THERAPEUTICS

NPARR 4(4), 2013-0407 Role of Adhatoda vasica (L.) Nees leaf extract in the prevention of aflatoxin-induced toxicity in Wistar rats

Aflatoxin contamination of various foodstuffs and agricultural commodities is a major problem worldwide. Several strategies have been reported for the detoxification of aflatoxins in contaminated foods and feeds, but all these methods have their own shortcomings. Traditional medicinal plants are potential sources of aflatoxin-detoxifying compounds. In this study a spray-dried formulation of Adhatoda vasica (L.) Nees leaf extract was prepared and its chemopreventive effect on aflatoxin B1 (AFB1)-induced biochemical changes in the liver and serum of Wistar rats was investigated.

Administration of AFB1 (1.5 mg kg\(^{-1}\) body weight (BW) intraperitoneally) to rats significantly reduced the activities of superoxide dismutase and catalase in liver tissues and increased the activities of aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase and the levels of very-low-density lipoprotein, low-density lipoprotein and cholesterol in blood serum. However, pre-feeding of rats with A. vasica formulation (500 mg kg\(^{-1}\) BW for 7 days) protected the animals from AFB1-induced biochemical changes during subsequent exposure to AFB1.

Pre-feeding of rats with A. vasica formulation counteracted the hepatic dysfunction induced by subsequent treatment with AFB1. This formulated A. vasica extract offers a biologically safe alternative to detoxify aflatoxin and has huge potential to be used in the poultry industry to reduce aflatoxicosis [Rajendran Brinda, Selvaraj Vijayanandraj, Doraiswamy Uma, Dorairaj Malathi, Vaikuntavasan Parandharan and Rethinasamy Velazhahan* (Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore 641003, Tamil Nadu, India), Journal of the Science of Food and Agriculture, 2013, 93(11), 2743-2748].

NPARR 4(4), 2013-0408 Antifertility effect of hydroalcoholic leaves extract of Michelia champaca L.: An ethnomedicine used by Bhatra women in Chhattisgarh state of India

Michelia champaca L. (family: Magnoliaceae), commonly known as Champa [Hindi], is traditionally used for fertility regulation by the women of Chhattisgarh state in India. No scientific evidence regarding the antifertility effect of this plant is available till date. The antifertility activity of the extract (HAEMC) administered at dose levels (100 and 200 mg/kg body weight, p.o.) was evaluated in two experimental animal models i.e. antiimplantation activity in female wistar rats and esterogenic/antiestrogenic activity in ovariectomized female rats. In anti-implantation activity, the extract (200 and 400 mg/kg body weight, p.o.) was administered to female rats from 1 to 7 days of pregnancy and on 10th day, laprotomy was performed to count the no. of implants. For estrogenic/anti-estrogenic activity, ovariectomized female rats were administered with the extract at both the doses alone as well as along with 17α-ethinyl estradiol (1 µ/rat/day) for 7 consecutive days. On the 8th day, all animals were sacrificed and blood serum was further processed for the estimation of biochemical parameters such as estrogen level, alkaline phosphates, cholesterol, tryglycerides, total protein etc.

The extract (HAEMC) showed significant (p<0.01) 49.95% and 71.03% antiimplantation activities at 100 and 200 mg/kg doses respectively. The extract also exhibited significant (p<0.01) estrogenic activity as evidenced by increase in body weight, uterine weight, increased thickness and height of
endometrium, vaginal cornification and significant \(p<0.01\) increase in estrogen, cholesterol, alkaline phosphate and triglycerides levels at higher dose when administered alone as well as along with ethinyl estradiol. Phytochemical screening showed the presence of steroids, flavonoids and alkaloids in the extract. Hydroalcholoholic extract of *Michelia champaca* leaves possesses significant antifertility effect which might be due to the inhibition of implantation and estrogenic effect which in turn might be due to the presence of some phytoconstituents in the plant. Hydroalchoholic extract of *Michelia champaca* leaves possesses significant antifertility effect which might be due to the inhibition of implantation and estrogenic effect which in turn might be due to the presence of some phytoconstituents in the plant [Seema Taprial, Deepak Kashyap, Vineet Mehta, Sunil Kumar and Dinesh Kumar*, *Journal of Ethnopharmacology*, 2013, 147(3), 671-675].

**NPARR 4(4), 2013-0409 Protective effect of ethyl acetate fraction of *Acacia ferruginea* DC. against ethanol-induced gastric ulcer in rats**

In traditional systems of medicine, stem bark of *Acacia ferruginea* DC. is used for the treatment of itching, leucoderma, ulcers, stomatitis and diseases of the blood. In the present study, we determined antioxidant and anti-ulcerogenic activities of *Acacia ferruginea* stem bark. Acetone extract and its sub-fractions of *Acacia ferruginea* stem bark were subjected to assess their antioxidant potential using various in vitro systems such as DPPH\(^*\), ABTS\(^+\) scavenging, FRAP and phosphomolybdenum reduction activities. Based on the antioxidant potential, the ethyl acetate fraction was used to evaluate the protective effect of ethanol-induced gastric damage in rat model. Enzyme activities such as superoxide dismutase, glutathione, catalase and lipid peroxidation were also determined in the stomach tissues.

Ethyl acetate fraction (AFE) of *Acacia ferruginea* stem bark registered higher antioxidant and free radical scavenging activities than the crude acetone extract and other fractions. In addition, AFE exhibited that the IC\(_{50}\) values of DPPH (2.5 \(\mu\)g/ml) and ABTS (1.8 \(\mu\)g/ml) were lower when compared to the standard quercetin (12.4 \(\mu\)g/ml and 4.7 \(\mu\)g/ml, respectively). In ethanol induced gastric ulcer, administration of AFE at doses of 10 mg/kg, 50 mg/kg and 100 mg/kg body weight prior to ethanol ingestion significantly protected the stomach ulceration. Consequently significant changes were observed in enzyme activities such as SOD, CAT, GSH and LPO in the stomach tissues when compared with ethanol control group.

It is concluded that the ethyl acetate fraction of *Acacia ferruginea* stem bark possessed higher antioxidant and anti-ulcerogenic activities. Based on the results, we suggest that *Acacia ferruginea* stem bark has potential to provide a therapeutic approach to ethanol mediated ulcer as an effective anti-ulcer agent [Kandhasamy Sowndhararajan and Sun Chul Kang *(Department of Biotechnology, Daegu University, Gyeongsan, Gyeongbuk 712-714, Republic of Korea), *Journal of Ethnopharmacology*, 2013, 148(1), 175-181].

**NPARR 4(4), 2013-0410 Anti-diarrhoeal activity of aqueous extract of *Ocimum kilimandscharicum***

*Ocimum kilimandscharicum* Baker ex Güerke, commonly referred to as Kapur Tulsi, is a medicinal herb that belongs to the family of Lamiaceae. It is traditionally popular for its gastroprotective effects, including its use as a digestive and anti-diarrhoeal.

The present study aims to prove the anti-diarrhoeal activity of aqueous extract of leaves of *Ocimum kilimandscharicum* in animal models. The aqueous extract was tested at three different
dose levels (100, 200 and 400 mg/kg, p.o. in rats and the corresponding doses in mice) against castor-oil induced diarrhoea model and castor oil induced enteropooling assay in rats; and charcoal meal test/intestinal motility test in mice. The parameters observed were the onset of defecation, cumulative faecal weight and consistency of faeces in the castor oil induced diarrhoea model; the weight of intestinal content in castor oil induced enteropooling assay; and the distance travelled by charcoal in the intestinal motility test. A significant delay in the onset of defecation (*p* <0.05), reduction in the cumulative faecal weight (*p* <0.001), along with a change in the faecal consistency from watery to solid form was observed at the dose of 200 mg/kg in the castor oil-induced diarrhoea model. Similarly, the extract at the doses of 100 mg/kg (*p* <0.01) and 200 mg/kg (*p* <0.001) significantly decreased the weight of intestinal content in castor oil induced enteropooling assay. In the charcoal meal test the extract at the dose of 280 mg/kg (corresponding to 200 mg/kg in rats) significantly (*p* <0.01) reduced the distance travelled by charcoal.

The aqueous extract of leaves of *Ocimum kilimandscharicum* showed anti-diarrhoeal activity, which may be due to its anti-motility and anti-secretory effects, which thus proved the traditional claims [Rajat V. Sarin*, Sumit Narwal, and Pallavi A. Bafna (Rayat Institute of Pharmacy, Rayat and Bahra Campus, Railmajra, Nawanshahar, Near Ropar, Punjab-144 533, India), *Journal of Ethnopharmacology*, 2013, 148(1), 223-228].

NPARR 4(4), 2013-0411 Flavonoid composition, antibacterial and antioxidant properties of tartary buckwheat bran extract

The tartary buckwheat [*Fagopyrum tataricum* (L.) Gaench] bran, which is an important by-product during the production of tartary buckwheat tea, is a good source of flavonoids but has not been made full use of. Some studies reveal its antioxidant activity. However no research is found for its antibacterial activities against *Propionibacterium* and *Staphylococci* species. The 60% (v/v) EtOH extract of the tartary buckwheat bran (TBBE) was prepared at room temperature and the flavonoids content was determined by HPLC. Rutin (541.3 ± 9.3 mg/g), isoquercetin (9.33 ± 0.16 mg/g) and quercetin (66.3 ± 1.14 mg/g) were detected in the TBBE. The inhibition zone of TBBE against four bacterial strains varied from 7.6 mm to 11.6 mm; minimum inhibition concentration (MIC) values were from 512±µg/mL to 2048 µg/mL. IC50 of DPPH scavenging activity and relative ORAC values were 8.36±0.27 µg/mL and 11,090 ± 1278 µmol TE/g, respectively. For the constituents of TBBE querectin showed higher antioxidant and antibacterial properties than TBBE and its glycosides (isoquercetin and rutin). These results suggest that TBBE might be useful to develop new types of antibacterial substance and new skin care cosmetics to prevent or improve acne [Lijun Wang*, Xiushi Yang, Peiyou Qin, Fang Shan and Guixing Ren (Institute of Crop Science, Chinese Academy of Agricultural Sciences, No. 80 Xueyuan South Road, Haidian District, Beijing 100081, PR China.), *Industrial Crops and Products*, 2013, 49, 312-317].

NPARR 4(4), 2013-0412 *Alpinia nigra* seeds: A potential source of free radical scavenger and antibacterial agent

The radical scavenging activity and the antibacterial properties of different solvent (hexane, ethyl acetate and methanol) extracts of *Alpinia nigra* seeds were investigated in the present study. All the extracts were used to assess their potential antioxidant activities using methods for scavenging of 2,2-diphenyl-1-picrylhydrazyl radical. Ethyl acetate and methanol extracts exhibited effective free radical scavenging activities compared to the standard
antioxidant butylated hydroxy toluene. The efficacy of *A. nigra* seed extracts was tested against three gram positive and four gram negative bacteria. Flow cytometry and field emission scanning electron microscopy study reveals and confirms the bacterial cell membrane damage, pore formation and membrane depolarization when treated with different solvent extracts. Bacterial cell membrane damage and releasing of cytoplasmic content (nucleic acids) was monitored using UV/vis spectrophotometer at 260 nm. Current investigation highlights the antimicrobial potential of *A. nigra* seed extracts and its total antioxidant efficacy for the first time.


*Swertia chirayita* as a substitute and adulterants. Continuous indiscriminate harvesting has enormously reduced its population strength in the natural habitat of Eastern Himalayas. The aim of the present work was to evaluate the level of genetic diversity, phytochemical constituents and antioxidant potential of different parts of *S. bimaculata*. Nineteen accessions of *S. bimaculata* collected from different locations of the Sikkim Himalayan region were analysed for genetic variation using 20 ISSR primers which generated 56 (93.3%) polymorphic amplicons. A high level of genetic diversity (*h* = 0.22 and *I* = 0.32) was detected among accessions. There was a moderate genetic differentiation (*Gst* = 0.44) observed among populations. Different parts of the species were evaluated in terms of total polyphenol, flavonoid, alkaloid, saponin and tannin contents. The study revealed that the level of polyphenols, flavonoids and alkaloids in the methanol extracts of the leaf and stem of *S. bimaculata* was considerable. However, leaf extracts showed significantly higher content of phytochemicals than the other parts. Antioxidant potential of different parts was tested by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reducing antioxidant power (FRAP) model system. Methanolic extracts of leaf exhibited stronger radical scavenging ability and its percentage of inhibition reached to 93.14% with the lowest IC$_{50}$ value of 4.80 µg/ml, which indicates its good antioxidant potential. Leaf of *S. bimaculata* can be used as a source of important phytochemicals like xanthones and as a substitute of commonly used *S. chirayita* [Jayashankar Das*, Sandhya Thapa, Deepti Pradhan, Sunil S. Thorat and Narayan C. Talukdar (Plant Bioresources Division, Regional Centre of IBSD, Sikkim, Gangtok 737102, India) , Industrial Crops and Products, 2013, 49, 341–347].

NPARR 4(4), 2013-0414 Antioxidant properties of different edible mushroom species and increased bioconversion efficiency of *Pleurotus eryngii* using locally available casing materials

Total phenolics, radical scavenging activity (RSA) on DPPH, ascorbic acid content and chelating activity on Fe$^{2+}$ of *Pleurotus citrinopileatus*, *Pleurotus djamor*, *Pleurotus eryngii*, *Pleurotus flabellatus*, *Pleurotus florida*, *Pleurotus ostreatus*, *Pleurotus sajor-caju* and *Hypsizygus ulmarius* have been evaluated. The assayed mushrooms contained 3.94–21.67 mg TAE of phenolics, 13.63–69.67% DPPH scavenging activity, 3.76–6.76 mg ascorbic acid and 60.25–82.7% chelating activity. Principal Component Analysis (PCA) revealed that significantly higher total phenolics, RSA on DPPH scavenging activity, 3.76–6.76 mg ascorbic acid and 60.25–82.7% chelating activity. Agglomerative hierarchical clustering analysis revealed that studied mushroom species fall into
two clusters; Cluster I included *P. djamor*, *P. eryngii* and *P. flabellatus*, while Cluster II included *H. ulmarius*, *P. sajor-caju*, *P. citrinopileatus*, *P. ostreatus* and *P. florida*. Enhanced yield of *P. eryngii* was achieved on spent compost casing material. Use of casing materials enhanced yield by 21–107% over non-cased substrate [K.K. Mishra, R.S. Pal, R. ArunKumar, C. Chandrashekar, S.K. Jain and J.C. Bhatt (Crop Protection Section, Vivekananda Institute of Hill Agriculture (Indian Council of Agricultural Research), Almora 263 601, Uttarakhand, India), *Food Chemistry*, 2013, 138(2-3), 1557-1563].