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## **Dental Caries Inhibition in Albino Rats by *Breynia nivosus* Extract**

E.S. Amadi, C.A. Oyeka, I. Okoli, J.I. Ihedioha and I.R. Iroha

The study investigated the caries inductive capacities of different sucrose concentrations and the anti-caries activity of *Breynia nivosus* extract in experimental albino rats. Different concentrations (70, 50, 30 and 10%) of sucrose-in-diet, were respectively fed to caries-free albino rats harboring *Streptococcus rattus* in their oral cavity, to determine their caries induction effect. Subsequently, 200 mg mL<sup>-1</sup> of *Breynia nivosus* extract were intra-orally administered to the teeth surfaces of caries-free and non caries free rats to ascertain its possible caries curative and/or preventive effects. Direct observation, probing, microbial count and radiography were used to monitor the caries status of the rats. There were significant increase (p<0.05) in the microbial count of dental plaque of rat groups fed with 70, 50 and 30% sucrose-in-diet. However, milky white spots were only observed among the rat groups fed with 70 and 50% sucrose-in-diet at the 6th week of observation. The results of this investigation suggests that *Breynia nivosus* extract possesses some degree of *in vivo* caries preventive and curative effect on the teeth surfaces of albino rats fed simultaneously with 70% sucrose-in-diet. (*Research Journal of Medicinal Plant* 3 (1): 1-8, 2009; *doi*: 10.3923/rjmp.2009.1.8)

## **Evaluation of the Hepatoprotective Effect of *Fumaria parviflora* and *Momordica balsamina* from Saudi Folk Medicine Against Experimentally Induced Liver Injury in Rats**

Saleh I. Alqasoumi, Mohammad S. Al-Dosari, Abdulmalik M. AlSheikh and Maged S. Abdel-Kader

In a project to evaluate the efficacy of traditional Saudi plants used for liver problems the two plants *Fumaria parviflora* Lam. (Fumariaceae) and *Momordica balsamina* Linn. (Cucurbitaceae) were studied. The ethanol extract of the aerial part of *Fumaria parviflora* and the leaves of *Momordica balsamina* were subjected to hepatoprotective assays using Wistar albino rats. Liver injury induced in rats using carbon tetrachloride. The biochemical parameters; serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP) and total bilirubin were estimated as reflection of the liver condition. Based on the results of the biochemical parameters measurements, histopathological study was performed on

the liver of rats treated with two extracts. The normal appearance of hepatocytes indicated a good protection of the extracts from carbon tetrachloride hepatotoxicity. All the results were compared with silymarin, the reference hepatoprotective drug. (*Research Journal of Medicinal Plant 3 (1): 9-15, 2009; doi: 10.3923/rjmp.2009.9.15*)

### **Phytochemical and Antibacterial Studies of Root Extract of *Cochlospermum tinctorium* A. Rich. (Cochlospermaceae)**

M.B. Tijjani, I.A. Bello, A.B. Aliyu, T. Olurishe, S.M. Maidawa, J.D. Habila and E.O. Balogun

Methanol extract of the root of *Cochlospermum tinctorium* was evaluated for antibacterial activities using hole-in-plate bioassay technique against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Corynebacterium ulcerans*, *Proteus mirabilis* and *Shigella dysenteriae* using ciprofloxacin ( $10 \mu\text{g mL}^{-1}$ ) and gentamicin ( $10 \mu\text{g mL}^{-1}$ ) as reference standards. The extract was active on all the test organisms at concentration of  $2000 \mu\text{g mL}^{-1}$ . The activity of the extract against *S. dysenteriae* was found to be more potent with MIC 100 and MBC  $500 \mu\text{g mL}^{-1}$ . Time kill studies showed that the antibacterial activities were time dependent. Phytochemical screening revealed the presence of alkaloids, flavonoids, tannins and cardiac glycosides. These phytochemicals could be responsible for the antimicrobial activities exhibited by the extract and hence justify the ethnomedicinal uses of *C. tinctorium*. (*Research Journal of Medicinal Plant 3 (1): 16-22, 2009; doi: 10.3923/rjmp.2009.16.22*)

### **Comparative Study of the Ethanolic Extracts of Four Nigerian Plants Against Some Pathogenic Microorganisms**

J. Nebedum, K. Ajeigbe, E. Nwobodo, C. Uba, O. Adesanya, O. Fadare and D. Ofusori

The ethanolic extracts of *Cassia alata* (CA), Walnut-*Juglan nigra* (JN), *Ocimum basilicum* (OB) and *Aloe vera* (AV) were studied for their *in vitro* antimicrobial activity against tested pathogenic microorganisms using Agar diffusion method. Preliminary phytochemical screening showed the presence of tannin, fats and oil, saponins and glycosides in the ethanolic extracts of all tested plants. *Juglan nigra* has the highest activity against all tested organisms *Escherichia coli*, *Staphylococcus aureus* and *Candida albican*. While the least activity against tested organism was shown by OB, ethanolic extracts of AV was the most

effective against *Staphylococcus aureus*, while JN was the most effective against *Escherichia coli* and *Candida albican*. Also, the combined 600 mg mL<sup>-1</sup> (concentration) of the four extracts showed a remarkable inhibitory effect on the organisms; produces over 50% of the activity of a standard antibiotic, Fulcin. Walnut-*Juglan nigra* (JN) showed the best antibacterial activity out of the four; hence this plant can be further subjected to isolation of the therapeutic antimicrobials and further pharmacological evaluation. (*Research Journal of Medicinal Plant* 3 (1): 23-28, 2009; doi: 10.3923/rjmp.2009.23.28)

### **Effect of *Jatropha tanjorensis* J.I. Ellis and Soroja Leaves in Rabbits: Biochemistry and Ultrasonography**

A.O. Akhigbe, M. Idu, E.S. Orhue, J.E. Ataman and S.O. Ehimwenman

Toxicological study of *Jatropha tanjorensis* leaves was conducted by evaluating changes in weight, biochemical and ultrasonographic parameters of rabbits that have been administered varying concentrations (0, 5, 10 and 25%) of the ground leaves mixed with feed-mash for a period of 30 days. There was no significant difference ( $p < 0.05$ ) in weight of rabbits. Renal function tests revealed that there was a significant reduction of serum urea concentration in the male rabbits ( $p < 0.05$ ) from 38.33 in group C to 18.33 in group D. This suggests that the amount of *J. tanjorensis* plant powder used in this study could interfere positively with the filtration function of the kidney in rabbits. The ultrasound picture of kidney, heart and spleen showed no significant change from the control, where as there was reduction in the size of the liver with increased echogenicity when compared with the control. This may be an indication of hepatic toxicity. (*Research Journal of Medicinal Plant* 3 (1): 29-33, 2009; doi: 10.3923/rjmp.2009.29.33)

### **Evaluation of the Uterotonic Activity of the Aqueous Leaf Extract of *Ficus exasperata* Vahl (Moraceae)**

Enitome E. Bafor, Eric K. Omogbai and Raymond I. Ozolua

The leaves of *Ficus exasperata* Vahl Enum. Pl. vahl (Moraceae) are used by traditional healers in Southern Nigeria to arrest preterm contractions in pregnant women and are also used as abortifacients in some parts of Africa. In this study the purported uterotonic activity of the aqueous leaf extract of *F. exasperata* (AET) was investigated *in vitro*. AET was obtained from the fresh leaves of the plant. The effect of the extract on rhythmic spontaneous uterine contractions was

investigated and the extract was also directly tested on uterine tissues. The effect of the extract was compared with those of acetylcholine. The extract, at concentrations ranging from  $2.5 \times 10^{-2}$  to  $100 \times 10^{-2}$  mg mL<sup>-1</sup>, significantly increased the frequency ( $p < 0.05$ ) but not the amplitude of spontaneous contractions and directly stimulated uterine contractions. Acetylcholine likewise, concentration-dependently stimulated uterine contractions and significantly increased the frequency ( $p < 0.05$ ) of spontaneous contractions. The aqueous leaf extract of *F. exasperata* at the concentrations used in this study stimulates uterine contractility which may account for its use in easing childbirth in some parts of Africa. (*Research Journal of Medicinal Plant* 3 (2): 34-40, 2009; doi: 10.3923/rjmp.2009.34.40)

### **Preliminary Pharmacognostical Standardisation of *Ruta graveolens* L. Aerial Parts**

I. Nazish, R.A. Kaskoos, S.R. Mir, S. Amin and M. Ali

*Ruta graveolens* L. belonging to family Rutaceae is commonly known as Common rue and locally as Sudab in India. It is an important medicinal plant used in capillary fragility, for eye diseases, as stimulant and emmenagogue. As the herb is used widely in the Indian traditional system, it was thought worthwhile to undertake the standardization of its aerial parts. Aerial parts consist mainly of leaves that are 3-5 inch long, flowers are tetramerous and fruits are 4-5 lobed. In the powdered form it had pungent odor and exceedingly bitter taste. Microscopical examination of powder of aerial parts showed fragments of epidermis, glandular trichomes, stone cells, lignified xylem elements and abundant calcium oxalate crystals. Successive extractive value was highest in aqueous extract (16.08% on dry weight basis). Mean ash values (%) were 8.13 (total), 2.01 (acid insoluble ash) and 1.02 (water soluble ash). Loss on drying was found to be 4.03% and pH values of aqueous extract was 6.74. Bitterness value of aerial parts was 1.28; foaming index was less than 100. Screening of all extracts indicated the presence of all phytoconstituents except saponins. TLC fingerprints of extracts of aerial parts were also developed. (*Research Journal of Medicinal Plant* 3 (2): 41-44, 2009; doi: 10.3923/rjmp.2009.41.44)

### **Lipid Lowering Activity of *Globimetula braunii***

J. Okpuzor, G. Kareem and C. Ejikeme

Extract of *Globimetula braunii* in different solvent systems were evaluated for possible lipid and blood pressure lowering activities using *in vivo* and *in vitro* experimental methods. Dried *Globimetula brauni* leaves were pulverized into

powder and successively extracted with methanol, hexane, chloroform, ethyl acetate, n-butanol and water using hot extraction methods. Normal male adult albino rats were administered a dosage of 200 mg kg<sup>-1</sup> b.wt. of the extracts for a period of 14 days and the level of total cholesterol, triacylglycerol and lipid peroxidation were monitored. The crude extract of *Globimetula braunii* was analyzed for some antihypertensive substances using High Performance Liquid Chromatography (HPLC). The results obtained, showed that different fractions of the extract caused significant ( $p < 0.05$ ) decrease in serum total cholesterol, triacylglycerol and malonyldialdehyde (MDA) levels. HPLC elution profile showed that the crude extract contained substances similar to some known antihypertensive drugs like propranolol, lisinopril, moduretic and nifedipine and the lisinopril-like compound seems to be the most abundant by having the highest concentration. Thus, the data from this study suggests that *Globimetula braunii* extract contains some biologically active substances that may lower blood pressure and serum lipids. (*Research Journal of Medicinal Plant* 3 (2): 45-51, 2009; doi: 10.3923/rjmp.2009.45.51)

### **Toxicological Studies of a Nigerian Commercial Polyherbal Product in Albino Rats**

E.U. Etuk, V. Igbokwe, O.P. Ajagbonna and M.O. Egua

There have been earlier reports of herbal medicine toxicity elsewhere in Nigeria, China and India. The present study examined the possible acute and subchronic toxic effects of Nasara Pile Syrup (NPS), a Nigerian commercial polyherbal medicine in albino rats. Graded doses (0.5, 1.0, 1.5 and 1.75 mL/100 g) of the herbal medicine were administered to 4 groups of albino rats and their responses observed for 72 h to study the acute toxic effect of the herbal medicine. In the subchronic toxicity study, the rats were treated orally with repeated doses of the extract for 28 days after which the animals were slaughtered and samples from the liver, kidney and heart obtained for histopathological examination. The results showed that, administration of a single dose of the herbal medicine did not produce any harmful effect or death in the animals. But in the repeated dose treatment, the herbal medicine produced a number of deaths and damages on the kidney, liver and heart of the rats that were evidenced by histopathological lesions in a dose dependent manner. Based on the results, it was concluded that, prolong administration of NPS may cause harmful effect in the consumers, therefore, the general public should exercise caution in taking this herbal remedy and they should be aware of the impending health risk that may be associated with it. (*Research Journal of Medicinal Plant* 3 (2): 52-60, 2009; doi: 10.3923/rjmp.2009.52.60)

## **Reproductive Biology and Breeding System of *Aconitum balfourii* (Benth) Muk: A High Altitude Endangered Medicinal Plant of Garhwal Himalaya, India**

B.P. Nautiyal, M.C. Nautiyal, N. Rawat and A.R. Nautiyal

*Aconitum balfourii* (Benth) Muk an endangered medicinal herb of high altitude region was studied for reproduction biology. Controlled pollination studies were also conducted on plants grown under hothouse. Observation reveals that ravine and scree wild habitats of alpine region had better flowers and seed production. Furthermore, hot house grown plants had far more superiority over wild populations for flowers and seed production. Protandry type of dichogamy was observed and is viewed as an anti-selfing mechanism. In general, higher pollen germination was achieved comparatively at low concentrations of GA<sub>3</sub>, IAA and IBA (1 ppm). Tube elongation was maximum upto 65 µm in IAA 1 ppm and 63 µm in IAA (5 ppm) and sucrose 5%. Dark condition along with violet color inhabits pollen germination whereas it enhances pollen tube elongation. Apomixis as well as autogamous self pollination was not observed in the species. However, fruit set differed significantly between the hand-selfed and hand-crossed treatments. Seed characteristics of open pollinated plants viz., number of seeds and seed yield per pod and plant were significantly at par than hand self pollinated flowers. Self-compatibility in the species may be a derived condition, considering that flowers are insect pollinated. The abundance and efficiency of pollinators may also affect mating patterns. The results of this study on the floral biology and breeding system of *A. balfourii* indicate reproductive potential of the species for cross-pollination, which would limit the production of selfed seeds and as such is likely to maintain sustainable levels of heterozygosity among the various populations. (*Research Journal of Medicinal Plant* 3 (2): 61-68, 2009; doi: 10.3923/rjmp.2009.61.68)

## **Isolation, Characterisation and Antimicrobial Activity of a Steroidal Ester from the Leaves of *Cassia nigricans* Vahl.**

R.G. Ayo, J.O. Amupitan and A.O. Oyewale

The aim of the study was to scientifically validate the claims that *C. nigricans* is used in traditional medicine for the treatment of skin diseases, infections and wounds. The leaves of *Cassia nigricans* is said to be used in traditional medicine for the treatment of peptic ulcer, gastro-intestinal disorders, diarrhoea and skin diseases. The glycoside present in the methanol extract of the leaves was

hydrolysed using dilute hydrochloric acid. A silica gel column of the resulting aglycone (using petroleum ether:ethyl acetate mixtures) gave a white amorphous powder, identified as steroidal ester by means of spectral analysis. The antimicrobial activity of the steroidal ester was investigated against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Corynebacterium pyogenes*, *Bacillus subtilis*, *Salmonella typhi*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, *Neisseria gonorrhoeae* and *Klebsiella pneumoniae* using agar diffusion technique. The results showed that the compound was effective against all the test organisms and the minimum inhibitory concentration was found to be  $2 \times 10^3 \mu\text{g mL}^{-1}$ . (*Research Journal of Medicinal Plant* 3 (2): 69-74, 2009; doi: 10.3923/rjmp.2009.69.74)

### **Evaluation of *Coleus forskohlii* Genotypes for Bio Chemical Characters**

C. Kavitha, E. Vadivel and K. Rajamani

*Coleus forskohlii* Briq., belonging to the mint family Lamiaceae, is an important ancient root drug credited with various medicinal properties. The root extracts of *C. forskohlii* were found to contain forskolin and its therapeutic properties contributed to the emergence of *C. forskohlii* as a taxon of importance in modern medicine. Traditionally it is used for pickle making and as a condiment in India. Thirty seven *C. forskohlii* genotypes collected from various places of the important *Coleus* growing states viz., Tamil Nadu and Karnataka were evaluated for total sugars, starch and crude protein at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore to assess its suitability for edible purpose. The genotypes exhibited remarkable variations for all the characters studied. The total sugar, starch and crude protein content in the fresh tubers varied from 5.90 to 10.03 g, 6.97 to 20.94 g and 6.14 to 9.05 g per 100 g, respectively. The genotype CF 37 excelled in the accumulation of total sugars, starch and crude protein in tuber and thus can be utilized for medicinal as well as edible purposes. (*Research Journal of Medicinal Plant* 3 (2): 75-79, 2009; doi: 10.3923/rjmp.2009.75.79)

### **Therapeutic Effect of *Telfairia occidentalis* on Protein Energy Malnutrition-Induced Liver Damage**

O.T. Kayode, A.A. Kayode and A.A. Odetola

Comparison was made between the efficacy of dietary protein replenishment and supplementation with *Telfairia occidentalis* leaves, in treatment of Protein Energy



Malnutrition (PEM) induced liver damage. PEM rats were produced by feeding weanling rats a protein deficient diet (2% protein) for 28 days and then divided into four dietary treatment groups: 2% protein (group A; PEM control group); 20% protein and 10% *T. occidentalis* (group C); 20% protein (group D) and 10% *T. occidentalis* (group E). The protein deficient diet caused a significant increase ( $p < 0.01$ ) in hepatic malondialdehyde (MDA) level and the liver function enzymes alkaline phosphatase (ALP), alanine amino transferase (ALT) and aspartate amino transferase (AST) level in the serum. It also caused a marked reduction ( $p < 0.01$ ) in glutathione level, significant decrease ( $p < 0.01$ ) in the antioxidant enzymes superoxide dismutase (SOD) and catalase (CAT) and significant damage to the hepatocytes. Recovery diets of protein alone and protein supplemented with *T. occidentalis* had significant effects on all the parameters. The MDA level and the serum liver function enzymes were significantly reduced ( $p < 0.01$ ), glutathione and antioxidant enzymes levels were markedly increased ( $p < 0.01$ ) and a highly significant hepatocyte healing observed in the histology images. The highest recovery was however observed in group C. Results indicate the restorative ability of *T. occidentalis* in treatment of oxidative stress induced liver damage in PEM rats. (*Research Journal of Medicinal Plant* 3 (3): 80-92, 2009; doi: 10.3923/rjmp.2009.80.92)

### **Effect of Drying Treatment on the Content of Antioxidants in *Enicostemma littorale* Blume**

R. Sathishkumar, P.T.V. Lakshmi and A. Annamalai

The Total Phenolic Content (TPC) and antioxidant activity of fresh and dried materials of *Enicostemma littorale* Blume were evaluated using the Folin-ciocalteau method, 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity and Ferric Reducing Antioxidant Power (FRAP) assays. Different drying treatments especially, microwave treated plant material led to significant reduction ( $p \leq 0.05$ ) in antioxidant properties of *E. littorale* in methanolic extracts as compared to that of the boiling water extracts, which appeared to exhibit significantly stronger antioxidant potentials ( $p \leq 0.05$ ) even in dried plant materials due to greater solubility of compounds, breakdown of cellular constituents as well as hydrolysis of tannins. A strong free radical scavenging activity in the chosen plant material suggests that it has great potential in the food industry as functional food ingredient. (*Research Journal of Medicinal Plant* 3 (3): 93-101, 2009; doi: 10.3923/rjmp.2009.93.101)

## **Anti-Ulcerogenic Activity of Two Extracts of *Parquetina nigrescens* and their Effects on Mucosal Antioxidants Defence System on Ethanol-Induced Ulcer in Rats**

A.A.A. Kayode, O.T. Kayode and A.A. Odetola

The effect of two extracts of *Parquetina nigrescens* on mucosal antioxidants defense system in ethanol-induced ulcer in rats was studied. Activities of superoxide dismutase (SOD), catalase (CAT) and levels of reduced glutathione (GSH) were determined in the gastric mucosa and liver of normal and experimental groups of rats. The rats were pretreated with 500 and 1000 mg kg<sup>-1</sup> of hexane and chloroform extracts of *P. nigrescens*, respectively dissolved in olive oil for a period of 14 days prior to ethanol induction. It was found that prior to ulcer induction, 14 days pretreatment with hexane and chloroform extract *P. nigrescens* significantly reduced ethanol-induced gastric damage. The levels of GSH and activities of the antioxidants enzymes (SOD and CAT) were depressed significantly ( $p < 0.05$ ) in the ulcerated rats when compared with that of normal control. The activity of SOD was lower significantly ( $p < 0.05$ ) in the ulcerated mucosa and liver of the experimental rats when compared to the normal control group. There was a significant increase ( $p < 0.05$ ) in the level of CAT in the groups pretreated with the extracts compared to the ethanol group. A similar result was observed for GSH. Pretreatment with hexane extract caused 75.43 and 74.55% elevations in the activities of SOD in the mucosa and liver homogenate, respectively. Similar elevations were observed in the group pretreated with the chloroform extract. The cimetidine group also caused 69.79 and 69.67% elevation in the SOD activity in the mucosa and liver homogenate, respectively. The pretreatment with *P. nigrescens* was found to exact a significant gastro protective and antiulcer effect partly by protecting against the ethanol-induced ulcerogenic effects in experimental rats and probably through the induction of antioxidant enzymes. (*Research Journal of Medicinal Plant* 3 (3): 102-108, 2009; doi: 10.3923/rjmp.2009.102.108)

## **Effects of *Piper sarmentosum* (Kaduk) Water Extract on Adiponectin and Blood Glucose Levels in Ovariectomy-Induced Obese Rats**

A. Aida Azlina, S. Farihah, M.S. Qodriyah and M.F. Nur Azlina

This study was conducted to evaluate the effects of *Piper sarmentosum* (PS) extract and glycyrrhizic acid (GCA) on plasma adiponectin and blood glucose in

ovariectomy-induced obese rats. Twenty eight female Sprague-Dawley rats were randomly divided into four groups. Three groups were ovariectomized (OVX), while the remaining group underwent sham operation. The OVX groups were given PS water extract (0.125 g kg<sup>-1</sup>), GCA (0.120 g kg<sup>-1</sup>) and water (CTRL), respectively, while the Sham-Operated (SHM) group received only water. Plasma adiponectin and blood glucose were measured at zero, three and five months of treatment, while body weight was measured weekly. All the OVX groups had a significant reduction (p<0.05) in the plasma adiponectin compared to the SHM group. After three and five months of treatment, both PS and GCA treated group showed a significant increment (p<0.05) in the plasma adiponectin level compared to CTRL group. While, the blood glucose level, only PS treated group showed significant reduction (p<0.05) after three and five months of treatment compared to CTRL group but no significant difference (p<0.05) occurred in body weight compared to CTRL group. Our finding suggests that water extract of *Piper sarmentosum* may have the ability to reduce the amount of visceral fat in the body as shown by the increment of plasma adiponectin and improve blood glucose levels in obese rats. (*Research Journal of Medicinal Plant* 3 (3): 109-115, 2009; doi: 10.3923/rjmp.2009.109.115)

### **Time-kill Curve Studies of Ampucare Against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Proteus vulgaris***

S.M. Shrivastava, S. Kumar and M. Chaudhary

Present study attempts to determine antimicrobial efficacy of Ampucare stored at different conditions by time kill curve studies against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Proteus vulgaris*. In all storage conditions, a rapid killing time was achieved by Ampucare. Bacterial count was less than 3 Log<sub>10</sub> cfu mL<sup>-1</sup> after 6 h of study in all organisms under study. No deviation in pattern of bacterial inhibition was found in all conditions of storage of Ampucare. There was no re growth reported even after exposure for longer time under influence of Ampucare. In conclusion, Ampucare has good antimicrobial activity under all storage conditions of study against *E. coli*, *S. aureus*, *P. vulgaris* and *K. pneumoniae*. (*Research Journal of Medicinal Plant* 3 (3): 116-122, 2009; doi: 10.3923/rjmp.2009.116.122)

## **Therapeutic Potential of *Citrus medica* L. Peel Extract in Carrageenan Induced Inflammatory Pain in Rat**

S. Sood, S. Bansal, A. Muthuraman, N.S. Gill and M. Bali

In this study, we planned to evaluate the antioxidative, anti-inflammatory and analgesic potential of *Citrus medica* peel extract. Antioxidant activity in different solvent systems was evaluated. Ethyl acetate extract of *Citrus medica* peel (EtCM) showed maximum 1,1-diphenyl-2-picrylhydrazyl (DPPH) and hydrogen peroxide radical scavenging activity in a dose dependent manner as compared to ascorbic acid. Further, anti-inflammatory and analgesic activities of EtCM (200, 300 and 400 mg kg<sup>-1</sup>) were studied on carrageenan induced inflammatory pain in rats. Anti-inflammatory activity was assessed by measuring paw volume in rats. Analgesic activity was evaluated for its central and peripheral pharmacological actions by using hot plate, plantar, pin prick and mechanical allodynia tests in rats. EtCM (400 mg kg<sup>-1</sup>) produced significant decrease in paw volume and pain as compared to diclofenac. Therefore, the *Citrus medica* peel extract may be used as a future antioxidant for the treatment of inflammation and pain. (*Research Journal of Medicinal Plant* 3 (4): 123-133, 2009; doi: 10.3923/rjmp.2009.123.133)

## **Biological Activity of *Merremia emarginata* Crude Extracts in Different Solvents**

A.V. Babu, R.S.C. Rao, K.G. Kumar, B.H. Babu and P.V.V. Satyanarayana

The plant *Merremia emarginata* (Burm. f.) Hallier f., belongs to Convolvulaceae family. In traditional medicinal system, different parts of *M. emarginata* have been mentioned to be therapeutically used as deobstruent, diuretic, for cough, headache, neuralgia and rheumatism. In the present study, biological activities of different solvent extracts isolated from *M. emarginata* were tested. Hexane (IA), ethyl acetate (IB), methanol (IC) and aqueous methanol (25%) (ID) extracts of *M. emarginata* were examined. Antioxidant properties of the extracts were studied by DPPH (1,1-Diphenyl-2-Picrylhydrozyl) radical scavenging activity method and superoxide radical scavenging activity method. Methanol extract exhibited better antioxidant activity than other extracts with IC<sub>50</sub> of 8.59 µg mL<sup>-1</sup> in DPPH radical scavenging method. Methanol and hexane extracts exhibited α-amylase inhibitory activity with IC<sub>50</sub> of 104.5 and 133.4 µg mL<sup>-1</sup>, respectively. Ethyl acetate extract showed cytotoxicity with ED<sub>50</sub> of 34.29 µg mL<sup>-1</sup> in brine shrimp lethality assay. The present study revealed that the extracts

IB and IC of *M. emarginata* were found to be showed promising biological activities. Methanol extract of this plant might be use full for antioxidant and antiobesity activities with minimal toxicity. (*Research Journal of Medicinal Plant* 3 (4): 134-140, 2009; doi: 10.3923/rjmp.2009.134.140)

### **Effects of *Croton penduliflorus* Methanolic Extract on Intestinal Enzymes and Protein Content in Pregnant Rats**

T.O. Oyesola, F.S. Oluwole and O.A. Oyesola

The seeds of *Croton penduliflorus* (Family Euphorbiaceae) are often used as a purgative. The physiological effects of the methanolic extract on some intestinal disaccharide splitting enzymes were investigated in pregnant rats using an *in vivo* study. The extract was administered orally at a dose of 550 mg kg<sup>-1</sup> body weight during the three phases of pregnancy. The extract caused a significant increase in maltase activity in the three phases of pregnancy, a significant increase in total protein concentration in early and late pregnancy and a significant increase in albumin concentration in early and mid pregnancy (p<0.01). The extract also caused a significant increase in sucrase activity in early pregnancy and in lactase activity in mid pregnancy. The present data suggest that increase activity of disaccharidase brush border enzymes most especially sucrase show that the extract might be having hyperplastic (growth) effect on the small intestinal enzyme activities, there is possibility of increased nutrients to the pregnant rats and fetuses. (*Research Journal of Medicinal Plant* 3 (4): 141-145, 2009; doi: 10.3923/rjmp.2009.141.145)

### **Chemical Composition of Fixed Oil of *Olea europaea* Drupes from Iraq**

R.A. Kaskoos, S. Amin, M. Ali and S.R. Mir

The present study was aimed to describe the fatty acid composition, stability and nutritional characteristics of fixed oil of *Olea europaea* drupes from Iraq, locally known as *Zaytoon*. The oil is commonly known as olive oil and is used throughout the world and is believed to have an important role in human health and nutrition. It is considered as one among newer source of edible oil. The oil is classified as generally regarded as safe (GRAS). The fact that there are few reports of analysis of olive oil from Iraq in comparison to other parts of the world also lured us to examine chemically. Fatty acid composition of the olive oil was determined by capillary GC-FID. Thirty fatty acids (95.88%) were identified in the oil. The major

fatty acids of the oil were oleic acid (68.07±1.089%), palmitic acid (12.12±0.162%), arachidic acid (9.78±0.155%), docosahexaenoic acid DHA (2.65±0.041%) and eicosapentaenoic acid EPA (0.53±0.01). The DHA and EPA are highly valued polyunsaturated fatty acid (PUFA) and part of several health foods and nutraceuticals. Peroxidizability index calculated for the oil was 27.37% and unsaturated/saturated ratio was 3.25. High unsaturated fatty acid content signified its potential as a health promoter. Moreover, it can be expected to offer considerable resistance to oxidative rancidity during storage. (*Research Journal of Medicinal Plant 3 (4): 146-150, 2009; doi: 10.3923/rjmp.2009.146.150*)

### **Spermicidal Action of Styrene Maleic Anhydride Polyelectrolyte in Combination with Magnetic and Electrically Conductive Particles**

Rakhi K. Jha, Pradeep K. Jha, Suresh V.S. Rana and Sujoy K. Guha

The aim of this study is to evaluate impact of a new polymeric contraceptive SMA-Fe<sub>3</sub>O<sub>4</sub>-Cu-DMSO called Smart RISUG (acronym for Smart Reversible Inhibition of Sperm under Guidance), a colloidal suspension of styrene maleic anhydride co-polymer (SMA), nano-micro iron oxide (Fe<sub>3</sub>O<sub>4</sub>) and copper powder (Cu) (one milligram) dissolved in dimethylsulphoxide (DMSO) (1:30); on Albino rat's sperm solution (one milliliter). Experiments to assess the morphology and viability of control as well as treated sperm cells were performed by using microscopic techniques like High Resolution Transmission Electron Microscopy (HRTEM), Field Emission Scanning Electron Microscopy (FESEM), Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM)-X ray microanalysis, phase contrast microscopy and Fluorescent Activated Cell Sorting (FACS). Treated cells indicate uniform adhesion of Smart RISUG particles to the sperm cell membrane, topological alteration, decrease in the cell count, reduced cell motility and viability, increased sperm abnormality and complete cell inactivation in about 72 h. This study suggests use of smart RISUG as a potential non-invasively reversible male/female contraceptive in future. (*International Journal of Pharmacology 5 (1): 1-12, 2009; doi: 10.3923/ijp.2009.1.12*)

### **Anticancer and Biochemical Effects of Calcium Chloride on Ehrlich Carcinoma Cell-Bearing Swiss Albino Mice**

Yousif A. Asiri

The anticancer activity of calcium chloride was evaluated from the total count and viability of Ehrlich Ascites Carcinoma (EAC) cells and their proteins, nucleic acid,

malondialdehyde (MDA) and Nonprotein sulfhydryl (NP-SH) groups in addition to observations on survival and the body weight changes. The tumors at site of injection were investigated for histopathological changes. The treatment with calcium chloride (50, 100 and 200 mg/kg/day) caused cytotoxic activity. These data are substantiated by biochemical and histopathological changes and are attributed to calcium ions, which are known to disrupt calcium homeostasis, produce ROS, damage mitochondria and cause DNA breaks. Nevertheless, these data were not in agreement with the results on survival and body weight of the same animals. Treatment at the higher doses of calcium chloride increased the body weight and restricted the life span much earlier than the lower dose of calcium chloride and ADM. The discrepancy between these results might be due to the difference in the time of observation. While the experiments on cytotoxic activity, biochemical investigation and histopathology were conducted 10 and 5 days after the implantation of EAC cells and treatment, respectively, the observations on body weight and mortality were continued until death of all the animals or up to a maximum of 50 days. Data obtained in the present study demonstrate that treatment of calcium chloride at the higher doses had no influence on body weight and cause mortality as a long term effect, which might be due to co-morbidity of several diseases, caused by hypercalcemia and impairment of mitochondria. Further experiments are warranted on the use of a sufficient number of lower doses of calcium chloride to determine a pharmacologically effective and non-toxic dose. (*International Journal of Pharmacology* 5 (1): 13-21, 2009; doi: 10.3923/ijp.2009.13.21)

### **Antidepressant-Like Effects of an Ethanolic Extract of *Sphenocentrum jollyanum* Pierre Roots in Mice**

E. Woode, N. Amidu, W.K.B.A. Owiredu, E. Boakye-Gyasi, C. Ansah and M. Duwiejua

In the present study, the effect of an ethanolic extract of the roots of the plant in two animal models of depression the Forced Swimming Test (FST) and Tail Suspension Test (TST) has been reported. The extract (100-1000 mg kg<sup>-1</sup>; p.o.), dose-dependently reduced the duration of immobility in both the FST (ED<sub>50</sub>: 296.20±53.97 mg kg<sup>-1</sup>) and TST (203.90±39.01 mg kg<sup>-1</sup>). The effect of the extract was 20-50 times less potent than imipramine and fluoxetine which were used as standards. Pretreatment with  $\alpha$ -methyldopa (400 mg kg<sup>-1</sup>; 3 h; p.o.) attenuated the anti-immobility effects of imipramine but not SJE and fluoxetine. Similarly, pretreatment with reserpine (1 mg kg<sup>-1</sup>; 24 h; s.c.) abolished the effect of imipramine and partially the effects of SJE but not fluoxetine. A concomitant

treatment with  $\alpha$ -methyldopa and reserpine attenuated the effects of all but fluoxetine. The extract, imipramine and fluoxetine did not modify motor performance on the rotarod test at all doses tested. Putting all together, present results suggest that SJE has antidepressant-like effects in the model employed and may possibly exert its effects by modifying monoamine transport and/or metabolism. (*International Journal of Pharmacology* 5 (1): 22-29, 2009; doi: 10.3923/ijp.2009.22.29)

### **Quantification of Acute Renal Denervation Diuresis and Natriuresis in Sprague Dawley and Spontaneously Hypertensive Rats**

I.M. Salman, M.A. Sattar, N.A. Abdullah, O.Z. Ameer, M.H. Abdulla, Md. A.H. Khan and E.J. Johns

The present study was undertaken to quantify the renal salt and water excretory functions in response to acute unilateral renal denervation in Sprague Dawley (SD) and spontaneously hypertensive (SHR) rats in an attempt to characterize the relative contribution of renal sympathetic nerve activity (RSNA) to renal functional excretory responses in normotensive and hypertensive conditions. Adult male SD and SHR rats were fasted overnight, anesthetized with pentobarbitone sodium ( $60 \text{ mg kg}^{-1}$  i.p.), denervated by application of phenol to the left renal artery and maintained on an intravenous (i.v.) infusion of normal saline for 2 h. Throughout this period, six urine and plasma samples were collected at 20 min intervals to study kidney function parameters. The data showed that there was a significantly higher ( $p < 0.05$ ) amount of sodium and water excretions in the urine of denervated SD and SHR rats as compared to their innervated counterparts. No significant difference in the renal salt and water excretions was seen between innervated SD and SHR rats; however, the difference was significant ( $p < 0.05$ ) following removal of renal sympathetic input. No appreciable changes in the mean arterial blood pressure (MAP) and plasma sodium ( $P_{\text{Na}}$ ) were observed in denervated SD and SHR rats as compared to the innervated ones; yet, MAP values were significantly higher ( $p < 0.05$ ) in denervated and innervated SHR rats in comparison to the denervated and innervated SD rats. Moreover,  $P_{\text{Na}}$  in denervated SHR rats, which was significantly higher ( $p < 0.05$ ) in SHR rats as compared to SD rats prior to renal denervation, tended to approximate the one in denervated SD rats. In conclusion, this study confirmed the significant role played by the renal nerves in the control of renal functions. Diuresis and natriuresis are typical responses to acute renal denervation (ARD) in SD and SHR rats. Enhanced salt and water excretion following ARD in SHR rats suggests high renal sympathetic nerve



discharge in these animals and highlights the significant contribution of renal nerves to the genetic model of essential hypertension. (*International Journal of Pharmacology* 5 (1): 30-36, 2009; doi: 10.3923/ijp.2009.30.36)

### ***Torreya nucifera* Essential Oil Inhibits Skin Pathogen Growth and Lipopolysaccharide-Induced Inflammatory Effects**

W.J. Yoon, S.S. Kim, T.H. Oh, N.H. Lee and C.G. Hyun

In this study, the chemical composition of *Torreya nucifera* essential oil (TEO) and its biological activities were analyzed. TEO was obtained by steam distillation from leaves collected from Jeju Island and analyzed using gas chromatography (GC)-flame ionization detection (FID) and GC-MS. dl-Limonene (30.1%),  $\delta$ -3-carene (15.37%) and  $\alpha$ -pinene (11.5%) were the major components in TEO. The antibacterial and anti-inflammatory activities of TEO against skin pathogens have not previously been reported. Thus, we assessed the antibacterial activities of TEO using the disk diffusion method. TEO showed excellent antibacterial activities against *Propionibacterium acnes*, *Propionibacterium granulosum*, *Malassezia furfur*, *Staphylococcus epidermidis* and *Candida albicans*. The minimum inhibitory concentration (MIC) of TEO against these skin pathogens ranged from 2.5 to 20.0  $\mu\text{L mL}^{-1}$ . In addition, TEO reduced the LPS-induced secretion of interleukin-1 $\beta$  (IL-1 $\beta$ ), IL-6, NO and PGE<sub>2</sub> in RAW 264.7 cells, indicating that it has anti-inflammatory effects. Therefore, we suggest that TEO may be an attractive candidate for promoting skin health. (*International Journal of Pharmacology* 5 (1): 37-43, 2009; doi: 10.3923/ijp.2009.37.43)

### **Vasorelaxant Properties of *Loranthus ferrugineus* Roxb. Methanolic Extract**

O.Z. Ameer, I.M. Salman, M.F. Yam, H.H. Abd Allah, M.H. Abdulla, A.M. Shah, A. Sadikun and M.Z. Asmawi

In the present study, *Loranthus ferrugineus* was evaluated for blood pressure lowering activity using *in vitro* and *in vivo* animal experimental approaches. The fresh aerial parts of the plant were dried, pulverized into powder and successively extracted with petroleum ether, chloroform, ethyl acetate, methanol and water using hot extraction methods. Each of the extracts was dried under reduced pressure using rotary evaporator and subsequently freeze-dried. The effects of three different concentrations (0.5, 1 and 2 mg mL<sup>-1</sup> of each extract were examined on isolated rat aortic ring preparations and responses to cumulative doses of noradrenaline (NA) were measured. It was found that the relatively polar

methanol extract was the most potent to produce a significant ( $p < 0.05$ ) dose-dependent inhibition in the maximum response and to shift the dose-response curve of NA to the right which suggests that *Loranthus ferrugineus* methanolic extract (LFME) contains compound(s) with non-competitive inhibitory activity. In another set of experiments, LFME was found to be the most active in blood pressure lowering activity in anaesthetized normotensive Sprague Dawley (SD) rat model. Moreover, LFME produced a dose-dependent blood pressure lowering effect. Chemical analysis of LFME showed the presence of significant amounts of polyphenolic and flavonoid constituents. The data suggests that LFME contains some biologically active substances that produce a significant dose-dependent blood pressure lowering effect and vasodilatation is one of the possible mechanisms which may explain its use in the management of hypertension. Furthermore, LFME effects can possibly be attributed to the high polyphenolic contents of this plant. (*International Journal of Pharmacology* 5 (1): 44-50, 2009; doi: 10.3923/ijp.2009.44.50)

### **Evaluation of the Reproductive Toxicity of Chlorpyrifos Methyl, Diazinon and Profenofos Pesticides in Male Rats**

Nour El-Hoda A. Zidan

The toxic effects of organophosphorus pesticides (i.e., chlorpyrifos methyl, diazinon and profenofos) on male reproductive system of rats were evaluated. Rats received pesticides mixed with powdered feed at concentrations of 5 and 50 ppm of each pesticide for 65 successive days. Sex organs weight, semen picture, concentrations of the hormones [i.e., testosterone, Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH)], activities of acetylcholinesterase (AChE) and histopathological changes in testes were the criteria used to evaluate the reproductive toxicity of the treated rats. Results showed that the effect of all tested pesticides on testes and seminal vesicles weights was dose-dependent since all tested pesticides at 50 ppm significantly decreased their weights. Serum AChE activity was inhibited with all tested pesticides. Both the concentrations of the tested pesticides decreased sperm count associated with increase in the number of morphologically abnormal spermatozoa of treated rats; however sperm motility was significantly decreased with the highest concentration of the tested pesticides. A decrease in the serum testosterone was observed in all treated groups; however LH and FSH levels were decreased with the highest concentration of the tested pesticides. Tissues of treated rat's testes showed slight alterations when histopathologically examined especially with the higher concentrations. (*International Journal of Pharmacology* 5 (1): 51-57, 2009; doi: 10.3923/ijp.2009.51.57)

## **Modulation of Restraint Induced Gastric Oxidative Changes in Rats by Tocotrienol and Tocopherol**

M.F. Nur Azlina, K. Rubaizah, M. Siti Muliana and M.I. Nafeeza

The present study compares the effect of tocotrienol mixture and  $\alpha$ -tocopherol on gastric malondialdehyde (MDA), glutathione peroxidase (GPx), superoxide dismutase (SOD), reduced and oxidized glutathione (GSH and GSSG) content and prostaglandin E<sub>2</sub> level in rats exposed to restraint stress. Twenty-four male *Sprague dawley* rats were randomly assigned into 4 equal sized groups; two control groups and two treated groups which were supplemented with either tocotrienol (TT) or  $\alpha$ -tocopherol (TF) orally at a dose of 60 mg kg<sup>-1</sup> body weight. After 28 days of treatment, one control group, the TT and TF groups were subjected to restraint stress, 2 h daily for 4 consecutive days. After the last exposure to stress, the stomach was excised for the evaluation of the parameters. Present findings showed that TT was better in preventing the formation of gastric lesion compared to TF while both TT and TF significantly reduces the gastric MDA content compared to stress control. We also found that both TT and TF have the ability to reduce prostaglandin E<sub>2</sub> loss which was apparent with stress exposure. The endogenous content of antioxidant enzyme GPx activity and GSH content was maintained towards the normal levels in rats receiving TT but not in the TF treated group. The SOD level however was not altered in stressed rats. As a conclusion, tocotrienol posses a better protective effect against stress-induced gastric lesions compared to  $\alpha$ -tocopherol. The protective effect was associated with decreased lipid peroxidation, increased prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) and restoration of GPx activity and GSH content which was altered by stress. (*International Journal of Pharmacology* 5 (1): 58-64, 2009; *doi*: 10.3923/ijp.2009.58.64)

## **Antisickling Activity and Thermostability of Anthocyanins Extract from a Congolese Plant, *Hymenocardia acida* Tul. (Hymenocardiaceae)**

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Antisickling activity of anthocyanins extract from a Congolese plant (*Hymenocardia acida* Tul.) was evaluated using Emmel test. Chromatographic separations using chloroform-benzene (2:1) provided three fractions A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> with the most polar [A<sub>1</sub> (TLC, R<sub>f</sub> = 0.21)] exhibiting the highest activity.

Thermal kinetic degradation of this fraction at 100 and 120°C produced a first order rate constants  $k = 2.64 \times 10^{-4}$  and  $4.08 \times 10^{-4}$ , respectively. Structural elucidation of isolated compounds is in progress. (*International Journal of Pharmacology 5 (1): 65-70, 2009; doi: 10.3923/ijp.2009.65.70*)

### **Biological Activities of *Pereskia bleo* Extracts**

S.I.A. Wahab, A.B. Abdul, S.M. Mohan, A.S. Al-Zubairi, M.M. Elhassan and M.Y. Ibrahim

The aim of this study is to screen the hexane, dichloromethane, ethyl acetate and methanol extracts of *Pereskia bleo* (PB) for their antibacterial, anti-oxidant and anti-cancer properties using disc diffusion method, DPPH assay and MTT cytotoxicity test, respectively. It is found that hexane and methanol extracts showed highly and moderately, respectively, considerable antibacterial activity towards two Gram-negative bacteria, *P. aeruginosa* 60690 and *S. choleraesuis*. Ethyl acetate extract showed a weak narrow spectrum activity ( $\approx 35\%$  of streptomycin activity). The highest antibacterial activity on MRSA is obtained by DCM extract. Hexane extract was the most effective DPPH radical scavenger (37.55%). Ethyl acetate and DCM extracts were less effective free radical scavenger (16.1%). None of the extracts were cytotoxic significantly towards MCF-7, HT-29 and CEM-SS cell lines after 72 h incubation time ( $IC_{50} > 30 \mu\text{g mL}^{-1}$ ). It could be concluded that antibacterial activity of *P. bleo* is the most promising biological activity attributed to this plant. (*International Journal of Pharmacology 5 (1): 71-75, 2009; doi: 10.3923/ijp.2009.71.75*)

### **Effect of Xylazine Sedation on Some Haematological Indices after Chloramphenicol Pre-Treatment in Sokoto Red Goats**

M. Gweba, K.I. Onifade and O.O. Faleke

The effect of a single dose pre-treatment with chloramphenicol at  $50 \text{ mg kg}^{-1}$  given intramuscularly on xylazine sedation was evaluated on 6 Sokoto Red goats weighing 11-14 kg. The duration of xylazine sedation after xylazine administration at  $0.2 \text{ mg kg}^{-1}$  IM alone was  $83.16 \pm 10.95$  min (control), as against  $129 \pm 1.78$  and  $157.83 \pm 4.99$  min for the other two pre-treatments with chloramphenicol, respectively. There was a significant ( $p < 0.05$ ) decrease in the haemoglobin concentration for all treatments while a significant increase in the white blood cells count was observed for all treatments. Irrespective of weight variation, the goats in all exhibited the same clinical signs. It can be deduced from this research that

chloramphenicol pre-treatment may prolong the duration of action of xylazine sedation. (*International Journal of Pharmacology* 5 (1): 76-80, 2009; doi: 10.3923/ijp.2009.76.80)

### **Antibacterial, Antifungal and Toxicity of Rare Iranian Plants**

K. Keymanesh, J. Hamed, S. Moradi, F. Mohammadipanah and S. Sardari

As a part of our drug discovery program, an effort to introduce new effective medicinal plants, with antibacterial, antifungal and cytotoxic properties was made. The extracts of aerial part of 8 plants, collected in southeastern Iran, were investigated against standard strains of *Bacillus subtilis*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Salmonella enterica* subsp. *enterica* ser. Typhi, *Escherichia coli*, methicillin resistant *Staphylococcus aureus* (isolated from patients), *Fusarium oxysporum*, *Aspergillus niger*, and *Aspergillus fumigatus*. We used brine shrimp (*Artemia salina*) cytotoxicity bioassay in order to provide a better base for introducing the extracts as the new therapeutic candidates. *Capparis deciduas* (Forsk.) Edjw. and *Cleome oxypetala* Boiss. (both from Capparidaceae family) were recognized as having the potential for development of new antibiotics. On the other hand, *Cistanche tubulosa* (Schrenk) R. Wight, could be worthy of attention for finding anticancer phytochemicals. (*International Journal of Pharmacology* 5 (1): 81-85, 2009; doi: 10.3923/ijp.2009.81.85)

### **Dual Effects of Interaction Between Meloxicam, Diclofenac Sodium or Tramadol and Nitrogen Species Radicals: *In vitro* Comparative Study**

M.S.M. Al-Nimer and E.A. Ali

This study aimed to investigate the interaction between synthetic peroxyxynitrite or sodium nitroprusside (nitric oxide donor) and meloxicam, diclofenac sodium or tramadol HCl. Meloxicam, diclofenac sodium or tramadol HCl (100-500 µg) were incubated in phosphate buffer saline in presence or absence of synthetic peroxyxynitrite (180 µM) or sodium nitroprusside as nitric oxide donor (10 mM). The level of peroxyxynitrite and nitric acid in solution were measured using UV-visible spectrophotometer. The results showed that meloxicam scavenged synthetic peroxyxynitrite and involved in peroxyxynitrite mediated phenol nitration when it incubated alone in phosphate buffer. All tested compounds, *in vitro*, behaved like sodium nitroprusside in releasing nitric oxide. Both meloxicam and diclofenac sodium reduced the activity of sodium nitroprusside-releasing nitric oxide.

Tramadol HCl was not interacted with sodium nitroprusside at any concentration. We concluded that selective or non selective nonsteroidal anti-inflammatory drugs reduced the activity of nitric oxide donor while tramadol HCl is free from this effect. (*International Journal of Pharmacology* 5 (1): 86-89, 2009; *doi*: 10.3923/ijp.2009.86.89)

## **Solid Lipid Nanoparticles Preparation and Characterization**

N. AL-Haj and A. Rasedee

The presents study aimed to prepare and characterize Solid Lipid Nanoparticles (SLNs) from palm oil materials. Hydrogenated palm oil and lecithin incorporated with surfactant were mixed and formed by High Pressure Homogenization (HPH) at elevated temperature. Appropriate analytical methods are needed for the characterization of SLN. The use of several analytical techniques is a necessity such as particle size which determined using Photon Correlation Spectroscopy (PCS). The change of particle charge was studied by Zeta Potential (ZP) measurements, while the melting and recrystallization behavior characterized by Differential Scanning Calorimetry (DSC). Data showed physical stability of the formulation. In conclusion, the SLN presented here are well suited for several applications including drug delivery. (*International Journal of Pharmacology* 5 (1): 90-93, 2009; *doi*: 10.3923/ijp.2009.90.93)

## **Evaluation of the Proposed Inhibitory Effect of the Aqueous Stem-Bark Extract of *Ficus exasperata* on Uterine Preparations *in vitro***

E.E. Bafor, M. Nwiko, E.K.I. Omogbai, R.I. Ozolua and Z.A.M. Nworgu

The effect of the aqueous stem-bark extract of *Ficus exasperata* (ASE) was studied on oxytocin- and acetylcholine-induced uterine contractions in uterine preparations isolated from non-pregnant Sprague-Dawley rats in oestrus. Preliminary phytochemical analysis was also performed. There were no statistically significant increases in the concentrations of oxytocin and acetylcholine required to elicit 30 and 50% of maximum response ( $EC_{30}$  and  $EC_{50}$ , respectively) in the presence of the extract. Salbutamol and atropine, however, significantly inhibited the effects of oxytocin and acetylcholine, respectively. Phytochemical analysis revealed the presence of alkaloids, tannins and saponin glycosides. These results indicate that ASE possesses no inhibitory effect on the non-pregnant rat uterus as claimed by traditional healers. (*International Journal of Pharmacology* 5 (1): 94-97, 2009; *doi*: 10.3923/ijp.2009.94.97)

## **Antimicrobial Activity of Essential Oil from *Nelumbo nucifera* Gaertn. Pollen**

Chaiyasit Sittiwet

The *Nelumbo nucifera* Gaertn. pollen essential oil was extracted by using vapor distillation. Antimicrobial activity of *Nelumbo nucifera* Gaertn. pollen essential oil has been investigated using agar diffusion susceptibility test and broth macro-dilution. The essential oil were tested against both gram positive (*S. aureus* ATCC 25923, *S. epidermidis* ATCC 12228, *M. luteus* ATCC 9341, *B. subtilis* ATCC 6633 and *L. plantarum* ATCC 14917) and gram negative (*E. coli* ATCC25922, *S. typhimurium* ATCC 14028, *K. pneumoniae* ATCC 10031, *P. vulgaris* ATCC 13315, *Ps. aeruginosa* ATCC 9721) bacteria using agar diffusion susceptibility test. Significant zone of inhibition were observed for *S. typhimurium* ATCC14028 and *E. coli* ATCC25922). The MICs and MBCs are 10-40 and 20-80 ml L<sup>-1</sup>, respectively. *Nelumbo nucifera* pollen essential oil show inhibitory effect on growth of food born pathogen bacteria in low concentration which indicated the possibility of used as food preservation additive. (*International Journal of Pharmacology* 5 (1): 98-100, 2009; *doi*: 10.3923/ijp.2009.98.100)

## **Anti-Nociceptive Effects and the Mechanism of *Palisota hirsuta* K. Schum. Leaf Extract in Murine Models**

E. Woode, E. Boakye-Gyasi, G.K. Ainooson, C. Ansah and M. Duwiejua

The anti-nociceptive effect of an ethanolic leaf extract of *Palisota hirsuta*, a plant used locally in Ghana for various painful conditions was assessed, using various pain models. *Palisota hirsuta* extract (PHE) together with morphine and diclofenac (positive controls), all showed significant dose-dependent anti-nociceptive activity in all the models used, that is the tail withdrawal test, the inflammatory-induced mechanical hyperalgesia test, the acetic acid induced writhing test and the formalin test. The anti-nociceptive effect exhibited by PHE in the formalin test was reversed by the systemic administration of the non-selective opioid antagonist, naloxone, the NO synthase inhibitor, N<sup>o</sup>-nitro-arginine methyl ester (L-NAME) and the ATP-sensitive K<sup>+</sup> channel inhibitor, glibenclamide. However, theophylline, a non-selective adenosine receptor antagonist did not reverse this effect. PHE, unlike morphine, did not induce tolerance to its anti-nociceptive effect in the formalin test after chronic administration and also morphine tolerance did not cross-generalize to PHE. Overall, the present results

demonstrate that the anti-nociceptive effects of PHE might partially or wholly be due to the stimulation of peripheral opioid receptors through the activation of the nitric oxide-cyclic GMP-ATP-sensitive  $K^+$  (NO/cGMP/ $K^+$ ATP)-channel pathway without tolerance induction after chronic administration. (*International Journal of Pharmacology* 5 (2): 101-113, 2009; doi: 10.3923/ijp.2009.101.113)

### **Safety Evaluation of Long Term Treatment of Methanol Sub-Fraction of Seeds of *Carica papaya* as a Male Contraceptive with Particular Emphasis on Carcinogenicity in Albino Rats**

S. Goyal, B. Manivannan, A.S. Ansari and N.K. Lohiya

A preliminary study to evaluate if long term treatment of Methanol Sub-Fraction (MSF) of the seeds of *Carica papaya* as a male contraceptive would develop neoplastic lesions in vital organs was carried out in albino rats at 50, 250 and 500  $\text{mg kg}^{-1}$  b.wt.  $\text{day}^{-1}$  for a period of 24 months, with a minimum dose being one therapeutic dose. Pre-terminal deaths, 45% in males and 48% in females, well within the acceptance limit, were reported to be age related and not treatment related, resulted due to general/respiratory/gastrointestinal/ urogenital disorders in both males and females of control and treated animals. Skin peeling, withering of fur leaving skin patches were observed in few of the animals after 18 months of treatment. Absence of spermatozoa in the cauda epididymis was evident in all the treated animals. No major structural changes compared to control were evident in the vital organs. Serum testosterone, serum electrolytes, tissue biochemical, hematology and clinical chemistry were comparable to those of control animals, suggesting no adverse effect of the test substance following long term treatment. The results provided evidence that the methanol sub-fraction of the seeds of *Carica papaya* does not lead any development of neoplastic lesion following life term treatment for 24 months in rats and is safe enough to be permitted for further trials as a male contraceptive. (*International Journal of Pharmacology* 5 (2): 114-125, 2009; doi: 10.3923/ijp.2009.114.125)

### **Selenomethionine Induced Changes on the Binding of Spermine with DNA: A Study by Fourier Transform Raman and Fourier Transform Infra Red Spectroscopy**

N. Iyandurai and R. Sarojini

In this research, FT Raman and FTIR spectroscopy had been used to extend our knowledge about spermine-DNA and selenomethionine-spermine-DNA



interaction at different volume ratios. The analysis of FT Raman and FTIR data supported the existence of structural specificities in the interaction. From the observed results, the effect of spermine on DNA is reversed when selenomethionine is added with spermine-DNA complexation. For example, band at  $1511\text{ cm}^{-1}$  is assigned to an adenine carbon-carbon stretching vibration. This band shifts downward by  $3\text{ cm}^{-1}$  in the spectra of spermine-DNA of all the complexes studied. Similarly this band shifts upward by  $2\text{ cm}^{-1}$  in the spectra of selenomethionine-spermine-DNA of all the complexes studied. (*International Journal of Pharmacology* 5 (2): 126-136, 2009; doi: 10.3923/ijp.2009.126.136)

### **Effect of Green and Black Teas on Immobilization Induced Stress in Male Wistar Albino Rats**

Salim S. Al-Rejaie

The present study was undertaken to investigate the potential of green and black teas to modulate restraint stress-induced oxidative changes in male Wistar albino rats. Repeated immobilization for 4 h daily for five consecutive days per week (for 2 and 4 weeks) was used as a test model. Repeated immobilization stress significantly decreased glutathione (GSH), RNA and total protein levels, while malondialdehyde (MDA) levels were elevated in brain and liver tissues. Daily drinking of green or black tea only attenuated the RNA decrease and the MDA increase in stressed groups in liver tissues. Green tea group attenuated the decrease in GSH and RNA and the increase in MDA induced by immobilization stress in brain tissues. However, black tea only attenuated the increase in brain MDA in stressed animals. The effect of green tea on restraint stress was higher in brain than liver. In conclusion, the present results revealed that the antioxidative effect of green tea during immobilization stress was higher, possibly attributed to the presence of relatively higher concentrations of flavonoids than in black tea. (*International Journal of Pharmacology* 5 (2): 137-145, 2009; doi: 10.3923/ijp.2009.137.145)

### **Inhibition of Ethanol-Induced Gastric Mucosal Damage by Carvedilol in Male Wistar Albino Rats: Possible Biochemical Changes**

Salim S. Al-Rejaie

The effect of acute carvedilol (a third-generation nonselective  $\beta$ -blocker) pretreatment on gastric mucosal injury induced by 80% ethanol was investigated

in male Wistar albino rats. The effects caused by pylorous ligation, accumulated gastric acid secretions and ethanol-induced changes in gastric mucus secretions, levels of proteins, nucleic acid, malondialdehyde (MDA) and non-protein sulfhydryl groups (NP-SH) in the stomach wall were investigated. The gastric ulcers were induced by administration of 1 mL of 80% ethanol, as a necrotizing agent into the stomach. Carvedilol pretreatment at two oral doses of 30 and 60 mg kg<sup>-1</sup> body weight were found to protect against the ulcerogenic effects of ethanol. Same dose regimen of carvedilol offered significant protection against ethanol-induced damage on the parameters evaluated for histopathology. Furthermore, the pretreatment afforded a significant inhibition of pylorous ligated accumulation of gastric acid secretions and ethanol-induced depletion of stomach wall mucus, nucleic acids, proteins and NP-SH contents. Only higher dose of carvedilol provided inhibition of ethanol-induced increase in MDA concentration. The protective effects of carvedilol against gastric secretion or damage to the gastric-wall mucosa may be mediated through its effects on mucus production and NP-SH concentrations, possible free-radical scavenging ability and/or cytoprotective properties. (*International Journal of Pharmacology* 5 (2): 146-154, 2009; *doi*: 10.3923/ijp.2009.146.154)

### **A Preliminary Study of Dexamethasone Against Ischemia/Reperfusion Liver Injury in Rats**

Amr A. Fouad, Mahmoud H. El-Bidawy, Arif Mohy Uddin and Mohamed T. Yacoubi

The hepatoprotective effect of dexamethasone was investigated in rats exposed to ischemia/reperfusion liver injury. Ischemia was induced by clamping the pedicle of the left hepatic lobe for 1 h followed by 3 h of reperfusion. Dexamethasone was administered 24 h before the ischemic insult in two i.p., doses (10 mg kg<sup>-1</sup>, each) with 12 h interval. Dexamethasone significantly attenuated the ischemia/reperfusion-induced elevations in serum aminotransferase and hepatic levels of tumor necrosis factor- $\alpha$  and nitric oxide. Dexamethasone also significantly compensated deficits in hepatic antioxidant defense mechanisms (reduced glutathione and catalase and superoxide dismutase activities) and suppressed lipid peroxidation observed with liver hypoxia-reoxygenation. This was associated with significant restoration of the ischemia/reperfusion-induced increase in hepatic caspase-3 activity. Neutrophil infiltration and hepatocellular necrosis and apoptosis detected by histopathological examination of liver tissue were markedly ameliorated by pre-ischemic dexamethasone treatment. In conclusion, dexamethasone can be considered a potential therapeutic agent to protect

against the major clinical challenge of liver injury resulting from ischemia/reperfusion. (*International Journal of Pharmacology* 5 (2): 155-161, 2009; doi: 10.3923/ijp.2009.155.161)

### **Anti-Angiogenic and Anti Oxidant Properties of *Orthosiphon stamineus* Benth. Methanolic Leaves Extract**

H.B. Sahib, A.F. Aisha, M.F. Yam, M.Z. Asmawi, Z. Ismail, S.M. Salhimi, N.H. Othman and A.M.S. Abdul Majid

Angiogenesis is a process by which new blood vessels are formed from the pre-existing blood vessel. *Orthosiphon stamineus* Benth. OS has been used as a medicinal herb for many centuries. Due to the presence of high level of anti-oxidants and phenolic content compounds in OS and the effect of anti-oxidants and phenolic compounds being anti-angiogenic, the perturbation of new blood vessels ability of OS was tested. Dry powdered leaves of the OS plant were extracted with Petroleum Ether (PE), chloroform (CE), methanol (ME) and water (WE) by using sequential cold maceration method. The ME of OS has the highest anti-angiogenic activity ( $93.28 \pm 1.24\%$ ) in the rat aortic assay followed by CE ( $85.55 \pm 1.64\%$ ), PE ( $51.54 \pm 4.12\%$ ) and WE ( $50.22 \pm 1.23\%$ ) in descending order of reactivity. The methanol extract was also found to have potent anti-oxidant activity in the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging activity assay. The  $IC_{50}$  value was measured to be  $0.286 \text{ mg mL}^{-1}$ . The total phenolic content of  $1 \text{ mg mL}^{-1}$  of methanol extract was equal to 38.27%. (*International Journal of Pharmacology* 5 (2): 162-167, 2009; doi: 10.3923/ijp.2009.162.167)

### **The Decoction of Leaves of *Phyllanthus discoideus* Possesses Anticonvulsant and Sedative Properties in Mice**

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The aim of this study is to scientifically look for sedative and anticonvulsant properties of the decoction of *Phyllanthus discoideus* Baill (*P. discoideus*) in mice. The *in vivo* models of epilepsy were used to evaluate the anticonvulsant properties of the plant. These models were maximal electroshock-, N-methyl-D-aspartate-, pentylenetetrazol-, isonicotinic hydrazide- acid and strychnine- induced convulsions or turning behavior in mice. The potentiation of sleep induced by diazepam in mice was used for the determination of the sedative properties. Four

doses of the plant in the decoction were used: 17.1, 42.7, 85.5 and 171 mg kg<sup>-1</sup>. The decoction of the leaves of *P. discoideus* strongly increased the total sleep time (p<0.001) induced by diazepam and precipitated its onset (p<0.001). The decoction also protected mice against maximal electroshock- (p<0.001), pentylenetetrazol- (p<0.001), strychnine- (p<0.001) and N-methyl-D-aspartate-induced seizures or turning behavior (p<0.001). Finally, the decoction increased the latency to the onset of seizure in isonicotinic hydrazide acid test (p<0.001). In conclusion the decoction of *P. discoideus* possesses anticonvulsant and sedative properties in mice. The presence of these properties could explain its use in traditional medicine in Cameroon in the treatment of insomnia and epilepsy. (*International Journal of Pharmacology* 5 (2): 168-172, 2009; doi: 10.3923/ijp.2009.168.172)

### **Effect of Protein Depletion on Host and Tumor Response to Paclitaxel in Experimental Animals**

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The present study is aimed to examine the possible effects of Protein Malnutrition (PM) on the therapeutic activity and toxicity of paclitaxel in mice implanted with Ehrlich carcinoma cells. Mice that were fed either with standard or low protein diets were treated with a single dose of paclitaxel (10 mg kg<sup>-1</sup>, i.p.). Paclitaxel administration increased the tumor growth delay of Ehrlich carcinoma from 2.8 days in protein deficient animals to 4.9 days in normal feeding mice and this represented about 43% increase in tumor growth delay. Furthermore, protein deficiency also interfered with the antitumor activity of paclitaxel. The percent survival of tumor-bearing mice after paclitaxel treatment were 56 and 19% in normal fed and protein deficient animals, respectively. Moreover, Paclitaxel administration increased the serum level of creatine phosphokinase isoenzyme (CPK-MB) in both groups, with maximum effect appeared after 48 h. Seventy two hours later, the levels were reduced to the normal values in normal fed animals while in protein malnourished mice, the activity was found to be high. In addition, paclitaxel administration significantly increased the plasma histamine concentration after 10 min and persisted for 120 min in animals on protein malnourished diet, however, in animals on a normal fed diet, histamine concentration reached the normal level after 120 min of paclitaxel administration. In conclusion, Paclitaxel administration exerts its toxic effects on both protein malnourished and normal feeding animals, however, its toxicity is enhanced and therapeutic activity is reduced in the protein deficient animals. (*International Journal of Pharmacology* 5 (2): 173-177, 2009; doi: 10.3923/ijp.2009.173.177)

## **The Effect of Oxamate on Fertilization Capacity of Mouse Sperm *in vitro***

F. Rahim, G. Saki, B. Ghavamizadeh, A. Jafaei and M. Kadkhodaei

This study was conducted *in vitro* to show the effect of oxamate on motility and fertility of the mouse. The spermatozoa were extracted from the caudal part of epididymis. The study animals divided into four groups: (1) control group in TYH medium+5 mg mL<sup>-1</sup> BSA; (2) test groups in TYH medium in which contain 10 Mm oxamate; (3) test groups in TYH medium in which contain 20 Mm oxamate and (4) test groups in TYH medium in which contain 30 Mm oxamate. All four groups were incubated for 90 min to obtain capacitation. Further their motility was checked after incubation time. The mice were super ovulated with PMSG and HCG hormones to obtain oocytes. Total of 600 oocytes were collected and cultured in drops of KSOM medium+5 mg mL<sup>-1</sup> BSA, then for fertilization process received spermatozoa from different groups of mentioned above. After 24-26 h, the rate of fertilization was checked. The results of this research indicated that oxamate at the concentration of 20 and 30 Mm significantly reduce ( $p<0.05$ ) the progress of motility and fertility. Statistical analysis showed that percentage of the sperm progress motility in both concentration of 20 and 30 Mm was significantly differ ( $p<0.05$ ) in compare with control group and in concentration of 10 Mm, respectively. The same results were obtained in the case of fertility. These findings suggested that oxamate has an inhibitory role on motility and fertility of mouse sperm. (*International Journal of Pharmacology* 5 (2): 178-180, 2009; *doi: 10.3923/ijp.2009.178.180*)

## **Anti-Arthritic Effects of *Palisota hirsuta* K. Schum. Leaf Extract in Freund's Adjuvant-Induced Arthritis in Rats**

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The anti-arthritic effect of an ethanolic leaf extract of *Palisota hirsuta*, a plant used locally in Ghana for various painful inflammatory conditions was assessed, using the Freund's adjuvant induced-arthritis model in rats. *Palisota hirsuta* Extract (PHE) as well as dexamethasone and methotrexate, used as positive controls, showed significant dose-dependent anti-arthritic properties prophylactically, curatively and also in combination therapy. PHE (30-300 mg kg<sup>-1</sup>) significantly reduced the arthritic edema in the ipsilateral paw with the highest

dose used giving a maximum inhibition of  $13.02 \pm 8.77\%$ . PHE  $300 \text{ mg kg}^{-1}$  also significantly prevented the spread of the edema from the ipsilateral to the contralateral paw indicating inhibition of systemic spread. Dexamethasone ( $0.3\text{-}3 \text{ mg kg}^{-1}$ ) and methotrexate ( $0.1\text{-}1.0 \text{ mg kg}^{-1}$ ) significantly and in a dose dependent manner also inhibited polyarthritis edema as well as completely preventing the spread of the arthritis from the ipsilateral to the contralateral paws of the treated animals. PHE in combination with methotrexate did not show any significant effect, however, there was a significant inhibition of arthritis in both the acute and the polyarthritis phases when PHE was combined with dexamethasone. Dexamethasone in combination with methotrexate gave the greatest inhibition of both phases with an extreme level of significance as expected. Overall, the present results demonstrate that PHE has anti-arthritic effect which could be similar to that exhibited by methotrexate. (*International Journal of Pharmacology* 5 (3): 181-190, 2009; doi: 10.3923/ijp.2009.181.190)

### **Vascular Responsiveness to *Macrosolen cochinchinensis* Extracts in Isolated Rat Thoracic Aorta**

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The aim of the current investigation was to examine the vascular responsiveness to different extracts obtained from *M. cochinchinensis* using isolated Sprague Dawley (SD) rat aortic rings preparations. The fresh aerial parts of the plant were dried, pulverized into powder and sequentially extracted with petroleum ether, chloroform, methanol and water using hot extraction method. The effects of three concentrations ( $0.5, 1$  and  $2 \text{ mg mL}^{-1}$ ) of each extract on rat thoracic aorta were tested using cumulative concentrations of noradrenaline (NA). The data showed that all the extracts had the ability to relax vascular smooth muscle; however, high concentrations of the methanol and water extracts caused the most significant ( $p < 0.05$ ) reduction in NA-induced vasoconstriction as compared to petroleum ether and chloroform extracts. Polyphenolic content, HPLC profiling and IR spectra were indicative of the presence of diterpenoid constituents. The results collectively suggested the presence of some biologically active ingredients of possible diterpenoid nature that have the ability to modulate the action of naturally occurring vasoactive agents such as NA on vascular smooth muscle responses *in vitro*. (*International Journal of Pharmacology* 5 (3): 191-199, 2009; doi: 10.3923/ijp.2009.191.199)

## **Antihyperglycemic, Hypolipidemic and Antioxidant Enzymes Effect of *Strobilanthes crispus* Juice in Normal and Streptozotocin-Induced Diabetic Male and Female Rats**

N.A. Norfarizan-Hanoon, R. Asmah, M.Y. Rokiah, O. Fauziah and H. Faridah

The aim of the present study was to investigate the effect of *Strobilanthes crispus* juice on glucose, lipid profile, glutathione peroxidase and superoxide dismutase in normal and streptozotocin-induced diabetic male and female albino Sprague-Dawley rats. This study was conducted on normal and streptozotocin-induced diabetic male and female Sprague-Dawley rats fed with basal diet and *S. crispus* juice with different doses 1.0, 1.5 and 2.0 mL kg<sup>-1</sup> b.wt. for 30 days. The results showed that significant ( $p < 0.05$ ) decrease in serum glucose levels in male and female diabetic and normal rats with treated *S. crispus* juice (1.0, 1.5 and 2.0 mL kg<sup>-1</sup> b.wt.). Cholesterol and triglyceride level significantly ( $p < 0.05$ ) decreased in diabetic rats treated with 1.0, 1.5 and 2.0 mL kg<sup>-1</sup> b.wt. of *S. crispus* juice. Cholesterol, triglyceride and LDL-cholesterol level showed reduction in treated male and female normal rats. HDL-cholesterol showed the increasing but not significant ( $p < 0.05$ ) difference in treated diabetic and normal male and female rats. Glutathione peroxidase and superoxide dismutase activities significantly ( $p < 0.05$ ) increased in treated diabetic and normal male and female rats. In conclusion, *S. crispus* juice possesses antihyperglycemic, hypolipidemic and antioxidant effect in streptozotocin-induced diabetic rats. Thus, *S. crispus* juice could be the alternative treatment for lowering glucose, cholesterol and triglyceride for diabetic patients in the future. (*International Journal of Pharmacology* 5 (3): 200-207, 2009; doi: 10.3923/ijp.2009.200.207)

## **Efficacy and Safety of Folic Acid During Toxic Hepatitis Induced by Acute Overdose of Paracetamol**

N.S. AL-Sowyan

Paracetamol, a major cause of acute liver failure represents a significant clinical problem. Intake of a large dose of paracetamol (APAP) may result in severe hepatic necrosis. Oxidative stress mediated by oxidative capacities of the APAP metabolite (N-acetyl-P-benzoquinon-imine (NAPQI)) is considered as the main cause of hepatotoxicity of APAP. This labor therefore seeks to induce liver damage in rats using single dose of APAP and to evaluate the possible protective effects of administration of folic acid on APAP induced liver damage in rats. Serum transaminases and lactic dehydrogenase levels were assessed as markers

of hepatic damage. Also, bilirubin, total protein, albumin, globulin and A/G ratio were analyzed. Equally, comparative effects of folic acid on the markers were also evaluated. Paracetamol caused liver damage as evident by statistically significant increased in the activities of alanine aminotransferase, aspartate aminotransferase and alkaline phosphates. There were general statistically significant losses in the activities of lactic dehydrogenase and an increase in total bilirubin and protein with significant decrease in A/G ratio in paracetamol treated group compared with the control group. Also, the histopathological examination of liver showed marked degeneration of hepatic cells and necrosis with congested portal vein and dilated hepatic sinusoid. However, folic acid was able to counteract the effect of APAP. The present results suggest that folic acid can act as hepatoprotective against paracetamol toxicity and that the mechanism by which they do this is by acting as antioxidants. (*International Journal of Pharmacology* 5 (3): 208-214, 2009; doi: 10.3923/ijp.2009.208.214)

### **Comparative Effect of Vitamins A and E on Gasoline Vapours-Induced Haematotoxicity and Weight-Loss in Male Rats**

F.E. Uboh, M.I. Akpanabiatu, Y. Alozie, E.E. Edet, J.I. Ndem and P.E. Ebong

Comparative effect of vitamins A and E on gasoline vapours haematotoxicity, growth-depression and weight-loss was assessed in male Wistar albino rats. The rats were exposed to gasoline vapours ( $17.8 \pm 2.6 \text{ cm}^3/\text{h}/\text{m}^3/\text{day}$ ), 6 h/day, 6 days/week for 20 weeks. Vitamins A (retinol) and E ( $\alpha$ -tocopherol) at prophylactic dosage (400 and 200 IU/kg/day, respectively) were orally administered to the rats separately, in the last 2 weeks of exposure. The levels of haemoglobin (Hb), haematocrit or Packed Cell Volume (PCV), Red Blood Cells (RBC), growth-rate and weight-gain in the rats exposed to the vapours were significantly lower ( $p < 0.05$ ) compared, respectively to the levels obtained for control rats. On the other hand, the levels of White Blood Cells (WBC) in the test rats were significantly higher ( $p < 0.05$ ) compared, respectively with the level obtained for male control rats. These observations indicate that exposure to gasoline vapours may cause haematotoxicity, growth-depression and weight-loss in male rats. However, administration of vitamins A and E was observed to produce a significant recovery ( $p < 0.05$ ) in haematotoxicity, growth-depression and weight-loss observed to be associated with exposure to gasoline vapours, although, the rats administered with vitamin E were noted to respond more favourably than those administered with vitamin A. This suggests that although retinol and  $\alpha$ -tocopherol may be used to reverse or prevent haematotoxicity, growth-depression and weight-loss in subjects exposed to gasoline vapours, the reversal potency of



$\alpha$ -tocopherol is higher than that of retinol. (*International Journal of Pharmacology* 5 (3): 215-221, 2009; doi: 10.3923/ijp.2009.215.221)

### **Hepatoprotective Activity of *Coccinia grandis* Leaves Against Carbon Tetrachloride Induced Hepatic Injury in Rats**

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*Coccinia grandis* Linn. (Cucurbitaceae) is a perennial branched handsome tendril climber, distributed through out India. It has been used in folk medicine for the treatment of jaundice. The aim of this work was to study the hepatoprotective effect of crude ethanolic and aqueous extracts from the leaves of *C. grandis* against liver damage induced by  $\text{CCl}_4$  in rats. The ethanolic extract at an oral dose of  $200 \text{ mg kg}^{-1}$  exhibited a significant ( $p < 0.05$ ) protective effect as shown by lowering serum levels of glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, alkaline phosphatase, total bilirubin and total cholesterol and increasing levels of total protein and albumin levels as compared to silymarin, the positive control. These biochemical observations were supported by histopathological examination of liver sections. The activity may be due to the presence of flavonoid compounds. The extracts showed no signs of acute toxicity up to a dose level of  $2000 \text{ mg kg}^{-1}$ . Thus it could be concluded that ethanolic extract of *C. grandis* leaves possesses significant hepatoprotective activity. (*International Journal of Pharmacology* 5 (3): 222-227, 2009; doi: 10.3923/ijp.2009.222.227)

### **Evaluating the Antibacterial Activity and *in vivo* Assay of Methanolic Extract of *Stichopus badiionotus***

N.S. Mariana, M.A. Norfarrah, K.A.N.I. Nik, F.M. Yusoff and A. Arshad

This study investigated the antibacterial activity of the methanolic extract of the animal to justify its use in traditional medicine. Antimicrobial activity was assayed by disc diffusion method and broth macro dilution method. From the result it appeared that the methanolic extract of *Stichopus badiionotus* displayed antibacterial activities against *Staphylococcus aureus*, three non resistant strains and three multiple resistant strains. The Minimum Inhibitory Concentration (MIC) of the extract against non resistant strain values were  $3.75 \text{ mg mL}^{-1}$  and for resistant strain values  $7.50 \text{ mg mL}^{-1}$ . Further more, this extract tested on rats in wound infection model justified faster healing rates compared to antibiotics. These

results indicate that the traditional use of these holothurians for the treatment of *S. aureus* infection mainly on resistant strains should be elucidate to bring out the potential antibacterial agent. (*International Journal of Pharmacology* 5 (3): 228-231, 2009; doi: 10.3923/ijp.2009.228.231)

### **Assessment of Inhaler Technique in Patients Attending a Chest Hospital in Riyadh City**

M.I. Al-Hassan

The study population consisted of patients diagnosed with Chronic Obstructive Pulmonary Disease (COPD), who were maintained on MDIs. The data was collected through structured questionnaire on demographic data, patient information characteristics and possible factors that might affect proper MDI utilization and scoring system to assess the technique. The results obtained demonstrated defective use of MDIs, which warrants education of the society and public awareness. Health professionals, including pharmacists should be well prepared to train the patients for their correct use. The present study concludes that most patients use the inhalers incorrectly. Thus, education of the society is an important factor that may increase public awareness about medication and therefore improve patient compliance. More studies are needed to assess health professionals' knowledge about use of inhalers and role of pharmacists in teaching patients their proper use. (*International Journal of Pharmacology* 5 (3): 232-235, 2009; doi: 10.3923/ijp.2009.232.235)

### **Anti-Nociceptive Assets of Coral Associated Gastropod, *Drupa margaritica***

C. Chellaram and J.K. Patterson Edward

The extract of gastropod, *Drupa margaritica* tested for their analgesic assets using chemical (acetic acid) induced and hot plate method on Swiss mice model showed promising results. One hundred percent column purified extracts of the *D. margaritica* (25 and 100 mg kg<sup>-1</sup> p.o.) exhibited significant (p<0.001) writhing inhibition of 65 and 78.57%, respectively against acetic acid induced abdominal constrictions. The result of hot plate study, in the difference between the mean reaction time and increased percentage of jump response of test animals in the treated groups, control and standard groups were statistically significant (p<0.001). At 30 min, the mean reaction time for extracts (50 mg kg<sup>-1</sup> p.o.) group was 6.67±1 sec, when compared to control group (2.67±0.52 sec) and

pentazocine treated groups ( $11.5 \pm 1.22$  sec) for  $100 \text{ mg kg}^{-1}$  p.o. These facts suggest that the 100% acetone fraction of the *D. margariticola* was shown the strongest analgesic action. The important results obtained in present study were central and peripheral analgesic activities demonstrated by the inhibitory action on the acetic acid induced writhings and hot plate models. The hot plate method was found to be suitable in the evaluation of centrally acting analgesic action but not for peripherally acting analgesic action. (*International Journal of Pharmacology* 5 (3): 236-239, 2009; doi: 10.3923/ijp.2009.236.239)

### ***In vitro* Antimicrobial Activity of *Schefflera leucantha*: The Potential of Respiratory Tract and Urinary Tract Infection Treatment**

C. Sittiwet, D. Puangpronpitag and N. Niamsa

The antimicrobial activity testing to evaluate the possibility of *S. leucantha* for treatment of nosocomial infection such as respiratory tract and urinary tract infections. The aerial part of *S. leucantha* was extracted using aqueous system with yield of 0.7-1.3% of dried weight of dried plant's powder. The antibacterial activity of *S. leucantha* aqueous extract has been screened using agar diffusion method. The *S. leucantha* aqueous extract showed inhibitory effect on growth of *L. plantarum* ATCC 14917, *E. coli* ATCC 25922, *K. pneumoniae* ATCC 10031 and *P. vulgaris* ATCC 13315. The MICs of *S. leucantha* are in the range of  $8-16 \text{ g L}^{-1}$  while MBCs are in the range of  $16-32 \text{ g L}^{-1}$ . In conclusion, the aqueous extract of *S. leucantha* showed inhibitory effect on growth of respiratory tract and urinary tract infection bacteria at low concentration. This result may give supporting data of used *S. leucantha* as nosocomial infection treatment. (*International Journal of Pharmacology* 5 (3): 240-243, 2009; doi: 10.3923/ijp.2009.240.243)

### **Fatty Acid Profile, $\alpha$ -Tocopherol Content and Total Antioxidant Activity of Oil Extracted from *Nigella sativa* Seeds**

Ghanya Al-Naqeeb, Maznah Ismail and Adel S. Al-Zubairi

*Nigella sativa* (*N. sativa*) is popularly known as the black seed, a herb that has traditionally been used for centuries in many parts of the world. It has gained popularity due to its potential health benefits. However, more scientific data is needed to support the various health claims. This study was carried out to determine the fatty acid profile,  $\alpha$ -tocopherol content and to evaluate the

antioxidant activity of seed oil samples from three different regions in Yemen namely Marib, Sadah and Taiz. *N. sativa* seeds oil was extracted using three different solvents (n-hexane, petroleum ether and chloroform: methanol 2:1 v/v) and the fatty acids composition was analyzed using gas chromatography, while the  $\alpha$ -tocopherol was determined using HPLC. Ferric thiocyanate (FTC) and thiobarbituric acid (TBA) methods were used to evaluate the antioxidant activity of the seeds oil. Results indicated that *N. sativa* seeds contain high amount of oil (30-48%) and the major unsaturated fatty acids were linoleic acid (57.96, 58.04 and 57.04%) followed by oleic acid (21.49, 20.87 and 20.60%), while the main saturated fatty acids were palmitic (11.56, 11.23 and 11.22%), followed by stearic and myristic acids in Marib, Taiz and Sadah samples respectively. Oil extracts exhibited strong antioxidant properties when compared to  $\alpha$ -tocopherol with 78-82% inhibition in the FTC method and 70-80% in the TBA assays. The oil extracts were found to be rich in  $\alpha$ -tocopherol content  $290 \pm 1.5$ ,  $170 \pm 0.40$  and  $120 \pm 0.15$  mg/100 g, in Marib, Sadah and Taiz samples, respectively. Present results suggest that *N. sativa* seeds contain high amount of antioxidants that are essential for health and preventing numerous diseases. (*International Journal of Pharmacology* 5 (4): 244-250, 2009; doi: 10.3923/ijp.2009.244.250)

### **Studies on the Anti-Inflammatory, Analgesic and Antipyretic Properties of *Andrographis echioides* Nees**

S.K. Basu, M. Rupeshkumar and K. Kavitha

The purpose of this investigation was to study the anti-inflammatory, analgesic and anti-pyretic properties of total extract and three fractions (ether, chloroform and ethyl acetate) from *Andrographis echioides* (Acanthaceae) in rats and mice. The plant material was extracted with methanol. In order to estimate the polarity of the active compounds, the total extract was successively partitioned between ether, chloroform and ethyl acetate. Dose of 200 and 400 mg kg<sup>-1</sup> of each extracts were used in carrageenan-induced paw edema, cotton-pellet granuloma in rats, writhing nociception in mice and yeast induced hyperpyrexia in rats. All compounds reduced paw edema in comparison to the control group at 5 h post carrageenan injection. The total, ether and ethyl acetate extracts were similar to phenylbutazone ( $p < 0.001$ ), while the chloroform extract was weaker than phenyl butazone in reduction of paw edema and cotton-pellet granuloma. All extracts as well as Paracetamol induced antinociception in writhing test in comparison to control. Positive results for flavanoids and phenolic compounds were investigated by phytochemical analysis of total extract. Phenolic compounds were found in three fractions. The higher antinociception effects of total and ether extracts among

different extracts tested, might back to the presence of flavanoids and phenolic compounds. The total, ether, ethyl acetate extract produced a significant dose dependent inhibition of temperature elevation. These data suggest that different extracts of *A. echioides* produce antinociceptive, anti-inflammatory and antipyretic activities that could be due to the effect of one or a combination of the bio active components in each extract. (*International Journal of Pharmacology* 5 (4): 251-256, 2009; **doi**: 10.3923/ijp.2009.251.256)

### **Preventive Effect of Grape Seed Hydroalcoholic Extract on Dementia Type of Alzheimer's Disease in Aged Male Rats**

Y. Farbood, A. Sarkaki and M. Badavi

Aim of this study was to investigate the effects of Grape Seed Extract (GSE), as a potent antioxidant on spatial memory in rats with Alzheimer's Disease (AD). Alzheimer's disease is a progressive neurodegenerative disease clinically characterized by dementia and neurobehavioral deterioration. Forty five aged male wistar rats were divided randomly into three equal number groups (n = 15). Control; AD and GSE+AD. The rat model of Alzheimer's disease was induced by local injection of Ibotenic acid (Ibo) into brain Nucleus Basalis Magnocellularis (NBM) or meynert bilaterally (Ibo, 6  $\mu\text{g } \mu\text{L}^{-1}$  each site) under stereotaxic surgery. The spatial memory performance was evaluated by Morris Water Maze task. The results show that injection of Ibo into NBM of rats could impair spatial memory capacity. The GSE supplementation (100 mg  $\text{kg}^{-1}$ , by gavages) for 30 days before NBM lesion could be alleviating pre-lesion memory impairment. Present results showed that GSE could be a useful agent to prevent neurodegenerative disorders such as AD. (*International Journal of Pharmacology* 5 (4): 257-262, 2009; **doi**: 10.3923/ijp.2009.257.262)

### **Antitumoral Effect of *L. inermis* in Mice with EAC**

Mehmet Ozaslan, Mehmet Emin Zümrütdal, Kenan Dağlıoğlu, Ibrahim Halil Kılıç, Işık Didem Karagoz, M.E. Kalender, Muhittin Tuzcu, Omer Colak and Beyhan Cengiz

In recent years, prophylactic usage of natural products and tendency to resort to alternative medicine has increased rapidly. Henna (*Lawsonia* sp.) has been used not only cosmetically but also medicinally in Turkish population. Among the studies of henna's antifungal, anti-microbial, tuberculostatic and antitumoral effects come on the science. In this study, we planned to research the effect of *Lawsonia*

*inermiss* that is an oxidant agent against development of cancer, by constituting peritonitis carcinomatous with Ehrlich ascites cells. The animals were divided to three groups and *Lawsonia inermis* extract and tap water were given to mice for 5 days. After 5 days, all of animals were decapitated by cervical dislocation and their liver tissues were sampled to measure reduced glutathione (GSH) level. Mean Survival Time (MST) and Average Survival Time (AST) were calculated; peritoneal liquid pH was measured; Ehrlich Ascites Carcinoma (EAC) cells were counted with hemocytometer. At the result, the longest life period was detected on the group which was given 10 mg/kg/day *Lawsonia inermis*. In group 2 and 3 which were given *Lawsonia inermis* following to forming Ehrlich ascites carcinoma, total number of cancer cell decreased. The scaled pH levels belonging to group 2 and 3 changed into alkaline compared to that of group1 (pH = 6.2). Glutathione levels of liver tissue were determined to decrease in group 2 and 3 in comparison with group1. In conclusion, *Lawsonia inermis* may lead cells to apoptosis related to deficiency in detoxification of intracellular radicals. (*International Journal of Pharmacology* 5 (4): 263-267, 2009; doi: 10.3923/ijp.2009.263.267)

### **Hepatoprotective Effect of *Enicostemma littorale blume* and *Eclipta alba* During Ethanol Induced Oxidative Stress in Albino Rats**

P. Baranisrinivasan, E.K. Elumalai, C. Sivakumar, S. Viviyan Therasa and E. David

The leaves of *Enicostemma littorale blume* (Ens) and *Eclipta alba* (Ecl) have been used for skin infection, antiviral and antibacterial activity in traditional medicine. The present study is aimed at to evaluate the hepato-protective effect of the aqueous leaf extracts of the above two plants during ethanol induced oxidative stress in albino rats. The aqueous leaf extracts of *Enicostemma littorale* and *Eclipta alba* combine (1:1) at dose level of 250 mg kg<sup>-1</sup> b.wt. were tested for hepato-protective and antioxidant effects during ethanol induced oxidative stress in liver tissue of wistar male albino rats. The degree of hepatoprotection was assessed by measuring the activity levels of the marker enzymes such as serum aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP). Free radicals generated lipid peroxidation was assessed by measuring the tissue levels of thiobarbituric acid reacting substances (TBARS) and the activity levels of the tissue antioxidant enzymes such as catalase (CAT), superoxide dismutase (SOD). The ethanol supplemented rats recorded elevated activity levels of serum AST, ALT and ALP revealing ethanol induced hepatotoxicity. The increased levels of TBARS in liver and decreased activity

levels of SOD and CAT in ethanol fed animal's revealed oxidative stress. The aqueous leaf extracts supplementation of Ens+Ecl in 1:1 produced significant hepatoprotection and antioxidative effect during ethanol induced hepatotoxicity. The study can be concluded that the therapeutic effect of aqueous leaf extracts of Ens+Ecl in 1:1 is not only hepatoprotective but also possess significant antioxidant property. (*International Journal of Pharmacology* 5 (4): 268-272, 2009; doi: 10.3923/ijp.2009.268.272)

### ***Orthosiphon stamineus* Benth. Methanolic Extract Enhances the Anti-Proliferative Effects of Tamoxifen on Human Hormone Dependent Breast Cancer**

H.B. Sahib, Z. Ismail, N.H. Othman and A.M.S. Abdul Majid

Estrogen Receptor (ER+) antagonist, Tamoxifen (TMX), is widely used in the treatment of the hormone responsive breast cancer. However, the common occurrence of resistance after prolonged treatment of TMX hampers its effectiveness. *Orthosiphon stamineus* Benth. (OS) is a common herb found in South East Asia and is used traditionally to treat various types of ailments. The aim of this study was to determine whether the methanolic extract of *Orthosiphon stamineus* Benth. (MEOS), that had been proven in previous study to act as anti-angiogenic agents, enhance the anticancer efficacy of ER+ antagonists. In this study methanolic extract of (MEOS) was treated to MCF-7 hormone sensitive breast cancer cell line with the addition of TMX. MEOS showed no significant cytotoxic effect towards MCF-7 when used alone, however when combined with TMX, the anti proliferative activity of the combination increased five fold higher when compared to the anti-proliferative activity of singly treated TMX. The result suggests that MEOS synergistically enhance the activity of TMX against hormone responsive breast cancer cells *in vitro* and may prove to be useful for the treatment of metastatic breast cancer. (*International Journal of Pharmacology* 5 (4): 273-276, 2009; doi: 10.3923/ijp.2009.273.276)

### **$\alpha$ -Glucosidase Inhibitor Activity of *Terminalia* Species**

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*Terminalia arjuna*, *Terminalia ballerica*, *Terminalia chebula*, *Terminalia catappa*, *Terminalia kaerbachii* and *Terminalia microcarpa* leaves were tested for their  $\alpha$ -glucosidase inhibitory activity *in vitro*. The  $\alpha$ -glucosidase activity was determined by measuring the p-nitrophenol release from pNPG at 400 nm. *Terminalia kaerbachii* has the highest  $\alpha$ -glucosidase inhibitor activity with IC<sub>50</sub>

value of  $0.27 \pm 0.17 \mu\text{g mL}^{-1}$  and is a promising antidiabetic herbal medicine candidate. However, most of the *Terminalia* species are also potential as antidiabetic medicine candidates as the  $\text{IC}_{50}$  values are approximately  $5 \mu\text{g mL}^{-1}$ , which is near the  $\text{IC}_{50}$  value of 1-deoxynojirimycin, the reference compound, except for *Terminalia microcarpa*, which has  $\text{IC}_{50}$  value of  $25.15 \pm 0.04 \mu\text{g mL}^{-1}$  (above  $21 \mu\text{g mL}^{-1}$ ). From the phytochemical screening, *Terminalia kaerbacchi* contains alkaloids, flavonoids and catechic tannins, but does not contain saponin, quinon, steroid/terpenoids and gallic tannins. It is estimated that there is a correlation between  $\alpha$ -glucosidase inhibitory activity and its phytochemical content. (*International Journal of Pharmacology* 5 (4): 277-280, 2009; doi: 10.3923/ijp.2009.277.280)

### **Anti-Microbial Properties of Clove (*Eugenia caryophyllum* Bullock and Harrison) Aqueous Extract Against Food-Borne Pathogen Bacteria**

D. Puangpronpitag, N. Niamsa and C. Sittiwet

Anti-microbial activity of *Eugenia caryophyllum* Bullock and Harrison aqueous extract has been tested against food-borne pathogen bacteria (*S. aureus* ATCC 25923, *S. typhimurium* ATCC 14028 and *E. coli* ATCC 25922), normal flora (*S. epidermidis* ATCC 12228 and *L. plantarum* ATCC 14917) and other pathogen bacteria (*P. vulgaris* ATCC 13315). The agar diffusion susceptibility test revealed inhibition zone of *Eugenia caryophyllum* Bullock and Harrison aqueous extract against *S. aureus* ATCC 25923, *S. typhimurium* ATCC 14028, *E. coli* ATCC 25922, *S. epidermidis* ATCC 12228, *L. plantarum* ATCC 14917 and *P. vulgaris* ATCC 13315. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were determined by using agar dilution and broth macro-dilution methods. The MIC and MBC of clove against all tested bacteria were in the range of 1 to  $4 \text{ g L}^{-1}$  and 2 to  $8 \text{ g L}^{-1}$ , respectively. In conclusion, the aqueous extract of *E. caryophyllum* showed good inhibitory effect on tested food-borne pathogen bacteria. (*International Journal of Pharmacology* 5 (4): 281-284, 2009; doi: 10.3923/ijp.2009.281.284)

### **Antioxidative and Antibacterial Activities of *Pangium edule* Seed Extracts**

Fook Yee Chye and Kheng Yuen Sim

Phenolic and alkaloid extracts of *Pangium edule* Reinw (Flacourtiaceae) seed were investigated for their antioxidative activities using DPPH radical scavenging



and  $\beta$ -carotene bleaching assays. The extracts were evaluated for antibacterial activity against *Salmonella typhimurium* and *Listeria monocytogenes*. The acetone extract with higher phenolic content ( $22.22 \pm 0.05$  mg GAE  $g^{-1}$ ) showed the most potent antioxidative activity in both DPPH radical scavenging and  $\beta$ -carotene bleaching assays as compared to other extracts. The phenolic extract seems to have stronger inhibitory against *L. monocytogenes* than *S. typhimurium*. The free phenolic acid extract was found to have the highest Minimum Inhibition Concentration (MIC) among the seed extracts, indicates its weak antibacterial activity against both bacteria. Nevertheless, both tested pathogens were killed at the Minimum Bactericidal Concentration (MBC) of 30.3 and 55.5 mg  $mL^{-1}$ , respectively, for the phenolic extracts. Significant correlation ( $p < 0.05$ ) was observed between the total phenolic content and its antioxidative activity ( $r = 0.878$ ) as well as antibacterial ( $r = 0.840$ ) activity suggesting that phenolics of the seed extract could be potential sources of natural antioxidant and antibacterial. (*International Journal of Pharmacology* 5 (5): 285-297, 2009; doi: 10.3923/ijp.2009.285.297)

### ***In vitro* Cytotoxic Activity of *Sargassum thunbergii* and *Dictyopteris divaricata* (Jeju Seaweeds) on the HL-60 Tumour Cell Line**

K.N. Kim, Y.M. Ham, J.Y. Moon, M.J. Kim, D.S. Kim, W.J. Lee, N.H. Lee and C.G. Hyun

The cytotoxic activity of a variety of Jeju coastal seaweeds against a panel of tumour cell lines was tested *in vitro* using a calorimetric 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. Twenty-three extracts were screened against HL-60 (human promyelocytic leukaemia cell line), HT-29 (human colon carcinoma cell line), B16F10 (murine melanoma cell line) and A549 (human lung cancer cell line). The ethyl acetate (EtOAc) extracts of *Sargassum thunbergii* and *Dictyopteris divaricata* showed excellent cytotoxic activity against the HL-60 cell line. Furthermore, the *S. thunbergii* extract also exhibited good cytotoxic activity against the HT-29 and B16F10 cell lines. To explore the mechanisms of cytotoxicity of *S. thunbergii* and *D. divaricata*, we used several measures of apoptosis to determine whether these processes were involved in EtOAc fraction-induced HL-60 cell death. We found that EtOAc fractions induced cell shrinkage, cell membrane blebbing and formation of apoptotic bodies. In addition, HPLC fingerprinting of the *S. thunbergii* extract revealed that fucosterol was a standard component of these fractions. These results suggest that *S. thunbergii* and *D. divaricata* have great potential value as food additives,

medicinal supplements for patients with chronic diseases and preventive agents against cancer. (*International Journal of Pharmacology* 5 (5): 298-306, 2009; doi: 10.3923/ijp.2009.298.306)

### **Diffusion of Sulbactam and Ceftriaxone into Cerebrospinal Fluid of Meningitis Induced Rat Model**

V.K. Dwivedi, M. Chaudhary, A. Soni, J. Yadav, A. Tariq, M.R. Siddiqui, A. Ahmad and P.S. Negi

The present study was to investigate the comparative efficacy of ceftriaxone and a fixed dose combination of ceftriaxone plus sulbactam along with VRP1034 (Sulbactam) in cerebrospinal fluid (CSF) of meningitis induced rat model. Eighteen rats were divided into three groups of six rats each. Meningitis were induced by MRSA strain ( $\log 10^6$  cfu mL<sup>-1</sup>). Group I was infected group; whereas group II and III were ceftriaxone and sulbactam treated groups. Drugs were analyzed in CSF by high performance liquid chromatography. Some biochemical parameters were studied in infected and treated groups. Present results showed that the mean level of ceftriaxone drug concentration was increased significantly in sulbactam treated group in comparison to ceftriaxone alone treated group. Glucose level was increased in sulbactam treated group as compared to ceftriaxone alone treated group. The levels of protein, calcium and phosphorus were significantly lowered in both treated group as compared to infected group. These biochemical parameters were decreased along with increased glucose level in sulbactam treated group in comparison to ceftriaxone alone treated group. Present findings concluded that sulbactam enhanced the penetration rate in CSF than ceftriaxone alone due to VRP1034. It plays a therapeutic role in crossing blood brain barrier and helps in prevention of bacterial meningitis infection. (*International Journal of Pharmacology* 5 (5): 307-312, 2009; doi: 10.3923/ijp.2009.307.312)

### **A Randomized Open-Label Comparison of Lamotrigine and Valproate in Patients with Juvenile Myoclonic Epilepsy**

S.E.M. Nejad, M.R.A. Nikpour, F. Rahim, S.N. Naghibi and M.A. Bahrammi

The aim of this study was to evaluate the efficacy and tolerability of lamotrigine and valproate in patients with different types of generalized epilepsy characterized by myoclonic seizures as well as compare the efficacy of those two drugs. A pilot, randomized controlled trial analysis of 46 female patients (age 8-30 years) in a

large university hospital. All patients underwent several interictal EEG including routine awake and sleep EEGs. Lamotrigine was started at the dose of 500 mg day<sup>-1</sup> and was progressively increased to a mean dose of 1500-2000 mg day<sup>-1</sup> in a time course of 8 weeks. The target maintenance dose for valproate was 800 mg day<sup>-1</sup> after starting valproate at the dose of 200 mg/12 h. The mean dose was reached within 4 weeks. Out of total 46 patients, 46 (100%) had juvenile myoclonic epilepsy; 43 (93.48%) had tonic-clonic; 5 (11%) had myoclonic absences. In the valproate and lamotrigine groups, there was significant reduction ( $p < 0.001$ ,  $p < 0.001$ ) in myoclonic seizure and tonic-clonic seizure frequencies. There was no clinically significant difference ( $p > 0.05$ ) between the effect of those two drugs that means the lamotrigine and valproate have similar effect in reducing the myoclonic seizure and tonic-clonic seizure frequencies. There was statistically significant effect ( $p < 0.05$ ) of those two drugs that means the lamotrigine and valproate also have significant effect in reducing the absences seizure frequency. The results suggest that lamotrigine monotherapy is a possible alternative for valproate among patients with juvenile myoclonic epilepsy who experienced unaccepted side effects or inadequate seizure control with valproate monotherapy. (*International Journal of Pharmacology* 5 (5): 313-318, 2009; doi: 10.3923/ijp.2009.313.318)

## **Evaluation of Preserving Efficacy for Different Cough Syrups Manufactured by Different Pharmaceutical Companies**

M. Khanfar, R. Khalil and A. AbuJafal

The aim of the current investigation is to assess the efficacy of different preservatives ingredients of different expectorant cough syrups manufactured by different pharmaceutical companies by comparing the growth of five microorganisms of known quanta of *S. aureus*, *E. coli*, *P. aeruginosa* and *C. albicans*. The microorganisms were inoculated into syrup A (glycerol and propylene glycol), syrup B (propylene glycol and glycerin), syrup C (glycerin, propylene glycol and butyl paraben), syrup D (methyl paraben and propylparaben) and normal saline as a control. All microorganisms were taken from standard stock cultures and incubated for 24 h. Growth of microorganisms into syrup was compared by counting the CFUs from a subculture of inoculated syrup at zero, 3, 6, 12, 24 and 48 h intervals. The data showed that all the combinations of the preservatives in the four studied cough syrups behaved similarly in term of antimicrobial efficiency. The findings suggested that the preservatives mixtures of propylene glycol with glycerol or with glycerin or with butyl paraben preservatives as well as methyl paraben with propylparaben are acceptable clinically and have

considerably antimicrobial activity against infectious bacteria during the 48 h studied period. (*International Journal of Pharmacology* 5 (5): 319-322, 2009; doi: 10.3923/ijp.2009.319.322)

### **Hypoglycaemic and Hypolipidemic Activities of *Rauwolfia serpentina* in Alloxan-Induced Diabetic Rats**

S.A. Qureshi, A. Nawaz, S.K. Udani and B. Azmi

The prevalence of diabetes is increasing worldwide. Changes in lipid metabolism are secondary to diabetes, which may become the cause of hypertension, atherosclerosis and other cardiovascular diseases. The present study was designed to investigate the effect of methanolic root extract of *Rauwolfia serpentina* (a known antihypertensive herb) on glucose, total cholesterol (TC), triglycerides (TG) and alanine aminotransferase (ALT). Alloxan-induced diabetic rats were divided into 3 groups viz., group I: diabetic control treated with 5% dimethyl sulfoxide (DMSO) in distilled water ( $1 \text{ mL kg}^{-1}$ ), group II (positive control): diabetic rats treated with known anti-diabetic drug chlorpropamide ( $20 \text{ mg kg}^{-1}$ ) and group III (diabetic test): treated with methanolic root extract ( $30 \text{ mg kg}^{-1}$ ). Glucose was estimated from each group at 0, 1, 2 and 4 h after intra-peritoneal injection of each treatment by using glucometer. Rats were decapitated at 4 h, blood was collected to separate the serum that used to analyze TC, TG and ALT. There was a significant decrease ( $p < 0.0001$ ) found in glucose level from 0 to 4 h ( $94\text{-}106 \text{ mg dL}^{-1}$ ) in test rats as compared to diabetic control. Similarly, TG ( $p < 0.01$ ), TC and ALT ( $p < 0.05$ ) were also significantly decrease in test group. The methanolic root extract of *R. serpentina* was found hypoglycaemic, hypolipidemic and hepato-protective in alloxan-induced diabetic rats. (*International Journal of Pharmacology* 5 (5): 323-326, 2009; doi: 10.3923/ijp.2009.323.326)

### **Dextromethorphan Attenuates Ethanol Withdrawal Induced Hyperalgesia in Rats**

U.S. Rao Chakradhara and K.S. Karanth

Ethanol withdrawal increases sensitivity to painful stimuli. N-methyl-D-aspartate glutamate receptors may have a role in alcohol dependence and the development of withdrawal signs and symptoms. This study examined the effect of oral administration of dextromethorphan on the hyperalgesia induced by ethanol

withdrawal, using hot plate assay and chemical induced writhing in rats. Wistar albino rats (250-300 g) were divided into three groups of six animals each. All the groups received 7.5% v/v alcohol and food *ad libitum*, for 10 days and were given saline (10 mL kg<sup>-1</sup>) or dextromethorphan dissolved in saline (32 and 64 mg kg<sup>-1</sup>) orally once daily for 10 days. Ethanol was withdrawn on day 10. The reaction times on the hot plate were measured on Day 0, at 6, 12 h after ethanol withdrawal. The ethanol withdrawal signs were rated immediately before testing. Chemical assay using acetic acid (1% v/v) was done on day 0 and at 12 h after ethanol withdrawal. Chronic exposure to ethanol produced antinociception while withdrawal produced hyperalgesia. Repeated administration of dextromethorphan prevented ethanol withdrawal induced hyperalgesia and significantly reduced total ethanol withdrawal scores at both the doses tested. This study demonstrated that dextromethorphan can attenuate hyperalgesia during ethanol withdrawal and suggests the role of N-methyl-D-aspartate receptors in ethanol withdrawal induced hyperalgesia. (*International Journal of Pharmacology* 5 (5): 327-332, 2009; doi: 10.3923/ijp.2009.327.332)

### **Comparison of Efficacy of Turmeric and Commercial Curcumin in Immunological Functions and Gene Regulation**

A.K. Chakravarty, S.N. Chatterjee, H. Yasmin and T. Mazumder

Curcumin, the active constituent of turmeric possesses anti-cancer, anti-inflammatory and other properties. Earlier we have shown ethanolic extract of turmeric rhizome (ETE) activates murine lymphocytes and induces apoptosis in tumor cells. The present investigation is intended to study comparative efficacy of ETE as used by us and others and commercially available curcumin. The efficacy of these two substances was tested for immunostimulatory, anti-inflammatory and anti-oxidant properties in murine model. The expression of a few genes such as perforin, IL-2, IL-6, TNF- $\alpha$  and iNOS related with these events have also been studied at transcriptional level in T-cells. The ETE promoted cell division and functions of murine lymphocytes like production of NO<sup>-</sup>, up regulation of perforin, IL-2 and IL-6 genes in course of functional differentiation much better than curcumin. The ETE acts better as anti-inflammatory agent in DTH reaction than curcumin. The better efficacy of ETE over curcumin could be due to presence of other compounds in the total extract than only diferuloylmethane as curcumin. The present study intends to recommend use of turmeric over curcumin whenever possible. (*International Journal of Pharmacology* 5 (6): 333-345, 2009; doi: 10.3923/ijp.2009.333.345)

## **A Study on the Effects of IL-10 in Anti-Thy 1-Induced Glomerulonephritis in Rats**

H. Rachmawati, L. Beljaars, C. Reker-Smit, H.I. Bakker, A.M. Van Loenen-Weemaes and K. Poelstra

In the present study, we examined the effects of IL-10 after 24 h in a model of acute glomerulonephritis (GN). One hour after the anti-Thy 1 antibody administration, a single i.v. dose of IL-10 was administered to rats. Normal rats, control nephritic rats and nephritic rats treated with IL-10, were sacrificed 24 h after administration of antibody. Samples of urine, blood and organs were subsequently collected. The effects of IL-10 were studied by quantification of various inflammatory parameters at the protein level after immunohistochemical staining and at the mRNA level by a quantitative real time PCR technique. Nitric oxide and protein content were determined in serum and in 24 h-excreted urine, respectively. The inflammatory parameters were reduced in the IL-10-treated group: in increment in glomerular CD14, ICAM-1 and MMP-13 staining induced by anti-Thy 1 injection was significantly attenuated by IL-10. In contrast, mRNA levels for CD14, IL-1 $\beta$ , TNF- $\alpha$  and MCP-1 were not different between IL-10-treated and control GN groups. In conclusion, a single i.v. dose of IL-10 suppresses the expression of several inflammatory parameters, 24 h after inducing of acute GN but at this time point mRNA levels of all parameters examined were not affected. Although its therapeutic efficacy needs further evaluation, anti-inflammatory effects of this short-lived cytokine can be found one day after its administration. (*International Journal of Pharmacology* 5 (6): 346-353, 2009; doi: 10.3923/ijp.2009.346.353)

## **Antinociceptive Effects of an Ethanolic Extract of *Capparis erythrocarpos* Isert Roots in the Mice Formalin Test**

E. Woode, C.A. Danquah, E. Boakye-Gyasi, C. Ansah and G. Ainooson

Antinociceptive effect of an ethanolic extract of *Capparis erythrocarpos* Isert roots (10-300 mg kg<sup>-1</sup>; p.o.) was evaluated in the mouse formalin test. Morphine (1-10 mg kg<sup>-1</sup>; i.p.) was used as positive control. The extract dose-dependently reduced pain scores in both phases of formalin-induced nociception with the 100 mg kg<sup>-1</sup> dose significantly reducing formalin-induced pain by 47.54 $\pm$ 5.65 and 80.01 $\pm$ 3.77% in the first and second phases, respectively. Naloxone (an opioid antagonist) did not block the antinociceptive effect of the extract in both the neurogenic phase and the inflammatory phase; however, theophylline (an adenosine antagonist) completely blocked the effect in the neurogenic phase and significantly inhibited the effect in the inflammatory phase. These findings

demonstrate that the ethanolic extract of *C. erythrocarpos* roots has both central and peripheral antinociceptive effect with possible involvement of adenosinergic mechanism. (*International Journal of Pharmacology* 5 (6): 354-361, 2009; *doi*: 10.3923/ijp.2009.354.361)

### **Effects of *Piper sarmentosum* Water Extract on 11- $\beta$ Hydroxysteroid Dehydrogenase Type 1 Bioactivity in Ovariectomy-Induced Obese Rats**

A. Aida Azlina, H.S. Farihah, H.M.S. Qodriyah and M.F. Nur Azlina

The 11 $\beta$ -hydroxysteroid dehydrogenase type 1 (11 $\beta$ -HSD1) convert inactive circulating 11-keto steroids into active glucocorticoids, amplifying local glucocorticoid action. It is elevated in adipose tissue in obese humans and rodents, suggesting that adipose tissue glucocorticoid excess may be the causative factor for obesity. This study was conducted to evaluate the effects of *Piper sarmentosum* (PS) water extract and glycyrrhizic acid (GCA) on 11 $\beta$ -HSD1 bioactivity in ovariectomized induced obese rats. Forty-two female *Sprague-Dawley* rats were randomly divided into six groups; four treatments (PS, GCA, CTRL and SHM) and two basal (B-CTRL and B-SHM). All groups underwent ovariectomy excluding SHM and B-SHM which underwent sham operation. Basal groups were sacrificed on the first day of treatment, while ovariectomized groups were given PS extract (0.125 g kg<sup>-1</sup>), GCA (0.120 g kg<sup>-1</sup>) and water (CTRL), respectively, while SHM received only water. Blood pressure was measured monthly while body weight weekly. After five months, rats were sacrificed and liver, heart and visceral adipose tissues were taken for analysis. *Piper sarmentosum* (PS) and GCA group showed a significant reduction in enzyme activity but no difference in body weight compared to CTRL group. Meanwhile only the blood pressure in GCA group was significantly higher after three months of treatment as compared to CTRL group but no difference after five months. In conclusion, both PS water extract and GCA have the ability to reduce 11 $\beta$ -HSD1 enzyme activity but only GCA cause an increased in blood pressure. (*International Journal of Pharmacology* 5 (6): 362-369, 2009; *doi*: 10.3923/ijp.2009.362.369)

### **Screening of Antiangiogenic Activity of Some Tropical Plants by Rat Aorta Ring Assay**

A.F.A. Aisha, K.M. Abu-Salah, Y. Darwis and A.M.S. Abdul Majid

Angiogenesis is essential for the growth and metastasis of most solid malignancies. Accordingly, tumor angiogenesis is an important pharmacological target for cancer prevention and treatment. This study was conducted to study antiangiogenic

activity of some tropical plants. Seven plants were extracted successively with n-hexane and methanol to prepare 18 extracts and antiangiogenic properties of the extracts were studied by rat aorta ring assay. Nine extracts showed more than 50% inhibition of the blood vessels outgrowth from the primary tissue explants. The MTT assay was used to study the cytotoxic activities of extracts with more than 50% inhibition. The Human Umbilical Vein Endothelial Cells was used as a test cell line versus two human colon cancer cell lines HCT-116 and HT-29, two human breast cancer cell lines MCF-7 and T47D and one hepatocarcinoma cell line HepG-2. The selectivity index on Human Umbilical Vein Endothelial Cells was calculated. The selectivity index results indicated antiangiogenic activities of three plants *Parkia speciosa*, *Syzygium campanulatum* and *Sandoricum koetjape*. The results presented in this research article make these plants good candidates for further studies to purify the active compounds and to study *in vivo* antiangiogenic activity. (*International Journal of Pharmacology* 5 (6): 370-376, 2009; doi: 10.3923/ijp.2009.370.376)

### **Evaluation of Free Radical Scavenging Activity of *Pandanus odoratissimus***

R. Londonkar and A. Kamble

*Pandanus odoratissimus* is used in traditional medicinal and it is also famous for its fragency. The present study was performed to evaluate the methanolic effect of *Pandanus odoratissimus* (MEPO) against free radical damage. The antioxidant activity of has MEPO been studied using its ability to scavenging DPPH, Nitric acid, superoxide radicals and hydroxyl radicals. The MEPO shows antioxidant activity by 87.52% reducing the DPPH and 73.55% inhibition of nitric acid. The result also indicates maximum inhibition of superoxide radical's inhibition 74.12 and 78.14% inhibition of hydroxyl radicals. The BHT was used as standard. (*International Journal of Pharmacology* 5 (6): 377-380, 2009; doi: 10.3923/ijp.2009.377.380)

### **Effect of Administration of Fungal Mycotoxin (Gliotoxin) on Clinical and Serobiochemical Parameters in Camels**

M.S. Shathele

The main objective of this study was to determine the effect of administration of fungal mycotoxin (Gliotoxin) on clinical and serobiochemical parameters in camels. A bolus of 0.1  $\mu\text{g kg}^{-1}$  b.wt. of gliotoxin was administered intravenously to camels.



The treated camels were lethargic and decreased their appetite from day 3 onwards. The toxin administration decreased the protein and glucose concentration of serum. The increased activity of aspartate amino transferase, gamma glutamyl-transferase, sorbitol dehydrogenase and alkaline phosphatase due to mycotoxin administration was indicative of liver damage. High concentration of urea nitrogen and creatinine in treated animals was a characteristic of renal injury. In conclusion, the gliotoxin is acutely toxic to camels affecting liver and kidney function. (*International Journal of Pharmacology* 5 (6): 381-383, 2009; **doi:** 10.3923/ijp.2009.381.383)