-specific restriction enzymes (DpnI & DpnII), which showed non-methylated status of phage genomes. Further, cluster classifications of the phages were performed using primers for conserved region in the TMP gene and by using Phage Enzyme Tools v2.0. Phage genome exploration appears to be a promising aspect given the fact that the functions of majority of phage genes are still unknown. Here, we have attempted functional characterization of gp65, an AAA⁺ ATPase gene from Mycobacteriophage, using bioinformatics tools followed by its purification as a recombinant protein. Sequence based functional annotation predicted gp65 to have AAA⁺ and AAA_5 domain, belonging to P-loop NTPase superfamily. After purifying the protein (up to 95% homogeneity) by Ni-NTA affinity chromatography, *in vitro* microtiter assay was performed. The specific activity of ATPase was found to be 7 U/mg at 4 mM concentration of MgCl₂ when incubated at 37°C for 30 minutes. Additionally, we also observed an increase in enzyme activity in the presence of DNA in the assay, which implies its possible role in the life cycle of Mycobacteriophage might involve DNA binding. Further investigation is required to establish whether it is involved in Mg(2+)-dependent endonuclease activity or genome encapsidation process but this study successfully validates the predicted function of gp65.

Keywords:

Mycobacteriophage, genetic diversity, AAA⁺ ATPase, DNA binding

GLYCINE AS A PROTECTIVE AGENT FOR HYPOXIC CELLS FROM IRREVERSIBLE CELL INJURY

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Glycine is the simplest amino acid being involved in various biochemical processes. It has been known from earlier times that Glycine protects ischemic cell injury but the exact mechanism behind this is still not clear. Our aim is to find a suitable mechanism for this process. The main mechanisms used by other cytoprotective cells are membrane phospholipids metabolism, intracellular calcium changes or calpain activities, but Glycine do not act with any of these mechanisms. Since, compounds like Strychnine have also shown to serve as cytoprotective agents, the mechanism focused here is through involvement of Glycine receptor (GlyR). During hypoxic cell injury, pathological pores are formed in the plasma membrane with increasing size. These pores are composed of different proteins, with components of GlyR presumably playing a central role. Glycine prevents the formation of these pores by binding to the GlyR components. It has been seen that Glycine decreases proteolysis in hypoxic cells. To carry out the experimental procedure on the given statement, HEK-293 cells were grown in Dulbecco's Modified Eagle's Medium (DMEM) and artificially transfected with GlyR using pGEM-T vector to see how cell injury pattern varies in cell line having GlyR as compared to those which do not have GlyR. The membrane integrity was measured by marker compounds like Rhodamine labeled Dextran. Further, inhibition of GlyR expression by RNA interference disrupted the cytoprotective action of Glycine. These findings suggested strong evidence that glycine's cytoprotective action is mediated by GlyR receptor.

Keywords:

Cell Injury, Cytoprotective action of Glycine, RNA interference

EFFECT OF HYDROALCOHOLIC EXTRACT OF *STREBLUS ASPER* LEAVES ON NEUROBEHAVIORAL ACTIVITIES IN THE RAT MODEL

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Streblus asper is a small tree with high medicinal importance. It is found in tropical countries, such as India, Sri Lanka, Malaysia, the Philippines and Thailand. Various studies have been reported in *S. asper* viz anti-inflammatory, antioxidant, epilepsy etc. *S. asper* is rich source of cardiac glycoside, sitosterol, α -amyrin, lupeol and diol etc. *The current study deals with the evaluation of neurobehavioral activities of hydroalcoholic extract (70%) of S. asper leaves in the rat model.*

Hydroalcoholic extract of *Streblus asper* leaves was administered to animals at the dose of 200 mg/Kg *p.o.* and 400 mg/kg *p.o.*, respectively. The muscle relaxant activity, anxiolytic activity, antidementic activity and locomotors activity of extract were evaluated.

The dose of 400 mg/kg *p.o.* of extract indicated significant improvement when compared with diseased group on neurobehavioral activity, especially antidementic activity and locomotion, whereas the same dose did not show a significant effect on anxiolytic and muscle-relaxant activities. It was found that *S. asper* leaves extract will be beneficial for the treatment of neurobehavioral disorders.

Keywords:

Neurobehavioral, Antioxidant, Streblus asper, Nootropic activity, Locomotion

DIRECT SYNTHESIS OF IMINES FROM BENZYL ALCOHOLS USING GOLD NANOPARTICLES SUPPORTED MgCe-HDO COMPOSITE

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The formation of carbon-nitrogen is the significant transformations in organic chemistry. It has various applications in the organic reaction like reduction, addition, condensation, etc. Imines, also known as Schiff bases are well-known intermediates in the synthesis of pharmaceutical natural product, non-natural amino acids, medicinal compounds, and heterocyclic. The Imines formation have been reported with traditionally several methods but they have some drawbacks. The liquid phase oxidation of benzyl alcohol to benzaldehyde can be performed using an oxidizing agent, hydrogen peroxide etc. Herein, we have synthesized Gold nanoparticle supported on Mg(OH)₂ and Ceria (CeO₂) composite using Co-precipitation. Catalyst was characterized by XRD, TEM, SEM, FTIR etc. We have used MgCe-HDO-supported Au catalyst to oxidation of various benzyl alcohols using atmospheric pressure of molecular oxygen for the base-free direct imines formation. Imines were characterized by NMR, and Mass spectrometry.

Keywords:

Gold nanoparticles MgCe-HDO, Alcohol, Base-free oxidation, Imines

RECENT INITIATIVES OF UTTAR PRADESH GOVERNMENT IN PROMOTION OF AYURVEDA AND OTHER INDIAN SYSTEM OF MEDICINE

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In comparison to allopathic system of medicine, Ayurvedic treatment is more effective in most of the chronic diseases. However, the popularity of Ayurveda is rather lesser as the majority of the global population prefers modern medicine because of its ability to give fast relief from diseases as compared to Ayurvedic treatment. Some important points which are responsible for trailing the Ayurveda are as following:

- Young Ayurvedic scholars, although enthusiastic, are not clear about their views and vision on the future of Ayurveda. Moreover, they are not even very clear that how to expose their valuable research outputs on Ayurveda
- More than a thousand Ayurvedic postgraduates pass out each year and enter into the streamline of academics and practice. Among them, only a few choose their profession as researcher in Ayurveda
- Neither has the Ayurvedic teaching changed in the last 50 years nor have the textbooks enriched with new research methodologies.

These are some of the following major points those should be highly needed to consider in the Ayurvedic research for its advancement.

Active involvement of government

The government should be more focused on the timeframe roadmap for the rapid development of Ayurvedic education and research. Science-based approaches may be promoted, utilized, and inculcated in the education of Ayurveda like traditional Chinese medicine (TCM). It is most appreciable that China has about 95% of Department of Traditional Medicine in their government hospitals. That is why their traditional medicinal system got global recognition and acceptable everywhere. Recently, Tu Youyou has won Nobel Prize in Medicine for discovering Artemisinin, a drug that has significantly lowered mortality rates from malaria, based on a TCM remedy. India also has to develop similar type of policies in the healthcare system for the development of Ayurveda.

ON-CHIP BIOSENSORS BASED ON SURFACE PLASMON RESONANCE

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Over the last few decades, there had been an enormous growth in biosensors based on optical transducers. Among the reported optical biosensors, Surface Plasmon Resonance (SPR) biosensors show a number of significant advantages over other conventional biosensors. Consequently, SPR biosensors have been studied extensively since the first demonstration in 1982. Although surface plasmon resonance technologies are now widely used for biosensing, several challenges remain, e.g., improving sensitivity and limit of detection, improving selectivity in complex biological solutions, and adaptation of sensing elements for point-of-care diagnostics or other cost sensitive applications. SPR is a physical phenomenon that occurs when plane-polarized light hits a thin metal film under total internal reflection conditions. Some of the light energy is absorbed in this phenomenon with maximum absorbance being at an angle we call theta SPR. This SPR theta changes whenever the refractive index changes due to the binding of any molecule at the dielectric interfaces. This change in the angle on ligand binding is the basis of the biosensing using the SPR. Our project is to develop SPR biosensors that can be used for the rapid diagnosis of various diseases. For SPR to occur, a receptor molecule must be immobilised onto a 50nm thin gold film in a way that it can be regenerated without damaging the sensitive gold film. For this, we attempted to make a self assembled monolayer (SAM) of undecanoic acid on the gold film. A receptor molecule can be covalently linked to this SAM layer by amine coupling. SAM also enables more sensitive detection of changes in the refractive index. SPR biosensing is much faster than the conventional diagnostic technique like ELISA and also enables real-time analysis therefore can also be used for kinetic studies of molecular interactions.

Keywords:

Surface Plasmon Resonance, biosensor, self assembled monolayer, surface chemistry.

IDENTIFICATION, CHARACTERIZATION AND PARTIAL PURIFICATION OF ACID PHOSPHATASE FROM SEEDLINGS OF *MUCUNA PRURIENS* (L) DC. VAR. *UTILIS*

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Orthophosphoric monoester phosphorylase, E. C. 3.1.3.2 or acid phosphatases are enzymes that catalyze the hydrolysis of orthophosphate esters under acid conditions. Germinating seedlings of *Mucuna pruriens* was used for the purification and characterization of acid phosphatase. We observed an increased activity of acid phosphatase in the first 42 hrs. of seed germination, further than which a slight reduction was observed. The enzyme in crude extract displayed a pH optimum of 4.5–5.5 in 0.1 M sodium acetate buffer. Catalytic activity *in vitro* displayed a linear time course (90 min) and reached its half maximum value at 500 μ M *p*-nitrophenyl phosphate (*p*-NPP). The phosphatase activity in the crude extract was robustly inhibited by FeCl₂ and NaMoO₄ and did oblige Mg⁺⁺ divalent metal as stimulating agent. Unexpectedly, NaF, a strong inhibitor of animal and other plant acid phosphatases did not influence the activity of acid phosphatase extracted from *Mucuna pruriens*. Among the inorganic phosphates used in the study, KH₂PO₄ and ATP were observed as strong inhibitors of *Mucuna* acid phosphatase catalyzed hydrolysis of *p*-nitrophenyl phosphate. The enzyme was enriched using ammonium sulphate precipitation method followed by gel filtration chromatography. Application of both the techniques gave a purification of 1692.18 fold from starting material with an estimated specific activity of 2707.5 nKat mg⁻¹. Molecular weight of partially purified proteins from embryonic axis was estimated as 36 kDa using SDS-PAGE and western blotting with potato polyclonal acid phosphatase antibody.

Keywords:

Acid phosphatase, Mucuna pruriens, Seeds, Embryonic axis, cotyledons

ANTIMALARIAL DRUG DISCOVERY

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Malaria has plagued man since ancient times and now threatens approximately 40% of the world's population. Over one million people die annually due to malaria, especially young children and pregnant women of resource poor families in Africa. Malaria remains the most cause of mortality and morbidity in the developing world and is caused by *Plasmodium falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. The chemistry is the most fascinating areas to develop newer drugs for human welfare. Sincere efforts have been made in the last two decades to optimize synthetic procedure and produce diversified newer molecules for drug discovery. Artemisinin (and its derivate), extracted from herb, *Artemisia annua*, is now the only drug which cures all forms of malaria, however, recently drug resistance has been found reported, thus to eradicate malaria globally, still more research is needed.

In this light, our group has been actively working in chemistry-based approaches leading to the development of the synthetic trioxanes and tetraoxanes. These synthetic peroxides retain the Endoperoxide Bridge that gives artemisinin its potent blood-stage activity. It is well reported that their activity is a result of the peroxide bond being reduced by ferrous iron and heme, which are liberated through the digestion of hemoglobin by the parasite. This reaction produces carbon-centered radicals that cause alkylation of heme and parasite proteins, thereby leading to parasite death. Most of these synthetic compounds showed nanomolar activity *in vitro*. Encourage by these findings, we have developed a series of hybrid molecules for *in vitro* and *in vivo* studies which showed even better antimalarial activity than natural artemisinin and its semi-synthetic analogs. The research work in this direction is under progress.

Keywords:

Malaria, Tetraoxane compounds, In Vitro & In Vivo Studies

THYROID DYSFUNCTION: A METABOLIC DISORDER INDUCED BY ACUTE EXPOSURE OF HERBICIDE, ATRAZINE IN ZEBRA FISH, *DANIO RERIO*

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Thyroid disorders are the most common amongst the various glandular disorders of the endocrine system. Fluctuations in thyroid hormones cause thyroid disorders. Across the whole living world about 300 million people suffer from thyroid disorders in which 30% produced by pesticide toxicity which is the major causative environmental factor. Atrazine is a chlorotriazine herbicide used in agricultural fields primarily in the growing corn and also extensively used for sorghum and sugarcane. It is the most common chemical contaminant of ground and surface water and causes several metabolic disorders specially thyroid disorders. T₃ (tri-iodothyronine), T₄ (thyroxine) and TSH (Thyroid Stimulating Hormone) are three important metabolic hormones. T₃, T₄ are produced by thyroid gland in which T₃ is the most bioactive compound. TSH is produced by the anterior pituitary gland and controls the production of T₃, T₄ hormones. Thyroid hormones regulate particularly metabolism as well as growth and development. Therefore, the current investigation was aimed to determine the effect of Atrazine on thyroid hormone in serum profile of zebra fishes. For assessment of thyroid dysfunctions, 60 fishes were divided into 3 groups of 20 fishes each. 1st group served as control, 2nd and 3rd group were treated with 24 hrs LC₅₀ (27.797 mg/l) and 96 hrs LC₅₀ (23.878 mg/l) concentrations respectively. After 24 and 96 hrs, blood was pooled separately from each group to separate the serum. The thyroid hormones were analyzed by Chemiluminescent Immunosorbent Assay (CLIA). The results revealed that acute exposure of Atrazine elevates the level of tri-iodothyronine (T₃), thyroxine (T₄) and depletes the level of thyroid stimulating hormone (TSH) as compared to control groups. It is concluded that atrazine exposure exhibits elevation in metabolic rate hence, it should be applied very carefully to reduce the risk of metabolic disorders.

Keywords:

Atrazine, LC₅₀, thyroid disorders, zebra fish.

PATENTING OF INVENTIONS BASED ON TRADITIONAL KNOWLEDGE-INDIAN PERSPECTIVE

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Intellectual property rights (IPR) have been defined as ideas, inventions, and creative expressions based on which there is a public willingness to bestow the status of property. IPR provide certain exclusive rights to the inventors or creators of that property, in order to enable them to reap benefits from their creative efforts or reputation by commercialization. There are several types of intellectual property protection like patent, copyright, trademark, etc. Patent is recognition for an invention/research work, which satisfies the criteria of global novelty, non-obviousness, and capable industrial application. Patent plays a vital role in development of the research in the world. Every country has its own IPR policies and that support the research environment and better opportunities in commercialization of the research work and thereby protection of invention or creativity. Patentability covers the pharmaceutical products including inventions/research based on ayurvedic or herbal formulation sand excluding the traditional knowledge or aggregation of properties of traditionally known components. The research of Ayurvedic formulations with herbs for several diseases is the emerging area in pharmaceutical field in India. The patent law will boost Indian Pharmaceutical research especially in the field of Ayurvedic or herbal formulations and help the nation to emerge as a strong force in global pharmaceuticals.

Keywords:

IPR, patent, novelty, non-obviousness, capable industrial application.

BIOMARKER RESPONSES OF CADMIUM-INDUCED TOXICITY IN *CHANNA PUNCTATUS* (BLOCH): ASSESSING OXIDATIVE STRESS AND HISTOPATHOLOGICAL ALTERATIONS

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The present study highlights on the assessment of oxidative stress induced by cadmium chloride. Study has been carried out on certain biomarkers in liver of fish (*C. punctatus*). The fish specimens were exposed to different concentrations (36mg Cd/L and 72 mg Cd/L) of Cadmium. Parameters related to oxidative stress were studied at the end of the experiment. The biomarkers selected for the study were thiobarbituric acid reactive substances for assessing the extent of lipid peroxidation (LPO) and antioxidant defense system such as reduced glutathione (GSH), superoxide dismutase (SOD) catalase (CAT) and Protein activities. Changes in serum biochemistry in response to cadmium exposure significantly decreased the level of reduced glutathione, superoxide dismutase, catalase and increased the activity of lipid peroxidation in tissue of treated group as compare to control. Low & high dose concentration of cadmium, histological manifestation of liver tissue showed severely adverse changes. As a result foci of necrosis, fibrosis, pycnotic nuclei, disruptions and dilatation of sinusoids as well as hypertrophy & hyperplasia of hepatocytes were found. Oxidative and antioxidant profiles indicate that chronic exposure to the cadmium is capable of inducing oxidative stress in fish.

Keywords:

Oxidative stress, Channa punctatus, Cadmium chloride, histopathology

MICROWAVE-ASSISTED DEVELOPMENT OF PYRAZINOINDOLES VIA PICTET-SPENGLER REACTION

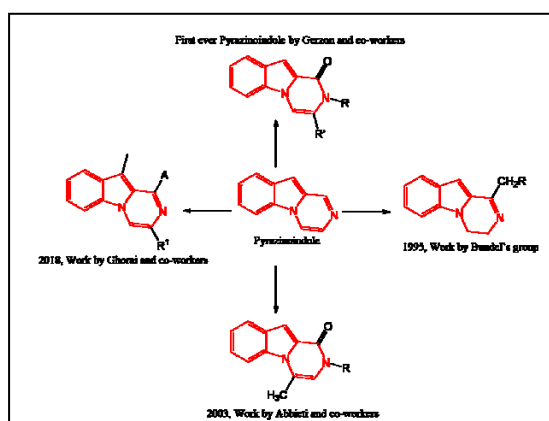
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N-heterocyclic motifs such as Noscapine (anti-cancer), Morphine (analgesic), Chelerythrine (antibacterial) etc. are found to possess wide spectrum of biological activity. One of such “N-heterocyclic” Indole derivatives is Pyrazinoindole which is known to possess various therapeutic activity as serotonin antagonist, thrombolytic, cardiovascular diseases, antidepressant, anxiolytics, central nervous system depressants, anticonvulsants, antihistaminic, protein kinase C inhibitors, and selective imidazoline I2 receptor ligands. Therefore, an efficient route is developed to access Pyrazinoindole in excellent yields starting with coupling of amino acids with Indole and 3-methyl indole followed by microwave-assisted acid catalyzed cyclisation via Pictet-Spengler reaction is accomplished. The diverse library of organic compounds was synthesized and they will be tested for antibacterial *in vitro*, *in vivo*, *in silico* studies. The interesting observations will be presented.



IN VITRO SCREENING, TLC, ANTIOXIDANT ACTIVITY, TOTAL PHENOLIC & FLAVONOID CONTENTS FROM EXTRACT OF *AEGLE MARMELOS* L (BAEL) LEAVES

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Introduction: *Aegle marmelos* L. belongs to the family Rutaceae, is also known as bael, Bengal quince, golden apple, Japanese bitter orange, stone apple or wood apple a moderate sized aromatic tree. Mainly founds in sub tropical and tropical region. The antioxidant activities of leaves are due to the presence of phenolic and flavonoid contents and act as anti-allergic, anti-inflammatory, anti-microbial, anti-thrombotic, cardioprotective, and vasodilatory agents.

Materials and Methods: The fresh leaves of *A. marmelos* were collected from Bundelkhand University campus, Jhansi. The shade dried and powdered leaves were extracted in soxhlet apparatus with 80% methanol and aqueous extraction was done by water bath. Both extract were used to detect the different phytoconstituents.

Results: In existing study we carried out a well systematic record of phytoconstituents in a quantitative manner in both methanolic and aqueous extracts of *A. marmelos*. In TLC total 5 spots were present in the methanolic extract with different Rf values (0.31, 0.59, 0.63, 0.71, 0.79). Total phenolic content was found to be 33 ± 7.62 mg GAE/g, flavonoid content was 307.8 ± 130.12 mg QE/g. Antioxidant activity was determined by Phospho-molybdenum assay in methanol extracts with different concentrations. Here antioxidant capacity showed the dose dependent activity.

Conclusions: The present study of *A. marmelos* leaves shows different secondary metabolites & their presence depends on solvents as well as methods. Presence of phenolic and flavonoids content could be responsible for antioxidant activity.

Keywords:

A. marmelos, Ascorbic acid, Antioxidant Activity, Total Phenolic content, Total Flavonoid Content

ELEMENTAL ANALYSIS AND SPECIATION OF ELEMENTS USING ICPMS AND LC-ICPMS TECHNIQUES IN AYURVEDIC AND HERBAL PRODUCTS

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Atomic spectroscopy is the technique for determining the elemental composition of an analyte by its photo radiations or mass spectrum. Several analytical techniques are available, and selecting the most appropriate one is the key to achieving accurate, reliable, real-world results.

There are three widely accepted analytical methods – atomic absorption, atomic emission and mass spectrometry – which will form the focus of our discussion; we would be focusing on atomic emission and mass spectrometry.

Inductively coupled plasma *optical emission* spectrometry (ICPOES) and Inductively coupled plasma *mass spectrometry* (ICPMS) are advanced techniques for multi-elemental analysis with the capability of detecting in ppb and ppt levels. These are widely used in various pharma & food manufacturing units, environmental testing labs, research institutes, petrochemical, nanomaterials etc. to address the multiple applications.

Now the days elemental analysis is not limited to elements only, analyzing the oxidation states like Cr⁺³ & Cr⁺⁶, hazardous compounds of that parent element and nanoparticles of that specific element is also possible by using ICP-MS when it is coupled with any chromatography techniques.

Following mentioned areas would be covered:

- Understanding the elemental analysis decision making matrix (ICPMS)
- Basic principle of ICPMS and overview of instrumentation
- Application horizon of ICPMS in Herbal, Drug and Medical sciences.
- Speciation techniques and it's use in herbal drugs.

DYNAMIC PROTEIN LANDSCAPE DURING INITIATION OF HUMAN TH17 CELL DIFFERENTIATION

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Introduction: Th17 cells play key role in the pathogenesis of inflammatory and autoimmune diseases. Hence, it is critical to characterize proteins involved in the development and differentiation of Th17 cells.

Methods: We performed a label-free mass spectrometry-based proteomics to identify the dynamic expression of proteins regulated during human Th17 cell differentiation. To determine the degree of correlation in the transcript and the protein levels, we executed a comprehensive analysis of the transcript-protein in Th17 cells at similar time points.

Results: The results from our analysis revealed a high degree of overlap between the transcriptome and proteome datasets. Interestingly, the comparison of the proteins differentially regulated in response to Th17 differentiation in human and with a published mouse Th17 differentiation dataset showed a limited overlap. At 72h post Th17 polarization, of the 758 and 397 Th17 differentially regulated proteins in human and in mouse, respectively, only 51 were detected as differentially regulated in both species. A panel of selected proteins with known and unknown functions were validated. Lastly, using RNA interference (RNAi), we revealed SATB1 as negative regulator of human Th17 cell differentiation.

Conclusion: To conclude, our study provided a first comprehensive picture of the global protein landscape during early human Th17 cell differentiation. Importantly, poor overlap with recently reported mouse Th17 data highlights the significance of human studies for translational research.

INHIBITORY EFFECT OF *LACTOBACILLUS CASEI* AND *BIFIDOBACTERIUM BIFIDUM* ON SMALL INTESTINAL ALPHA GLUCOSIDASE ACTIVITY

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Background: *Lactobacillus* and *Bifidobacterium* are generally reported as major gut microflora and used as probiotics, having beneficial activity such as antidiabetic, antimutagenic, anti-inflammatory immunomodulatory and antiobesity. Diabetes is continuously increasing growing metabolic disorder characterized by insulin resistance, dyslipidemia, glucose intolerance and increase level of PPG and FBG. Postprandial blood glucose level may be control by delay the absorption of intestinal carbohydrates by decrease the activity of alpha glucosidase. α - glucosidase is a key gut enzyme involved in breakdown of complex polysaccharides to monosaccharides in gut. There are many antidiabetic drugs which inhibit α - glucosidase activity but these drugs have various side effects so in this study we want to explore the role of these two selected probiotic strains in improvement of glucose tolerance by reduced the activity of α - glucosidase enzyme.

Method: Diabetes in rats was induced by an intraperitoneal injection of streptozotocin (45mg/kg). Rats were divided randomly into six groups and treated with acarbose (10mg/kg) or *Lactobacillus casei*, *Bifidobacterium bifidum* alone and combination of both (1×10^7) CFU/ml, orally by gavaging for four weeks. The change in fasting blood glucose (FBG) and postprandial blood glucose (PPG), HbA1c, lipid profile and intestinal α - glucosidase activity were investigated.

Result: Diabetic rats showed, hyperglycemia and dyslipidemia condition. Oral administration of *L.casei* and *B.bifidum* alone and combination decrease blood FBG, PPG, total cholesterol, triglycerides, low density lipoprotein, α - glucosidase activity and increase high density lipoproteins.

Conclusion: These result suggested that selected probiotic strains reduce the activity of alpha glucosidase might contribute to delay in carbohydrates digestion and simultaneously lowering blood glucose level and cure diabetes.

Key words:

Lactobacillus casei, *Bifidobacterium bifidum*, *Alpha glucosidase*, *Diabetes*

PHENOLICS FROM PIPER BETEL LEAF MAY REGULATE HYPERTHYROIDISM IN RATS THROUGH INHIBITION OF THYROTROPIN RECEPTORS

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Hyperthyroidism is a clinical syndrome that commonly results from excess secretion and/or release of thyroid hormones in the circulation. We have now explored the possible role of two major phenolic compounds, chavibetol and allylpyro catechol, isolated from *Piper betel* leaves in the regulation of L- thyroxine (L-T₄)-induced hyperthyroidism in rats and to work out the possible involvement of thyrotropin receptors(TSHR) in their mode of action. Either chavibetol or allylpyro catechol (20 and 2 mg/kg, respectively) was administered to L-T₄-induced hyperthyroid rats for four weeks and their effects were evaluated on the alterations in levels of thyroid hormones, on the activities of 5'-deiodinase I (5'DI), alanine amino transferase (ALT), aspartate amino transferase (AST), and inflammatory markers; hepatic lipid peroxidation as well as in antioxidants. Hyperthyroidism was confirmed by higher levels of thyroid hormones and low thyrotropin (TSH) in serum. Increased hepatic activity of 5'-D1, serum concentrations of ALT,AST , lactate dehydrogenase (LDH), tumour necrosis factor alpha (TNF- α) and TSHR expressions were observed in T₄-induced rats. However, administration of the test compounds decreased the levels of serum thyroid hormones, ALT, AST, and TNF- α and LDH, as well as hepatic 5' D1 activity. The expression of TSHR was also significantly decreased and thyroid histology was improved suggesting the potential of test compounds to ameliorate hyperthyroidism.

Keywords:

Chavibetol, Allylpyrocatechol, hyperthyroidism, antioxidants ,thyrotropin receptors

INVESTIGATION(S) ON THE ROLE OF HCMV miRNAs ON HUMAN ANTIVIRAL MECHANISMS SUCH AS APOPTOSIS AND AUTOPHAGY

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Human cytomegalovirus (HCMV) is a ubiquitous human pathogen exhibiting more than 70% sero positivity in adult populations around the globe. Though it doesn't cause any disease in immunocompetent individuals, cause significant morbidity and mortality in immune naïve and immunocompromised individuals. HCMV like other Herpes viruses, exhibits long latent periods in their human hosts and exhibits several immune evasive strategies for its survival in the human body. It is co-evolved with its human host and reported to downregulate the human antiviral mechanisms such as Apoptosis and Autophagy. Apoptosis is an innate antiviral mechanism present in humans, HCMV reported to subvert this mechanism through its protein machinery. Through *in silico* studies, we reported the antiapoptotic role of HCMV miRNAs. HCMV encodes 26 mature miRNAs from both the UL and US region of its genome and the miRs UL70-3p and UL-148D found to exhibit anti-apoptotic and anti-autophagic activity. The antiapoptotic activity of these miRs were evaluated in *in vitro* by using the HEK293T cells. The results show that both the miR's downregulate the H₂O₂ induced apoptosis by targeting the proapoptotic gene, Modulator of Apoptosis-1 (MOAP-1), as evaluated through Flow cytometry. Further, the MOAP1 mRNA down regulation by these miRs were analyzed through qRT-PCR independently and jointly and observed both the miRs downregulates the MOAP1 mRNA independently, and the extent of downregulation was augmented when they jointly expressed in the cells. The dual luciferase assays with these miRNA mimics and the MOAP1 UTR region reveal that both the miRNAs target different sites in the UTR region. This is in accordance with our *in silico* studies, and the show that 2miRNAs target a single mRNA. The results of this study reveal that HCMV miRNAs target the cellular mRNAs involved in apoptosis and autophagy, and helps the viral proteins in subverting the antiviral mechanisms for the survival of virus in the human hosts.

Keywords: *Apoptosis, Human cytomegalovirus, miRNAs, MOAP1*

AIR POLLUTION AND ITS IMPACT ON HEALTH

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Air pollution is a major environmental health threat and it's a mixture of particles and gases that can reach harmful concentrations both outside and indoors. According to the World Health Organization (WHO), 9 of the world's 10 most polluted cities are from India (Kanpur, Faridabad, Gaya, Varanasi, Patna, Delhi, Lucknow, Agra, and Gurgaon). Among which Kanpur is the most polluted city. (PM 2.5 - 173 mg/mm). Around 42 lakh people died due to ambient air and 38 lakh people due to cooked and polluted fuels. There are about 12.4 lakh deaths every year due to air pollution in India. Air pollution causes problems for asthma, COPD, Bronchitis, Pneumonia, greater risk of blood pressure, cancer, mental retardation, anxiety, hair loss, infertility, miscarriage, deplete ozone layer, decreases fertility of the land. The amount of sunlight decreases due to air pollution which affects the function of photosynthesis of plants. The decreasing forest cover also adds to this impact of air pollution. 50% forest cover has been destroyed in the last 50 year. Around 3 billion people still use solid fuels such as coal, wood etc. for cooking and heating in open fires and leaky stoves contributing to pollution in rural areas. The two main sources of outdoor pollution are transportation and industry pollutants. In order to prevent air pollution, Government of India made Pollution Prevention and Control -Act, 1981. Restrictions on deforestation of forests and plantation of more and more plants, minimize urbanization process, use of high technology by establishing factories from urban areas, minimum use of vehicles and promotion of CNG vehicles, promoting solar energy technology, promoting LPG Gas in the Rural areas, are same activities which can minimize air pollution. The Prime Minister Narendra Modi's Ujjwala scheme, which gives LPG connections at affordable rates to the women living below the poverty line, launched on 1st May 2016 from Balia in Uttar Pradesh. The scheme is aimed at replacing the unclean cooking fuels mostly used in the rural India with the clean and more efficient LPG (Liquefied Petroleum Gas). Prime Minister Modi's "GIVE IT UP" campaign, in which the 8 crore families of India left LPG subsidy, due to which many poor families got the benefit. The Ministry of Environment, Forest and Climate change has started the National Environment Health Profile Study, which is a multisite study involving 20 cities of the country to assess health associated with environment exposure, Kanpur is one of them. The National Clean Air Programme (NCAP) has also been launched which is a time bound (five-year action plan) national strategy for pan India implementation to tackle the increasing air pollution problem in the country (102 cities) and the tentative national level target of 20%–30% reduction of PM_{2.5} and PM₁₀ concentration by 2024.

ANTIOXIDANTS IN GREEN TEA EXTRACT AND ITS AMELIORATING EFFECTS ON CYPERMETHRIN TOXICITY IN FRESH WATER FISHES *HETEROPNEUSTES FOSSILIS*

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Ayurveda is the ancient therapy in India, largely based on Natural Products. India has immense medicinal plant diversity having vast variety of flora, among them green tea is one of the most popular beverage containing polyphenols and caffeine which are of considerable pharmacological significance. Green tea extract (GTE) contains several poly phenolic compounds with antioxidants properties. The protective effect of green tea has been attributed to a wide variety of mechanism by modulating enzyme activities resulting inhibitory effect of pesticides and drugs. The objective of this study was to determine antioxidant activity in green tea extract and its protective effect on pesticide toxicity. Antioxidant activity in GTE was determined by phosphomolybdate assay method and obtained value of antioxidant in GTE was 12.43 mg/g. To observe the effect of green tea extract (GTE) during acute exposure of cypermethrin at LC₅₀ concentrations which have been previously estimated, fishes were divided into 4 groups of 10 fishes each. 1st group served as control, 2nd, 3rd and 4th groups were treated separately with cypermethrin alone (LC₅₀), GTE alone (0.5ml/l) and cypermethrin + GTE respectively for 24, 48, 72 and 96hr exposure periods. After completion of experiment blood and liver tissues were collected to estimate glucose and glycogen content respectively. The increased level of glucose in serum and decreased glycogen content in liver tissue were observed after all exposure periods. Green tea combats toxicity by altering the glucose metabolism as result glucose and glycogen level became normalise.

Keywords:

Green tea, Antioxidants, Cypermethrin, Hetero pneustes fossilis, LC₅₀, Glucose, Glycogen

**FORMULATION AND *IN-VITRO* & *EX – VIVO* EVALUATION
OF MICROSPHERES CONTAINING ANTI-CANCER
DRUG IMATINIB MESYLATE USING SODIUM ALGINATE
BY CHEMICAL CROSS LINKING METHOD**

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The aim of the present work was to prepare microspheres containing an Anti-cancer drug Imatinib mesylate to reduce the frequency of dosing, drug side effects and to prolong the gastric residence time. The Imatinib mesylate is used for treatment of Chronic Myeloid Leukemia (CML) and Gastrointestinal Stromal Tumors (GISTs). Imatinib mesylate loaded microspheres were prepared by using Sodium Alginate polymer by Chemical cross linking method. The nine formulations (F1- F9) were prepared to study the effect of concentration of polymer ratio on the microspheres properties like percentage of drug loading, biodegradability, drug release kinetics, particle size, encapsulation efficiency, angle of repose, bulk density by using SEM, DSC and XRD during the study.

Keywords:

Sodium Alginate, Imatinib Mesylate, microsphere, chemical cross linking, release kinetics.

**PHARMACEUTICAL POTENTIAL OF *MORINGA OLEIFERA*
LEAF EXTRACT IN IMIDACLOPRID INDUCED
HYPERGLYCEMIA AND HYPERCHOLESTEROLEMIA
IN ZEBRA FISH, *DANIO RERIO***

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Moringa oleifera is multipurpose, medicinal plant commonly known as “Miracle tree” or “the tree of life”. It is the member of family Moringaceae of perennial angiosperm plants. Leaves of *Moringa oleifera* are rich in minerals, amino acids, antioxidants such as caffeoylquinic acid, chlorogenic acid, rhamnetin, apigenin, β - carotene, flavonoid glycosides. Dietary consumption of *Moringa oleifera* leaf promotes as a strategy of personal health preservation and self medication in several serious diseases such as cancer, diabetes, hepatorenal and cardiovascular diseases. Moringa leaf extract (MLE) has a hypoglycemic and hypocholesterolemic action to prevent toxicant induced hyperglycemia and hypercholesterolemia. The current study was designed to investigate the pharmaceutical potential of aqueous extract of *Moringa oleifera* leaf against Imidacloprid (IMC) induced toxicity in zebra fishes after chronic exposure. For this investigation, healthy fishes were randomly selected and divided into four groups of 16 fishes each. Group I served as control, Group- II received effective concentration (EC) of MLE (10 ml/l), group III exposed with $1/10^{\text{th}}$ of 96 hrs. LC₅₀ (0.270 ml/l) of IMC and Group-IV received both ($1/10^{\text{th}}$ of 96hrs LC₅₀ of IMC + EC of MLE) for 15 days. Experiments were also carried out after 30 and 45 days exposure periods by same protocol. At the end of experimental periods, blood was pooled from each group separately, centrifuged to separate the serum for the assessment of blood glucose and total cholesterol by auto analyzer. The results revealed that the blood glucose and cholesterol level were increased in IMC induced fishes whereas the co-administration of MLE restored the impact of IMC showing the reduction of elevated blood glucose and total cholesterol level after 15, 30 and 45days exposure periods. These findings suggest that MLE has anti-hyperglycemic and anti- hypercholesterolemic potential due to powerful antioxidant activities.

Keywords:

MLE, IMC, hyperglycemia, hypercholesterolemia, zebra fish

AUGMENTING THE FARMER'S INCOME IN BUNDELKHAND REGION THROUGH CULTIVATION OF AROMATIC CROPS

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In past two decades, the Bundelkhand region has passed through successive drought spells and crop failures has caused despair among the farmer and ultimately search for alternate livelihood options. Aromatic crops (Lemongrass, Palmarosa and Vetiver) which have shown a high degree of tolerance to drought and salt stress were thought of as alternate to traditionally grown crops in this region. On sight demonstrations on farmers field were carried out to demonstrate and compare the returns obtained from aromatic crops (Lemongrass) and conventionally grown crops viz. Wheat, Gram, Lentil and Mustered etc. It was observed that return per acre/year from Lemongrass crops (Rs.35,000) were significantly higher than above mentioned conventional crops (Rs.25,000). Besides the additional mention gains, rural employment worth Rs. 15.00 lakhs were also generated with simultaneous availability of quality raw material i.e. essential oils to the perfumery and pharmaceutical industries. The distillation spent of lemongrass was also used for making vermicompost and it is value of worth Rs.5.00 lakhs was produced. This presentation will cover, present crops verses aromatic crops and their economics, employment generated in rural areas and utilization drought affected land for production of essential oils and spent materials in to value added products.

Keywords:

Bundelkhand region, Aromatic Plants, Essential oil, Distillation, Employment Generation

HEAVY METALS AS POTENTIAL RISK FACTORS FOR AMYOTROPHIC LATERAL SCLEROSIS

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Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disorder characterized by progressive loss of motor neurons. Cytoplasmic aggregates composed of TAR DNA binding protein (TDP-43) is the hallmark pathology of ALS. The majority (~90%) of the ALS cases are sporadic strongly suggesting a role for environmental factors including exposure to heavy metals in the etiology of the disease.

Epidemiological studies have suggested the association of heavy metals with increased risk of ALS, but the underlying molecular mechanism is not known. Moreover, it is challenging to screen large number of environmental compounds for their potential to cause neurodegenerative changes using traditional *in vivo* methods. In this study, we screened putative neurotoxins for their ability to induce aggregation of TDP-43 in stably transfected rat PC12 cells. We observed that exposure to four of these toxicants, lead (II) acetate trihydrate, methyl mercuric (II) chloride, bis (tributyl-tin) oxide, and colchicine, triggered the aggregation of TDP-43 into nuclear granules. Lead and methyl mercury also induced formation of nuclear TDP-43 inclusions in primary neurons. These toxins also disrupted RNA metabolic activities of TDP-43 which has been shown to be deleterious to neurons. These important findings suggest novel evidence of a direct mechanistic link between heavy metals and molecular changes in TDP-43 that occur in ALS.

ANIMAL MODELS OF TUBERCULOSIS

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Tuberculosis (TB) remains a leading cause of death globally among infectious diseases that has killed more number of people than any other infectious diseases. It was Robert Koch who recognized the spectrum of pathology of tuberculosis (TB) in different animal species. The examination of clinical specimens from infected humans and animals confirmed the variable patterns of pathological reactions in different animal species. Guinea pigs are innately susceptible while humans, mice and rabbits show different level of resistance depending upon their genotype. The studies of TB in laboratory animals like mice, rabbits and guinea pigs have significantly increased the understanding of the etiology, virulence, and pathogenesis of the disease. By introducing less than five virulence organisms into guinea pigs by the respiratory route can produce lung lesions, bacteremia and fatal diseases, which has helped the extrapolation of results of such experiments to humans beings. The similarities in the course of course of clinical infection between guinea pigs and humans allow us to model different models of TB and to evaluate the protective efficacy of candidate in such systems. The only limitation of this model is a dearth of immunological reagents required for the qualitative and quantitative evaluation of the immune responses, special reference to cytokines and cell phenotypes. Further limitation is the higher cost of the guinea pigs as compared with the mice. The rabbit is relatively resistant to M TB infection, however following infection with virulent *Mycobacterium bovis*, the rabbit produces pulmonary cavities like humans. The rabbit model, however, is also limited by the lack of immunological reagents. Mice are the animal choice of studying the immunology of Mycobacterial infections and contributed much to our current understanding of the roles of various immunological mechanisms of resistance. The resistance of mice to the development of classic TB disease, however, represents a significant disadvantage to the mouse model. Although non-human primates are closely related to humans, owing to high cost and handling difficulties they have not been exploited to a large extent. As all existing animal models fall to mimic the human disease perfectly, efforts should be focused on the development of the non-human primate (s) as the alternative animal model for TB.