

**Comparative studies of *in vitro* and *in vivo* grown *Abutilon indicum* for Quercetin content by Preliminary Phytochemical Screening and HPLC**

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**ABSTRACT**

Medicinal plants are the most important source of life saving drugs for the majority of the world's population. Phytochemicals are naturally occurring biologically active chemical compounds in plants. Herbs are rich source of flavonoids. Flavonoids are polyphenolic compounds that are ubiquitous in nature and are categorized according to their chemical structure into flavones, isoflavones & flavon-3-ol and anthocyanidins. They have aroused considerable interest because of their potential beneficial effect on human health like – antidiabetic, anticancer, antiviral, anti allergic, antioxidant, anti-inflammatory, antitumor, anti carcinogenic and anti ageing properties. Biotechnological tools like *In vitro* culture techniques in association with phytochemical analysis will immensely help to select, multiply, improve and analyze medicinal plants & their secondary products. *Abutilon indicum* (Malvaceae) an important medicinal plant distributed throughout of tropical and subtropical areas and zones has been used for various disorders in traditional and folk medicine. It contains many secondary metabolites including flavonoids like Quercetin, one of the most abundant natural flavonoids present in medicinal plants. In the present study, a preliminary phytochemical analysis for the production of bioactive compounds from *in vitro* grown leaf derived callus of *Abutilon* was carried out. The phytochemicals produced *in vitro* were compared with that of the wild plant. Phytochemical extract obtained at optimum conditions was then analyzed by High Performance Liquid chromatography (HPLC) for quantifying bioactive flavonoid compounds. A simplified method for the detection of flavonoids was also developed using Reversed-Phase HPLC. Concentration of Quercetin in *Abutilon* leaves was calculated based on calibration curve.

Phytodrugs/2014/02

**Phytochemical analysis and molecular docking studies on red onion scales derived quercetin a prospective anti-cancer drug candidate**

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**ABSTRACT**

Recent research suggests that the outer skins of red onion scales contain bioactive flavonoids of which quercetin is important due to its antioxidant, immuno-modulatory and anticancer properties. It is well known that oxidative stress initiates different pathological conditions, including cancer. Since antioxidants are capable of preventing oxidative damage, wide use of naturally derived antioxidants like quercetin, has received greater attention as a potential anti-carcinogen. Our study was aimed at phytochemical analysis, Molecular Docking of quercetin, extracted from red onion outer scales with methanol using Soxhlet apparatus. The R<sub>f</sub> value of quercetin was analysed by Thin Layer Chromatography and the extract was quantified using aluminium chloride total flavonoid colorimetric assay. Quantitative studies on quercetin were carried out using High Performance Liquid Chromatography at 350nm. Proton NMR studies was carried out to understand the number of Hydrogens present using NMR 400MHz(Bruker) and further the derivatives of Quercetin were employed in Docking studies. Lipinski rule of 5 of quercetin was evaluated using Insilico approach. Structurally derived quercetin was docked with selected cancerous proteins present in most commonly occurring cancers of Indian population to elucidate the binding affinity and its suitability as a potential drug candidate using Argus lab 4.0 and Autodock 4.0. The interactions were evaluated using Accerlys DS Visualizer 3.0.

## Effect of *Punica granatum* peel and *Vitis vinifera* seeds on Biochemical Indices in DEN induced hepatocellular carcinoma in Rats.

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### ABSTRACT

Plants have been the source of traditional medicines for many diseases known to mankind. Many materials which are considered as waste products from plants are reservoir of phytochemicals possessing important biological activities. In the current study the hepatoprotective potential of *Punica granatum* peel and *Vitis vinifera* seeds were evaluated in rats against diethylnitrosamine (DEN) induced hepatocellular carcinoma. Rats were divided into four groups. The first group served as normal control group, the second group received DEN at a dose of 200 mg/kg body weight by Single intraperitoneal administration. The third one received DEN as in DEN-treated group and co-treated with 400 mg/kg *Punica granatum* peel extract (EPGP). The final group also received DEN and co-treated with 400 mg/kg *Vitis vinifera* seeds extract (EVVS). DEN administration to rats resulted in significantly elevated levels of serum AFP, bilirubin, triglycerides, cholesterol and urea. The levels of plasma total protein, albumin and blood glucose were significantly decreased in DEN treated rats. No significant changes were noted in creatinine levels of DEN induced rats. Co-treatment with the *Punica granatum* peel and *Vitis vinifera* seed extracts orally for 12 weeks significantly reversed the DEN induced alterations of above mentioned parameters in the serum. The present study indicates that both the selected extracts exhibits good hepatoprotectivity against diethylnitrosamine induced hepatocellular damage in rats.

Phytodrugs/2014/04

## Phytochemical screening of bioactive compounds of *Artemisia nilagirica* (clarke) pamp

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### ABSTRACT

Among the natural sources of medicinal and aromatic plants in India, the genus *Artemisia* comprises of 400 species and they found to be abundant in South Africa and South America. Around 35 species are found in India which are of high therapeutic value and are used in traditional medicine. *Artemisia nilagirica* (clarke) pamp is an aromatic herbaceous perennial plant belongs to Asteraceae family used herb in Indian traditional medicinal for the treatment of various ailments. In the present investigation, the various parts (Leaves, stem, flower and root) of *Artemisia nilagirica* (Clarke) Pamp plant was segregated, dried, powdered and stored for further investigation. In the present study, a known amount of powdered leaf and flower sample were subjected for qualitative screening of bioactive constituents by standard methods, using four different solvents (Hexane, Ethyl acetate, Methanol and Water). Around 16 phytochemical analyses were carried out to identify their presence in leaf and flower samples. On comparative study, methanol recorded the highest number of phytochemical constituents in both leaf and flower sample. From the above results, Leaf showed positive results for tannins, flavonoid, saponins, alkaloids, coumarins, phenols and steroids. Flower showed positive results for tannins, flavonoids, saponins, terpenoids, alkaloids, coumarins and phenols.

## Callus and cell suspension culture for optimization of anticancer secondary metabolite production from periwinkle (*Catharanthus roseus* L.) using Response Surface Methodology

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### ABSTRACT

The periwinkle (*Catharanthus roseus* L.) occupies a special place as herbal medicine due to its number of activity against wide range of diseases which is attributed to more than 130 types of secondary metabolites produced by this plant. Vincristine and vinblastine produced by this plant have been demonstrated for their anti-cancerous activity. These compounds are very high priced but are produced in trace amounts by the plants. The present investigation is focusing on isolation and characterization of *C. roseus* callus and suspension culture for improved production of these alkaloids. A response surface methodology (RSM) has been applied using Plackett-Burman and Box-Behnken experimental design for optimization of various factors for induction and multiplication of callus from leaf tissues and for the establishment of cell suspension culture. Eight different factors such as medium strength, concentrations of sucrose, plant growth regulators (2,4-D, NAA, and KIN), medium pH, culture illuminations, nitrogen source have been subjected to Plackett-Burman design for optimization and the results with the significant factors influencing callus production are further analyzed through Box-Behnken experimental design to study their interactions. A model of these interactions has been developed using RSM for optimization of the callus development process. The model was validated for five significant factors viz. 2,4-D, NAA, KIN, pH and sucrose concentrations for callus production from leaf tissues and applied production of cell suspension culture under shake-flask condition. Productions of several of the *C. roseus* secondary metabolites have been identified by TLC procedure. Efforts are in progress for improved production of anticancer vincristine and vinblastin indole alkaloid in cell suspension culture system following similar approaches of RSM in shake-flask condition. The model developed during the study would be helpful for designing a pilot scale commercial production of these anticancer secondary metabolites.

Phytodrugs/2014/06

## Extraction of phytochemicals and synthesis of silver nanoparticles from selected herbal plants and its application against bacterial and fungal species causing urinary tract infection

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### ABSTRACT

Plants and its extracts are used as medicines by a majority of people around the world and many of the modern drugs are produced from traditional medicinal plants. Studying medicinal plants helps to recognize it is toxic towards pathogens and protect human and animals from infectious disease. In the present investigation, we have done the aqueous and solvent extraction from *Bassia longifolia*, *Nerium indicum*, *Aristolochia bracteata*, *Propolis juliflora* and its allowed to synthesis of silver nanoparticles and they were evaluated for their *in vitro* antimicrobial activity against selected bacterial and fungal species causing urinary tract infection. The antimicrobial activity of different extracts and silver nanoparticles were tested against *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Staphylococcus aureus*, *Aspergillus niger* and *Candida albicans*. The solvent and crude extract and silver nanoparticles of *Bassia longifolia*, *Propolis juliflora* exhibited considerable activity against *Bacillus subtilis*, *Proteus mirabilis*, *Aspergillus niger* and *Candida albicans*. The active antimicrobial compounds found to be alkaloids, flavonoids, saponins and tannins by phytochemical screening and FTIR analysis. Hence these plants can be used to extract the bioactive compounds that may provide as lead in the formulation of new pharmaceuticals drugs.

## **Insecticidal activity of *Justicia tranquebariensis* plant extracts against *Helicoverpa armigera***

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### **ABSTRACT**

*Justicia tranquebariensis* belongs to the family Acanthaceae and it is widely used in folk medicine for the treatment of respiratory, gastrointestinal diseases, anti-inflammatory, anticancer and plays a vital role in insect antifeedant activities, food digestive properties. The bioactive compounds present in leaf extracts of *Justicia tranquebariensis* were identified by using GC-MS study. The leaf components obtained from ethanol, methanol, chloroform and water extracts are dissolved in acetone and it were separately tested at 1000 ppm continuously for 24, 48 and 72 hours on larval stage of *Helicoverpa armigera*. Larval mortality was observed when the insects were fed with different concentrations of *Justicia tranquebariensis* leaf extracts implying death due to toxic nature of the plant.

Phytodrugs/2014/08

## **Virtual screening and shape based docking studies of phytochemicals as metabotropic glutamate receptor ligands- towards the development of anti-epileptic drug**

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### **ABSTRACT**

Epilepsy is a long-term neurological disorder characterized by seizures. The excitatory metabotropic glutamate receptors mGluR1 and mGluR5 contribute to neurotoxicity and hyperexcitability during epileptogenesis. Out of two, mGluR5 is an interesting target due to its anxiolytic, antidepressant and anti-addictive effects. Researchers suggest that mGluR5 antagonists can be used in treating epilepsy. To date, none of the current approved anti-epileptic drugs functions by inhibiting this receptor. Our aim is to find a suitable phytochemical that can act as competitive inhibitor against this target. The interaction of phytochemicals and anti-epileptic drugs with mGluR5 was studied. A dataset of more than 100 ligands consisting of approved anti-epileptic drugs and the small molecules from the plants that are being used traditionally for treating epilepsy. A shape based docking protocol Ligandfit was applied to predict the ligand conformations and their relative orientations with the glutamate binding active site of the target. The phytochemicals showed favorable bonded and non-bonded interactions with satisfactory docking scores. The binding affinity of the ligands based on the candidate ligand pose geometry docked into a target receptor structure was estimated with six well-known scoring functions. A Consensus scoring was performed to identify the phytochemicals that score high in more than one scoring function. The higher rank hits were also predicted for its efficiency to cross the Blood Brain Barrier. This paper suggests that the hits can be used as competitive antagonists against this receptor and can find their place in the treatment of epilepsy.

## Computational analysis of *Emmenagogues* with a human nuclear receptor for its futuristic application in polycystic ovarian syndrome treatment

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### ABSTRACT

Emmenagogues are plants which stimulate blood flow in the pelvic area and uterus. In recent years Polycystic Ovarian Syndrome (PCOS) has become the most common endocrine disorder among the women of reproductive age which is due to insulin resistance and obesity. Metformin, an anti-hyperglycemic drug which is currently prescribed for PCOS is found to interact with Peroxisome proliferator-activated receptor gamma (PPAR $\gamma$ ) receptor present in the ovarian granulosa cells and attenuate insulin resistance. The interaction of emmenagogues with this receptor target has not been investigated yet. Our idea is to make use of computational docking approaches to study the interaction and binding pattern of emmenagogues with this receptor in comparison to metformin. For this purpose, a dataset of emmenagogues was retrieved from the standard database. A generic evolutionary based algorithm was followed to compute ligand conformations and orientations relative to the active site of this target. This work resulted in the identification of a particular emmenagogue showing favorable bonded and non-bonded interactions on par with metformin. The molecular properties have been studied and found to be satisfactory. A structure based pharmacophore model has also been proposed based on the common interacting features that will further help in the screening of database to identify the PPAR $\gamma$ . This paper suggests that this compound can be used in the PCOS therapy based on its pharmacological interactions with the receptor to which the metformin is bound.

Phytodrugs/2014/10

## Molecular Interaction Study of the Compounds from *Ballota nigra* with a Modeled EML4-ALK Protein against Non-Small Cell Lung Cancer

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### ABSTRACT

The *echinoderm microtubule associated protein-like 4 (EML4)-anaplastic lymphoma kinase (ALK)* fusion gene has been discovered in ~7% of Non-Small Cell Lung Cancers (NSCLC) Patients. This abnormal gene fusion leads to the malignant growth of Lung cancer cells and by targeting the ALK of (EML4-ALK fusion) with plant inhibitors has shown promising efficacy for treatment of lung cancer through the stimulation of apoptosis. For many centuries, medicinal plant has been used as remedies to treat human diseases due to its therapeutic values. *Ballota nigra* (black horehound) of the family Lamiaceae is traditionally used as a medicinal herb. The main goal of the present study is to find the natural compound that shows high binding affinity to the drug target of the non-small cell lung cancers. Due to the lack of structural information about EML4-ALK has prompted for homology modeling of the protein and binding sites were predicted. Therefore, Flexible docking study of the 18 compounds from *Ballota nigra* describes the molecular interaction with the protein. Of the docked compounds, three compounds showed better interaction of < -10 kcal/mol with EML4-ALK. Compounds exhibit a number of hydrogen-bond-accepting or donating groups which shows wide-ranging interactions with the protein. Therefore, the three compounds were found to interact with Polar and hydrophobic amino acids of the protein. Further, the compounds shows drug like properties and found to be non toxic, non mutagenic. This result paved the way for *in vitro* and *in vivo* analysis in the further step of drug designing.

## Ethanol production from spoiled fruits by batch fermentation

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### ABSTRACT

The increasing of energy demand for public transport and a rise of oil prices lead to intense of using green fuel for sustainable future. India is the second major producer of fruit and vegetables. The biochemical characteristics of the mixed fruits and vegetables, such as moisture content, protein, carbohydrate and ash content were analyzed by standard methods. *Acetobacter aceti*, *Clostridium butyrium*, *Bacillus sp* and *Micrococcus* are isolated from Apple, Mango, Grape, Orange, Banana and Papaya. From the different isolated yeast strains, the percentage yield of ethanol was investigated through optimized design method. The substrate concentration, different nutrient supplements, pH, temperature, time are optimized for the ethanol production is analyzed through the Box Behnken Design. With the optimized substrate, the isolated yeast strains were carried out in the fermentation process to attain the better yield in batch reactor. The maximum amount of bioethonal production was analyzed by using HPLC method.

Phytodrugs/2014/12

## Identification and isolation of $\alpha$ - amylase inhibitors from leaves of *Lycopersicon lycopersicum*

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### ABSTRACT

Prevalence of diabetes is increasing in pandemic proportions, particularly in developing countries like India. Much oral therapeutics is available for the treatment of this carbohydrate metabolism disorder. One approach involves blocking of the carbohydrate hydrolyzing enzymes in the digestive tract thereby reducing the post prandial hyperglycaemic condition. This is done by retarding and reducing the digestion and absorption of glucose through the inhibition of  $\alpha$ - glucosidase and  $\alpha$  – amylase in the digestive tract. The prominent side effects of synthetic  $\alpha$ - amylase drugs have driven for seeking alternative therapies with less severe or no side effects. Flavonol glycoside and flavanones are found to have those structural features to inhibit Human alpha amylase. The most common example of Flavonol glycoside is rutin. Rutin rich, easily available, native plant *Lycopersicon lycopersicum* was chosen for *invitro* studies. Before isolating rutin related compounds from total flavonoids in EELL the extraction conditions were optimised using L9 orthogonal array. The optimum conditions for extraction of flavonoids from EELL are ethanol concentration of 99.99%, solid liquid ratio of 1:100 g/mL and extraction time of 150 minutes. Rutin related compounds were directly scraped from PTLC plate Finally the  $\alpha$ -amylase inhibition activity of rutin related compounds isolated from ethanolic extract of *Lycopersicon lycopersicum* (EELL) leaves was evaluated. The maximum inhibitory potential was shown by rutin. The inhibitory potential of rutin related PTLC isolate was higher than the crude extract and the commercial  $\alpha$ - amylase inhibitor acarbose. Optimized EELL and rutin related PTLC isolate showed 31.43 $\pm$ 2.78 and 59.34 $\pm$ 7.54 % inhibition respectively on porcine pancreatic alpha amylase enzyme.

Phytodrugs/2014/13

## A rediscovery of moscatilin from *Dendrobium* in Western Ghats of Karnataka

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### ABSTRACT

Orchidaceae, the second largest plant family, is the most diverse and highly evolved amongst angiosperms, and constitutes about 40% of the monocotyledonous taxa. In the orchid family, *Dendrobium* is the third largest genus characterized by tremendous diversity in growth habits with a broad geographical distribution. This study aims to identify the endemic and exotic *Dendrobium* species of Western Ghats of Karnataka, India. Wild *Dendrobium* species were collected from different sites in the South Canara, which is one of the buffer zones of Western Ghats. After their collection, phytochemical profiling of all the plants was performed to detect the presence of moscatilin and resveratrol. Resveratrol, a potent antioxidant, was considered for the study as it structurally emulates moscatilin, the bibenzyl phenol produced by *Dendrobium* species. The goal of the study is to identify the potential of moscatilin on cancer cell lines relative to resveratrol and other standard clinically used drugs.

## Effect of Triacontanol on organogenesis and lipid peroxidation of tomato callus

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### ABSTRACT

Plant regeneration via adventitious shoot and root organogenesis from callus cultures initiated from leaf explants of tomato plant (*Lycopersicon esculentum*, Mill.) was achieved in this study. Callus cultures were induced from leaf explants of four weeks old tomato plants in MS media supplemented with 4.4  $\mu$ M benzyl amino purine (BAP) and 5.37  $\mu$ M alpha-naphthalene acetic acid (NAA). Shoot regeneration from callus cultures was induced on medium containing 11.1  $\mu$ M benzyl amino purine(BAP) and 0.57  $\mu$ M indole-3-acetic acid(IAA) and that of root regeneration from 4.9  $\mu$ M indole-3-butyric acid (IBA). In-vitro effect of triacontanol (TRIA) on shoot and root organogenesis and subsequent lipid peroxidation was evaluated. Of three (2  $\mu$ M, 4  $\mu$ M and 6  $\mu$ M) different concentration, 4  $\mu$ M TRIA resulted in increased frequency of shoot and root formation with subsequent increase in lipid peroxidation. These findings provide useful information on correlation of levels of lipid peroxides and organogenesis of tomato callus.

Phytodrugs/2014/15

## Proteases from latex producing medicinal plants as potential vegetable milk coagulants

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### ABSTRACT

Increasing demand for cheese, high cost of rennin, its insufficient supply and ethical issues has led to the search for a suitable substitute. Plant coagulants have been used as milk clotting agent in traditional preparation of cheese in Southern European and West African countries. Present study screens the milk clotting potential associated with ten latex producing medicinal plants (*Acalypha fruticosa*, *Acalypha indica*, *Baliospermum montanum*, *Calotropis gigantea*, *Gymnema sylvestre*, *Jatropha carcus*, *Leptedenia reticulata*, *Rauvolfia tetraphylla*, *Wrightia arborea*, *Wrightia tinctoria*). The plant part (stem) was homogenised in appropriate buffer and centrifuged to obtain crude enzyme (CE) which was assayed for their respective MCA and MCI (MCA/ caseinolytic activity). Commercially available bovine rennin (rennet strength 800 IMCU/g) was used as positive control. *Wrightia arborea* possessed highest mean MCA (631.58 $\pm$ 0 U/ml) followed by *Wrightia tinctoria* (444.44 $\pm$ 0 U/ml). *Calotropis gigantea* (118.23 $\pm$ 0.58 U/ml) exhibited the lowest MCA. *Rauvolfia tetraphylla* showed highest mean MCI (57.66 $\pm$ 0.03) with relatively better MCA (375 $\pm$ 0) indicating its suitability as promising vegetable coagulant source. Study highlights the dairy industrial application potential associated with these latex producing plant proteases.

Phytodrugs/2014/16

## In vitro study to evaluate the Antifungal potential of *Cassia alata* leaf extract against mold allergens

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### ABSTRACT

*Cassia alata* is a significant plant that has diverse medicinal values. This study focuses on the evaluation of phytochemical constituents, its antifungal activity and identification of clinical isolate mold allergens by ITS sequencing. The fungal samples were collected from the pus of skin pustules and inoculated on Sabouraud Dextrose Broth at 25 °C and incubated for 7-14 days. The fungi grown were cultured again to obtain individual colonies which were identified by streak plate method. Totally 32 organisms isolated were isolated and pure culture slants were maintained. *Cassia alata* leaves were collected; air dried, powdered and extracted using hydroethanol by 1:10 ratio. Antifungal assay was performed by well diffusion method. Out of the 32 fungal cultures, 2 cultures showed higher zone of inhibition. The organisms that can be inhibited effectively were identified as *Nigrospora* species and *Stilbella fimetaria*. Thus, hydroethanolic leaf extract of *Cassia alata* can be used as a potential antifungal agent for these mold allergens.

## Evaluation of *in vitro* antibacterial activity of *Cassia auriculata* flower and leaf in different solvents

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### ABSTRACT

Human pathogenic microorganisms are resistant to many antibiotics; this scenario is on the rise in recent years and new antimicrobial drugs are developed by alternate natural plant material. *Cassia auriculata* is a common plant in Asia and used in traditional Ayurveda and Siddha systems of medicine. In this study, acetone, ethyl acetate, Ethanol, n-butanol, and 50% hydroethanol extract of cassia auriculata leaf and flower was tested against human pathogens by agar well diffusion and minimum inhibitory concentration were determined. The pathogenic organism used in this study are *Staphylococcus aureus* (MTCC3169), *E.coli* (MTCC 728), *Pseudomonas aeruginosa* (MTCC741), *Proteus vulgaris* (MTCC7299), *Klebsiella pneumoniae* (MTCC\*661). Minimum inhibition concentration  $I_{c50}$  value was detected by Spectrophotometric turbidity assay method. *Cassia auriculata* flower and leaf ethanolic extract have maximum activity against *E.coli*, *staphylococcus aureus*, *Pseudomonas aeruginosa* and was ineffective against *Klebsiella pneumoniae* and *Proteus vulgaris*. Minimum inhibitory concentration was detected in all the five extracts and found to be effective at 200 $\mu$ l-600  $\mu$ l extract concentration.

Phytodrugs/2014/18

## *In silico* Analysis of phytoconstituents from *Allium sativum* as potential Inhibitors of InhA in *Mycobacterium tuberculosis*

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### ABSTRACT

Tuberculosis is one of the leading causes for bacterial infections mortality worldwide. *Mycobacterium tuberculosis*, the primary causative for tuberculosis survives in human host for decades in latent or persistent state. Moreover in recent years the emergence of tuberculosis has been accompanied with multidrug resistance at an alarming rate. The rapid spread of resistance to first line treatment drugs has shifted the focus of scientific community in development of new array of drugs against *Mycobacterium tuberculosis*. The InhA protein is part of Fatty acid synthetase (FAS) II and shows an NADH dependent enoyl-ACP reductase activity. InhA is an essential enzyme of *M. tuberculosis* responsible for cell wall synthesis, it can prove as a good target for the synthesis of anti-tubercular drugs. Encouraged from the promising biological activities of phytoconstituents from *Allium Sativum*, the present study focuses on exploring novel drug lead molecules from the plant. Molecular docking studies were performed using selected phytoconstituents from *Allium sativum* with the target protein InhA. Ajeone showed more promising results with a Mol Dock score of -80.6047, compared with the standard first line drug isoniazid (Mol Dock Score - 58.7028). Molecular docking predictions suggest that Ajeone can be developed in to a potential drug lead molecule for the treatment of *Mycobacterium tuberculosis*.

## Molecular docking studies of few anti trypanosomal inhibitors isolated from *Ocimum sanctum*

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### ABSTRACT

Human trypanosomiasis or sleeping sickness is a protozoan disease which is caused primarily by *Trypanosoma brucei* in India. Trypanosomiasis is re-emerging in India due to the proximity of domesticated animals with the people. Though, human infection through animal vector is unlikely due to the presence of a trypanolytic factor in human serum, still there are number of reports of a distinctive human infection caused by animal trypanosomes in recent times. As the available medication is either too expensive or having side-effect, so there is an urgent need for discovery of novel natural drug. In this investigation, a study was conducted to identify efficient drug molecule having antitrypanosomal activity. The plant extract of *Ocimum sanctum* which is well known for its antiparasitic property was used to obtain the inhibitory small molecule. In Silico molecular docking was performed to identify the best lead molecules retrieved from Pubchem against trypanosome target proteins which were retrieved from PDB by ArgusLab Software. The ADMET properties of the ligand were evaluated with AdmetSAR software to verify its drug likeness activities. The docking result demonstrated a particular target revealing exceptional binding affinity with the inhibitors in contrast to other targets. Further, clinical studies will confirm its efficiency as a superior contender for development of improved drug against trypanosomiasis.

Phytodrugs/2014/20

## Formulation and characterization of novel nanoemulsion from the leaf extract of *Andrographis serphyllifolia* (Rohl.ex.Vahl) against *Aedes aegypti* and *Culex quinquefasciatus*

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### ABSTRACT

Mosquitoes are the major vectors for causing many diseases like malaria, filariasis, dengue fever, yellow fever, chikungunya, etc. The use of synthetic insecticides to control mosquito vectors has created resistance to vectors. Similarly, use of synthetic insecticides has resulted in environmental pollution as well as toxicity to organisms and humans. Plant extract based bioinsecticides with significant larvicidal activity are one of the novel strategies for controls of mosquito larvae. Nanoemulsions have received a growing attention as colloidal drug carriers. Attraction of nano-emulsion is due to their potential advantages over conventional emulsions which owes to their unique physicochemical properties such as very small droplet size, optical transparency and long term physical stability. In this study, O/W nanoemulsion was formulated from methanolic leaf extract of *Andrographis serphyllifolia*, surfactant/co surfactant with the ratio 1:1 Tween 20/methanol and distilled water by ultrasonic emulsification method. Transparent nanoemulsion with mean droplet diameter of 188.9 nm was obtained at 3:3:4 ratios (v/v/v) of (oil, surfactant/co surfactant and water) were found to be stable. There was no change in droplet diameter even after storage for one month. Surfactant concentration played a vital role in physical appearance, droplet size, viscosity, turbidity and stability of emulsion. Physicochemical characterization such as pH ranged (6.0-7.5), conductivity, polydispersity index (0.234) and viscosity (0.8872cP at 25°C) remained constant. The larvicidal bioassay against *Aedes aegypti* and *Culex quinquefasciatus* showed time and dose dependent larvicidal activity. The results suggested that formulated plant extract based nanoemulsion can be used for control of mosquito vector-borne diseases without affecting environment in eco-friendly manner.

## Evaluation of Hepatoprotective Activity of Hydroalcoholic Extract of *Vetiveria zizanioides* roots on Paracetamol Induced Hepatotoxicity in Wistar Albino Rats

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### ABSTRACT

The aim of the study is to evaluate the hepatoprotective activity of hydroalcoholic extract of *Vetiveria zizanioides* roots on paracetamol induced hepatotoxicity in Wistar albino rats. The study proposal was approved by the Institutional Animal Ethics Committee [IAEC]. The plant material was dried, powdered and extracted with hydro-alcohol. The Wistar albino rats were procured from the central animal house and were housed in the experimental laboratory for 1 week. The animals were divided into 6 groups. Group-I: control (2% gum acacia orally OD), Group-II: Paracetamol (3 gm/kg/orally), Group-III: Liv 52 (1 ml/kg orally OD), Group-IV: Hydroalcoholic Extract of *Vetiveria zizanioides* roots (75 mg/kg orally OD), Group-V: Hydroalcoholic Extract of *Vetiveria zizanioides* roots (150 mg/kg orally OD), Group-VI: Hydroalcoholic Extract of *Vetiveria zizanioides* roots (300 mg/kg orally OD). The standard and test drugs were administered to Wistar albino rats of Groups III, IV, V and VI for consecutive 6 days. On 7<sup>th</sup> day paracetamol was administered to Groups-II, III, IV, V and VI. On 9<sup>th</sup> day blood was collected by retro orbital plexus under anaesthesia for estimation of liver enzymes. The data was expressed in Mean±SEM. Statistical significance between the groups was analysed by one way ANOVA followed by Dunnet post hoc test using SPSS [16.0 version] software. Group-II showed significant increase in liver enzymes when compared to the control group. Prior administration of plant extract groups showed dose dependent decline in liver enzymes when compared to Group II. Administration of hydroalcoholic Extract of *Vetiveria zizanioides* roots at 300 mg/kg was comparable to standard drug [Group III]. Hydroalcoholic Extract of *Vetiveria zizanioides* roots has significant hepatoprotective activity against paracetamol induced hepatotoxicity in Wistar albino rats.

Phytodrugs/2014/22

## Anti-diabetic activity of *Eugenia jambolana* fruit juice against dexamethasone induced diabetes in Albino rats

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### ABSTRACT

The aim of the study is to investigate the anti-diabetic activity of *Eugenia jambolana* fruit juice against dexamethasone induced diabetes in Albino rats. Effect of *Eugenia jambolana* fruit juice on dexamethasone induced diabetes and comparison of anti-diabetic activity of fruit juice with standard drug. Rats were divided in 5 groups. Group-I served as a control, group-II (Dexamethasone 4mg/kg/i.p), group-III (Metformin 500mg/kg/oral+ Dexamethasone 4mg/kg/i.p), group-IV (*Eugenia Jambolana* fruit juice 10ml/kg/OD/orally+ Dexamethasone 4mg/kg/i.p), group-V (*Eugenia Jambolana* fruit juice 10ml/kg/BD/orally+ Dexamethasone 4mg/kg/i.p). Standard drug and plant fruit juice was administered their respective groups 1 to 6 days, from 7 to 12 days it was administered along with 4mg/kg dexamethasone. On 12<sup>th</sup> day rat blood was collected and used for estimation of glucose (Oxidase peroxidase method) and insulin (ELISA method). The data was analysed by SPSS (16.0) software to find statistical significant. Dexamethasone administered groups showed increase in glucose and insulin level compared to control group. *Eugenia jambolana* fruit juice and standard drugs significantly prevent the dexamethasone induced increase in the glucose and insulin levels. Prior administration of *Eugenia jambolana* fruit juice significantly decreased dexamethasone induced diabetes in rats.

## Screening of Anti-Microbial Activity of Hydroalcoholic Extract of *Costus Pictus* Leaves: *In Vitro* Study

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### ABSTRACT

The aim of the study is to evaluate the anti-microbial activity of hydroalcoholic extract of *Costus pictus* leaves against *Pseudomonas aeruginosa*. Plant material was collected from local areas (Nagercoil, Tamil Nadu) and extracted by Soxhlet extraction by using hydroalcohol as a solvent. Culture of *Pseudomonas aeruginosa* was obtained from the Central Laboratory, Microbiology Division, SMIMS. Group-I: Control, Group-II: Amikacin (30 µg/disc), Group-III: Hydroalcoholic extract of *C.P* leaves (300µg/disc), Group-IV: Hydroalcoholic extract of *C.P* leaves (600µg/disc), Group-V: Hydroalcoholic extract of *C.P* leaves (1200µg/disc). For each dose ten discs were prepared. The antimicrobial activity was evaluated by disk diffusion method. The data was analyzed by SPSS (16.0 version) ANOVA Post hoc (Dunnet) test applied to find the statistical significance between the groups. Control group showed no zone of inhibition. Amikacin and high dose of *C.P* showed significant effect compared to the control group. Hydroalcoholic extract of *C.P* leaves showed dose dependent anti-microbial effect against *Pseudomonas aeruginosa*. Hydroalcoholic extract of *Costus pictus* (1200µg/disc) and standard drug showed comparable antimicrobial activity against *Pseudomonas aeruginosa*.

Phytodrugs/2014/24

## Evaluation of Analgesic Activity of Chloroform Extract of *Solanum nigrum* Linn in Swiss Albino Mice

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### ABSTRACT

The aim of the study is to evaluate the analgesic activity of chloroform extract of *Solanum nigrum* Linn in Swiss albino mice. The leaves of the plant were air dried, powdered and extracted using chloroform. Healthy Swiss albino mice of either sex weighing between 20-30 g were used for the study. The animals were procured from the central animal house and were acclimatized in the experimental laboratory for 7 days. The study consisted of 4 groups with 6 animals in each group. Group-I: control (Equivalent volume of normal saline orally), Group-II: Morphine (5 mg/kg/s.c), Group-III: Chloroform Extract of *Solanum nigrum* [CSN] (100 mg/kg i.p), Group-IV: CSN (200 mg/kg i.p). Analgesic activity in Swiss albino mice was assessed by performing tail clip and tail flick methods. The data was expressed in Mean±SE. Statistical significance among study groups was carried by using Graph Pad Instat Software, by ANOVA test followed by Bonferroni Post hoc test. Group-II showed significant increase in reaction time in both tail clip and tail flick methods when compared to the Group I. Administration of plant extract in Groups III and IV showed dose dependent increase in the reaction time when compared to control group. Administration of CSN at 200 mg/kg showed statistical significant increase in reaction time in both the methods when compared to CSN at 100 mg/kg, however it was not comparable to the morphine in Group II. Chloroform Extract of *Solanum nigrum* Linn. possesses significant analgesic activity in Swiss albino mice.

## Evaluation of free radical scavenging activity and antimicrobial activity of aqueous extract of *Alpinia galanga*

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### ABSTRACT

Medicinal plants are contributed to human health care system. Most of the plants are utilized by rural peoples as a folk medicine. Medicinal plants used in this region for ayurvedic purpose by villagers and local herbal health. Synthetic drugs are often produce undesirable side effects in body upsetting the balance of whole systems and finally lead to lethal. In the context of herbal medicines it is to help treat common ailments without any side effects. *Alpinia galanga* is a common annual plant in Indian garden and widely distributed in Himalaya and Southern region of Western Ghats in India. The root extract of *Alpinia galanga* was evaluated for their antimicrobial activity against various pathogenic bacteria as well as fungi and also for their free radical scavenging activity by using various *invitro* methods such as DPPH, Nitric Oxide, Superoxide scavenging activity and assay of DNA sugar damage. The preliminary study was performed to find the active principles of *Alpinia galanga*. The total antioxidant activity of the aqueous extract of the *Alpinia galanga* was estimated by FTC and TBA method.

Phytodrugs/2014/26

## Hairy root cultures as plant production systems

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### ABSTRACT

The tremendous potential of plant secondary metabolites has been determined in various fields such as medicine, cosmetics, food and nutrition industry, environmental industry and so on. Not only are such metabolites produced in very minute quantities by plant species but also such plants are rare and/or endangered. This scenario demands the development of techniques that can obtain maximum yield from limited plant resources. Hairy root disease is a kind of tumor induced by the pathogen *Agarobacterium rhizogenes* on plant wound sites. Plant tissues infected by this bacterium give rise to numerous adventitious roots that are capable of growing in hormone free medium. Harvesting the required metabolites from *in vitro* grown hairy roots of various plants supplemented by elicitation proves to be a viable option, since the biosynthesis of such metabolites in hairy roots is high by many folds. Scale up from lab scale to reactor scale leads the process to commercial level. The success of scale up depends on a range of factors such as medium, inoculum size, and measurement of growth, interpretation of effects of various physical parameters on growth, product recovery and reproducibility of results. Hence, large scale production of plant secondary metabolites using hairy roots requires further research.

## Isolation and Identification of Sediment derived Actinomycetes through Molecular Characterization of 16s rRNA Technique

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### ABSTRACT

The Actinomycetes were isolated from the soil sample of turmeric crop plantation in Erode, District. Then the soil samples were air dried under *in vitro* lab condition for 3 – 4 days. After air drying it has been washed two times with the help of distilled water to remove the unwanted dust particles from the soil sample. The soil samples was subjected into the basic microbiological techniques such as, serial dilution, pour plate and spread plate methods, that is to identify the specific growth of Actinomycetes and its identified that it is present in the 10<sup>-3</sup> and 10<sup>-4</sup>. Followed by the microbiological procedure, finally the samples were undergone for identifying the biochemical characterization and catalase production. Using various parameters of the biochemical test like Methyl red, Vogues-Proskauer, and Nitrate Reduction was clearly performed for the identification. After the Isolation procedure is completed the sample was subjected to the purification steps here Dialysis of sample was performed after the dialysis is over the partially purified sample was taken over to the next level of purification that is using the column chromatography technique purification. After purifying sample through column chromatography it was taken to Identification. Isolated Actinomycetes culture was identified by 16s rRNA sequencing and it was confirmed through the bioinformatics tools as BLAST.

Phytodrugs/2014/28

## Efficacy of the leaf extract of *Lippia citriodora* against heamolysis

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### ABSTRACT

Heamolysis is caused due to the demolition of erythrocytes membrane causing the loss of Heamoglobin and other internal components into the neighbouring fluid. Due to the preponderance of polyunsaturated fatty acids in the erythrocyte membranes, they are highly susceptible to oxidative damage that results in the erythrocyte membranes, they are highly susceptible to oxidative damage that results in lipid peroxidation and heamolysis. Human body has numerous mechanisms especially enzymatic and non enzymatic antioxidant systems which protect the cellular molecules against reactive oxygen species induced damage. However the innate defense may not be enough for severe or continued oxidative stress. Hence certain amounts of exogenous anti-oxidants are required constantly to maintain an adequate level of anti-oxidants in order to balance the reactive oxygen species in human body. *Lippia citriodora* was cultivated in India and Egypt for its lemon-like aroma to be used in herbal tea preparations, as it is known for its antispasmodic, antipyretic, sedative and digestive properties. Phenolic compounds (mainly flavonoids, phenolic acids and phenyl propanoids) present in these plants were responsible for most of the pharmacological activities such as analgesic, anti-inflammatory, antihemolytic and antioxidant effects. This study focused on the in-vitro evaluation of the antihemolytic activity of the leaf extract of *Lippia citriodora*. The leaf extract *Lippia citriodora* showed a better contribution in erythrocyte osmotic resistance and exhibited free radical scavenging capacity towards ABTS, superoxide anion, hydroxyl ion radicals and nitric oxide and also exerted strong reducing capacity and chelating property.

Phytodrugs/2014/29

## *In vitro* flowering of *Centella asiatica*

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### ABSTRACT

*In vitro* flowering of plants depends on numerous factors such as internal, external and Physical factors all of this interact with various complexes in unpredictable ways; flowering was regulated by a combination of environmental and genetic factors. These factors influence the *denova* flower morphogenesis. The plant growth hormones cytokinin and auxins were selected to induce flowering in this *in vitro* study at different concentration which showed increased flowering. This study clearly shows auxin and cytokinin induce the flowering of *Centella asiatica* by micropropagation.

## Extraction of bioactive compounds from the fruit wastes of *Punica granatum* for pharmaceutical applications

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### ABSTRACT

*Punica granatum* (Pomegranate) is rich in bioactive compounds with known health benefits, due to its high antioxidant capacity. Around 1.5 million tonnes of this fruit is produced in the world annually and India ranks first with respect to its cultivation area and production. This generates 60% of fruit wastes and research has not been focused on utilization of these as suitable raw materials. Moreover, the demand is towards search for cheap and abundant sources of natural antioxidants worldwide. In this regard, the fruit wastes of *Punica granatum* (FWPG) were dried, powdered and assessed for its antioxidant properties. The bioactive compounds from FWPG were extracted by maceration and homogenization with various solvents including, acetone, ethanol, water, ethyl acetate and hexane. The total phenolic content of the extracts was determined by Folin-Ciocalteu method and a maximum of 217.73 mg gallic acid equivalents [GAE] /g dry extract of phenolics was obtained by homogenisation of FWPG using ethanol as solvent. The extraction conditions were further optimized using a five-level three-factorial central composite rotatable design, a tool of response surface methodology. Under optimum conditions, the phenolics yield was 785.36 mg/g dry extract using 3.37 g of fruit waste powder homogenized at 17,000 rpm for 1 min. *In vitro* antioxidant properties of the fruit extract was estimated by total antioxidant and free radical scavenging assays. At 1 mg/ml concentration, the extract could scavenge 93.28% and 72.69% of 1,1-diphenyl-2-picryl hydrazyl (DPPH) and nitric oxide (NO) free radicals, respectively. The increasing concentrations of the extract also showed potent inhibitory effects on  $\alpha$  – amylase activity. The present investigation will serve as a baseline of initial studies for exploitation of FWPG as a viable substrate for extraction of bioactive compounds with antioxidant properties.

Phytodrugs/2014/31

## Chemotyping of *Sapindus emarginatus* populations for saponins

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### ABSTRACT

*Sapindus emarginatus* Vahl., commonly known as Soapnut, is a valuable bioresource that finds importance as a Non-Timber Forest Produce (NTFP) in Tamil Nadu. The dried fruit rind is the most valuable part as it contains saponin, which is rich in detergent properties. As a measure of sustainable utilization, harvesting of soapnut in the wild need to be minimized and compensated by agroforestry plantations and industrial plantations raised outside the forests. With this objective, domestication and improvement of the *S. emarginatus* was undertaken at the Institute of Forest Genetics and Tree Breeding, Coimbatore. The tree improvement program of this species involved reconnaissance survey in Tamil Nadu to select Candidate Plus Trees (CPTs) of *S. emarginatus* based on the fruit yield during the peak fruiting season. Each CPT was chemotyped for saponins. Fruits collected were processed and the rind was used for saponin extraction. The method of isolation of saponins was standardized by differential solvent extraction method. The isolated saponins were quantified tree-wise by gravimetric method. The CPTs were shortlisted and ranked based on saponin yield (>13%). The high saponin yielding trees were multiplied on large scale for establishing trials and popularization among farmers and foresters.

## **Inhibitory action of piperine as alkaloidal agent from black pepper against angiogenesis in cancer treatment**

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### **ABSTRACT**

Angiogenesis plays a critical role in the cancer therapy. Its action mechanism involves the formation of blood vessels and differentiation of endothelial cells and offers the nutrient to the tumor cells. These lead the normal cells also to get affected and are converted to tumor cells. We therefore need to expand our knowledge of the qualitative differences in tumor vessel formation that are specific to each tumor and individualize the therapeutic approach. Herbs can provide better treatment forever for both chronic and acute diseases. Piperine is an active ingredient of black pepper, which has been reported in recent decades. Dietary polyphenols like piperine has been studied for their effect on prevention of angiogenesis for cancer treatment. In the recent researches, technologists' investigation reported that the piperine has potentially anti-tumor activity and enhances inhibition of angiogenesis. The research studies suggest that, the piperine is an alkaloid agent or component found abundantly in black pepper has diverse physiological actions including the ability to kills the cancer cells. This article gives information about the role of piperine for the treatment of angiogenesis in cancer.

*Phytodrugs/2014/33*

## **Enzymatic pretreatment of White ponni rice to improve its milling performance**

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### **ABSTRACT**

The goal is to investigate the effect of two commercially available hydrolysing enzymes viz., cellulase and xylanase to treat brown rice variety of White Ponni prior to mechanical polishing. Since the outer bran layer of brown rice consists of high in dietary fibres which is mainly composed of non-starch polysaccharides mostly cellulose and hemicelluloses, with less amount of fats, proteins, vitamins, antioxidants and minerals. To break up the bran layer, it is necessary to degrade the polymers like polysaccharides and proteins which are present by means of specific hydrolysing enzymes, so commercial enzymes such as cellulase and xylanase were used to degrade cellulose and hemicelluloses (xylan) respectively. By this effect, there is decrease in polishing time with minimum broken percentage during milling. Thus the effect of enzymatic pretreatment on milling quality, cooking time, whiteness and nutrient analysis was also investigated. Before enzymatic pretreatment of brown rice, the enzymes were diluted, by using sodium citrate buffer solution at pH-5.2 in three different concentrations such as 0.15 % ( 0.0015g/mL), 0.35 % (0.0035g/mL) and 0.55 % (0.0055g/mL). 100grams of head brown rice of variety White Ponni was treated with 1.67mL of enzyme solution at three different treatment (or) extraction time period such as 1, 2 and 3 minutes, and it was incubated at three different temperatures such as 27°C, 37°C and 47°C. The process parameters showed significant effect on broken percentage, time of polishing, loss of nutrients and optimal cooking time. As a result of improve in milling performance.