The ethnopharmacological importance of *Pithecellobium dulce* is evidenced by its traditional use for gastric complications. The aim of the study is to evaluate the gastroprotective activity and the mechanism of action of hydroalcoholic fruit extract of *P. dulce* (HAEPD) in rats by using chemical and stress induced ulcer models. Gastric ulcer was induced by administering alcohol (or) acetylsalicylic acid (or) hypothermic restraint stress to rats pretreated with HAEPD (200 mg/kg b wt for 30 day). Volume of gastric fluid, pH, acidity, activities of pepsin, H⁺, K⁺-ATPase, myeloperoxidase, mucin content, nucleic acids, glycoproteins and prostaglandin E₂ (PGE₂) levels were assessed in gastric tissues. Ulcer score was significantly minimized in HAEPD administered animals. pH and acidity of gastric fluid were significantly minimized and the mucin, PGE₂ levels were significantly maintained in drug pre administered animals. The activities of H⁺, K⁺-ATPase and myeloperoxidase were found to be significantly elevated in ulcer control animals and found to be decreased in drug pretreated animals. The cell proliferation was found to be enhanced in drug received animals. The total protein bound carbohydrate to total protein ratio was found to be significantly maintained by HAEPD. The effects were found to be comparable with that of standard drug omeprazole. It is concluded that HAEPD possess a potent antiulcer activity probably by acting as cytoprotective and antiacid secretory agent. [Jayaraman Megala and Arumugam Geetha (Bharathi Women's College (Autonomous), North Chennai 600108, India), *Journal of Ethnopharmacology*, 2012, 142(2), 415-421].

Antiulcerogenic activity of hydroalcoholic fruit extract of *Pithecellobium dulce* in different experimental ulcer models in rats

NPARR 3(4), 2012-0403

Anti-tumor activity of *Annona squamosa* seeds extract containing annonaceous acetogenin compounds

Seeds of *Annona squamosa* L. have been used in the south of China as a folk remedy to treat “malignant sores” (cancer). To investigate the chemical constituents and the anti-tumor activity of the standardized *A. squamosa* seeds extract in *vitro* and in *vivo*. Annonaceous acetogenin profiles of the standardized extract were determined by using Fourier transform infrared (FT-IR) and high performance liquid chromatography (HPLC) techniques. The anti-tumor activity of the extract was tested by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) cytotoxicity *in vitro* and *H₂₂* hepatoma cells transplantation tumor model *in vivo*. The FT-IR spectroscopy showed the presence of annonaceous acetogenin compounds in the extract. Two major annonaceous acetogenins: 12, 15-cis-squamostatin-A and bullatacin were identified and quantified by HPLC. The seed extract showed significant anti-tumor activity against four human tumor cell lines, especially for MCF-7 (IC₅₀. 0.25 μg/ml) and Hep G2 (IC₅₀. 0.36 μg/ml) cells *in vitro*. The extract inhibited the growth of *H₂₂* tumor cells in mice with a maximum inhibitory rate of 69.55% by oral administration. *A. squamosa* seed extract showed significant anti-tumor activities against human hepatoma cells *in vitro* and *in vivo*, indicating a potential for developing the extract as a novel anti-liver cancer drug [Yong Chen, Sha-sha Xu, Jian-wei Chen, Yu Wang, Hui-qing Xu, Nai-bing Fan and Xiang Li*(College of Pharmacy, Nanjing University of Chinese Medicine, Nanjing, China), *Journal of Ethnopharmacology*, 2012, 142(2), 462-466].

NPARR 3(4), 2012-0405

*Achyranthes aspera* (Apamarg) leaf extract inhibits human pancreatic tumor growth in athymic mice by apoptosis

NPARR 3(4), 2012-0404

*Achyranthes aspera* (Apamarg) leaf extract inhibits human pancreatic tumor growth in athymic mice by apoptosis.
Achyrantes aspera (Family Amaranthaceae) is used for cancer therapy by ayurvedic medical practitioners in India. However, due to the non formal nature of its use, there are no systematic studies validating its medicinal properties. Thus, it's utility as an anti cancer agent remains anecdotal. Earlier, we demonstrated A. aspera to exhibit time and dose-dependent preferential cytotoxicity to cultured human pancreatic cancer cells. In this report we validate in vivo anti tumor properties of A. aspera. The in vivo anti tumor activity of leaf extract (LE) was tested by intraperitoneal (IP) injections into athymic mice harboring human pancreatic tumor subcutaneous xenograft. Toxicity was monitored by recording changes in behavioral, histological, hematological and body weight parameters. Dosing LE to athymic mice by I.P. injection for 32 days showed no adverse reactions in treated mice. Compared to the control set, IP administration of LE to tumor bearing mice significantly reduced both tumor weight and volume. Gene expression analysis using Real time PCR methods revealed that LE significantly induced caspase-3 mRNA (p<0.001) and suppressed expression of the pro survival kinase Akt-1 (p<0.05). TUNEL assay and immunohistochemistry confirmed apoptosis induction by activation of caspase-3 and inhibiting Akt phosphorylation in treated sets. These results are in agreement with RT PCR data. Taken together, these data suggest A. aspera to have potent anti cancer property [Pochi R. Subbarayan, Malancha Sarkar, Shamaladevi Nagaraja Rao, Sakhi Philip, Pradeep Kumar, Norman Altman, Isildinha Reis, Mansoor Ahmed, Bach Ardalan and Bal L. Lokeshwar (Department of Medicine, University of Miami Miller School of Medicine, Miami FL-33136, USA), Journal of Ethnopharmacology, 2012, 142 (2), 523-530].

NPARR 3(4), 2012-0406 Evaluation of the wound healing activity of methanol extract of Pedilanthus tithymaloides (L.) Poit leaf and its isolated active constituents in topical formulation

Pedilanthus tithymaloides leaves are widely used in Indian medicine to heal wounds, burn, mouth ulcers. However, systematic evaluation of these activities is lacking. Thus, the present study aimed to assesses the wound healing activity of Pedilanthus leaves and its isolated constituents in topical ointment formulation. Bioassay-guided chromatographic fractionation of the methanol extract of leaves resulted in the isolation of 2-(3, 4-dihydroxy-phenyl)-5,7-dihydroxy-chromen-4-one and 1, 2-tetradecanediol, 1-(hydrogen sulfate), sodium salt. The ointment formulation of methanol extract (2.5%, 5% w/w) and isolated compounds (0.25% w/w) was prepared and evaluated on excision, incision and dead space wound models in rats. The effects of formulations on wound healing were assessed by the rate of wound closure, period of epithelialization, tensile strength, granulation tissue weight, hydroxyproline content and histopathology. Significant wound healing activity was observed with methanol extract and isolated constituents. Topical application of isolated compound ointments caused faster epithelialization, significant wound contraction (95.41%), and better tensile strength (565.33 g) on 16 post-wounding day, while 5% extract showed wound epithelialization with 95.55% contraction on 18th post-wounding day, better than the control group (76.39% on 22 day). The tensile strength of incision wound was significantly increased in extract and compound treated animals. Moreover, in dead space model the extract significantly increased granuloma tissue weight, tensile strength and hydroxyproline content. The tissue histology of ointment treated groups showed complete epithelialization with increased collagenation, compared to the povidone-iodine group. The results validated the traditional use of Pedilanthus tithymaloides for cutaneous wound management [Soma Ghosh, Amalesh Samanta, Nirup Bikash Mandal, Sukdeb Bannerjee and
NPARR 3(4), 2012-0407 Antinociceptive activity of methanol extract of flowers of Impatiens balsamina

Impatiens balsamina Linn. (Balsaminaceae), an annual herb locally called “Dopati”, is cultivated as an ornamental garden plant in Bangladesh. Flowers of the plant are used in folk medicine to treat lumbago, neuralgia, burns and scalds. This study evaluated the antinociceptive effect of the methanol extract of I. balsamina flowers (MIB). The extract was evaluated for antinociceptive activity using chemical- and heat-induced pain models such as acetic acid-induced writhing, hot plate, tail immersion and formalin test. To verify the possible involvement of opioid receptor in the central antinociceptive effect of MIB, naloxone was used to antagonize the effect. The effect of MIB on central nervous system (CNS) was also studied using hole cross and open field tests. MIB demonstrated strong and dose-dependent antinociceptive activity in all the chemical- and heat-induced mice models (p<0.05). These findings imply the involvement of both peripheral and central antinociceptive mechanisms. The use of naloxone confirmed the association of opioid receptors in the central antinociceptive effect. MIB also showed significant central nervous system depressant effect (p<0.05). This study reported the peripheral and central antinociceptive activity of the flowers of I. balsamina and rationalized the traditional use of the flower in the treatment of different painful conditions [Mohammad Zafar Imam*, Nazmun Nahar, Saleha Akter and Md. Sohel Rana (Department of Pharmacy, Stamford University Bangladesh, 51, Siddeswari Road, Dhaka-1217, Bangladesh), Journal of Ethnopharmacology, 2012, 142(3), 804-810].

NPARR 3(4), 2012-0408 Evaluation of antitumor activity and in vivo antioxidant status of Anthocephalus cadamba on Ehrlich ascites carcinoma treated mice

Anthocephalus cadamba (Roxb.) Miq. (Family: Rubiaceae) is commonly known as “Kadamba” in Sanskrit and Hindi in India. Various parts of this plant have been used as a folk medicine for the treatment of tumor, wound healing, inflammation and as a hypoglycemic agent. The purpose of this investigation was to evaluate the antitumor activity and antioxidant status of defatted methanol extract of A. cadamba (MEAC) on Ehrlich ascites carcinoma (EAC) treated mice. In vitro cytotoxicity assay has been evaluated by using the trypan blue method. The determination of in vivo antitumor activity was performed by using different EAC cells (2×10^6 cells, i.p.) inoculated mice groups (n=12). The groups were treated for 9 consecutive days with MEAC at the doses of 200 and 400 mg/kg b.w. respectively. After 24 h of last dose and 18 h of fasting, half of the mice were sacrificed and the rest were kept alive for assessment of increase in life span. The antitumor potential of MEAC was assessed by evaluating tumor volume, viable and nonviable tumor cell count, tumor weight, hematological parameters and biochemical estimations. Furthermore, antioxidant parameters were assayed by estimating liver and kidney tissue enzymes. MEAC showed direct cytotoxicity on EAC cell line in a dose dependent manner. MEAC exhibited significant (P<0.01) decrease in the tumor volume, viable cell count, tumor weight and elevated the life span of EAC tumor bearing mice. The hematological profile, biochemical estimations and tissue antioxidant assay were reverted to normal level in MEAC treated mice. Experimental results revealed that MEAC possesses potent antitumor and antioxidant properties. Further research is going on to find out the active principle(s) of MEAC for better understanding of mechanism of its antitumor and antioxidant activity [Narayan Dolai, Indrajit Karmakar, R.B. Suresh Kumar,
Several ailments are caused by infectious bacteria and in other diseases; they act as co-infection which complicate human life by causing health hazards. In Venda (South Africa), many plants are used in traditional medicine to treat cough and fever. This study was aimed at evaluating the antibacterial and antifungal properties, cyclooxygenases (COX), acetylcholinesterase (AChE) enzyme inhibitory effects and the phenolic composition as well as mutagenic properties of six medicinal plants used by the Venda people of Limpopo Province of South Africa against cough and fever. The petroleum ether (PE), dichloromethane (DCM), 80% ethanol (EtOH) and water extracts of six plants were tested against four infectious bacteria (Bacillus subtilis, Escherichia coli, Klebsiella pneumoniae and Staphylococcus aureus) and a fungus Candida albicans. The same extracts were evaluated for their ability to inhibit COX-1 and -2 enzymes. Methanolic and water extracts of the same plant were tested for acetylcholinesterase inhibitory effects. Total phenolics, flavonoids, gallotannins and condensed tannins were determined. The ability of the extracts to bind and precipitate proteins was also investigated. The extracts were investigated for genotoxicity with and without S9 (metabolic activation) against three Salmonella typhimurium tester strains TA98, TA100 and TA102. The organic extracts of Rhus lancea leaves exhibited the best antibacterial activity with minimum inhibitory concentration (MIC) values ranging from 0.0061 to 0.049mg/ml. The best antifungal activity was observed from a DCM extract of Syzygium cordatum leaves with a MIC value of 0.195mg/ml. The methanolic and water extracts of the same plant exhibited high inhibitory effects towards AChE with IC50 values of 0.22 and 0.26mg/ml, respectively. The highest levels of flavonoids and gallotannins were detected in Spirostachys africana bark; 11.57 and 48.88μg/g, respectively. The highest percentages (1.2%) of condensed tannins were detected in Uvaria caffra leaves. The high levels of phenolic compounds may have been responsible for high antimicrobial activities for extracts of S. africana bark and U. caffra leaves. S. cordatum leaves represented the highest affinity for protein binding with 93%. All the extracts were non-mutagenic towards the three tested strains with and without S9 metabolic activation. The result obtained in this study goes a long way in validating the ethnobotanical usage of these medicinal plants in the treatment of cough and fever by the Venda people. However, more evidence obtainable from other assays not performed here are urgently required to confirm these results [R.B. Mulaudzi, A.R. Ndhlala, M.G. Kulkarni and J. Van Staden* (Research Centre for Plant Growth and Development, School of Life Sciences, University of KwaZulu-Natal Pietermaritzburg, Private Bag X01, Scottsville 3209, South Africa) Journal of Ethnopharmacology, 2012, 143(1),185-193].

NPARR 3(4), 2012-0410 Hepatoprotective potential of Tecomella undulata stem bark is partially due to the presence of betulinic acid

Tecomella undulata (TU; Family Bignoniaceae) is used in Indian Ayurvedic system of medicine for treating various diseases including hepatic ailments. It is also incorporated in various marketed hepatoprotective polyherbal formulations. The present study was aimed at evaluating possible hepatoprotective role of isolated compounds from TU stem bark (TSB) using in vitro and in vivo experimental models. In vitro cytotoxicity and hepatoprotective potential of various extract, fractions and isolated compounds from TU stem bark were evaluated using HepG2 cells. Rats were pre-treated with TU methanolic extract (TSB-7) or betulinic acid
(MS-2) or silymarin for 7 days followed by a single dose of CCl₄ (0.5 ml/kg, i.p.). Plasma markers of hepatic damage, hepatic antioxidants and indices of lipid peroxidation along with microscopic evaluation of liver were assessed in control and treatment groups. TSB-2 and MS-1 accounted for significant cell death whereas; TSB-1, TBS-7, TSB-9, TSB-10 and, MS-2 did not register significant cytotoxicity. Further, non-cytotoxic components exhibited ascending grade of hepatoprotection in vitro (TSB-10<TSB-7<TSB-9<MS-2). Pre-treatment of TSB-7 or MS-2 to CCl₄ treated rats prevented hepatocyte damage as evidenced by biochemical and histopathological observations. It can be concluded that, hepatoprotective potential of *Tecomella undulata* stem bark is partially due to the presence of betulinic acid [Mahendra Jain*, Rakhee Kapadia, Ravirajsinh N. JadejaMenaka C. Thounaojam, Ranjitsinh V. Devkar and S.H. Mishra (Herbal Drug Technology Laboratory, Pharmacy Department, Faculty of Technology and Engineering, The M.S. University of Baroda, Kalabhavan, Vadodara 390001, Gujarat, India), *Journal of Ethnopharmacology*, 2012, **143**(1), 194-200].

**NPARR** 3(4), 2012-0411 Evaluation of mechanism for antihypertensive action of *Clerodendrum colebrookianum* Walp., used by folklore healers in north-east India

The present investigation was aimed to justify the pharmacological basis in traditional use of *Clerodendrum colebrookianum* as antihypertensive agent in north-east India. The aqueous extract (AECc), its aqueous, n-butanol (nBFCc), Ethyl-acetate (EtFCCc) and Chloroform fractions of *C. colebrookianum* leaves were evaluated for antihypertensive potential by using fructose-induced hypertension model in rats and in isolated frog heart. The *ex-vivo* muscarinic action in isolated rat ileum, *in-vitro* assay for Rho-kinase (ROCK II), phosphodiesterase-5 (PDE-5) and angiotension converting enzyme (ACE) were also carried out to establish the mechanism of action of samples. The total phenolic and flavonoied contents in test samples were estimated to establish phyto-pharmacological relationship. The 100 µg/mL test samples were showed calcium antagonism in rat ileum and at 50 µg/mL and 75 µg/mL doses exhibited ROCK-II and PDE-5 inhibition respectively where, EtFCCc was caused maximum 68.62% (ROCK-II) and 52.28% (PDE-5) inhibition, but none of the sample was exhibit effect in ACE at 100 µg/mL. The test samples also showed negative inotropic and chronotropic effect on isolated frog heart and significant (P<0.001) reduction in systolic blood pressure and heart rate in hypertensive rats compared to control. The total phenolic content maximum 80 µg gallic acid equivalents in nBFCc and flavonoids content maximum 69.57 µg Quercetin equivalent in AECc were estimated. These observations established the traditional claim and thus *C. colebrookianum* could be a potent antihypertensive agent for use in future. The antihypertensive effect mediated by cholinergic action and following ROCK-II, PDE-5 inhibition of *C. colebrookianum*. The present investigation was aimed to justify the pharmacological basis in traditional use of *Clerodendrum colebrookianum* as antihypertensive agent in north-east India. The aqueous extract (AECc), its aqueous, n-butanol (nBFCc), Ethyl-acetate (EtFCCc) and Chloroform fractions of *C. colebrookianum* leaves were evaluated for antihypertensive potential by using fructose-induced hypertension model in rats and in isolated frog heart. The *ex-vivo* muscarinic action in isolated rat ileum, *in-vitro* assay for Rho-kinase (ROCK II), phosphodiesterase-5 (PDE-5) and angiotension converting enzyme (ACE) were also carried out to establish the mechanism of action of samples. The total phenolic and flavonoied contents in test samples were estimated to establish phyto-pharmacological relationship. The 100 µg/mL test samples were showed calcium antagonism in rat ileum and at 50 µg/mL and 75 µg/mL doses exhibited ROCK-II and PDE-5 inhibition respectively where, EtFCCc was caused maximum 68.62% (ROCK-II) and 52.28% (PDE-5) inhibition, but none of the sample was exhibit effect in ACE at 100 µg/mL. The test samples also showed negative inotropic and chronotropic effect on isolated frog heart and significant (P<0.001) reduction in systolic blood pressure and heart rate in hypertensive rats compared to control. The total phenolic content maximum 80 µg gallic acid equivalents in nBFCc and flavonoids content maximum 69.57 µg Quercetin equivalent in AECc were estimated. These observations established the traditional claim and thus *C. colebrookianum* could be a potent antihypertensive agent for use in future. The antihypertensive effect mediated by cholinergic action and following ROCK-II, PDE-5 inhibition of *C. colebrookianum*. The present investigation was aimed to justify the pharmacological basis in traditional use of *Clerodendrum colebrookianum* as antihypertensive agent in north-east India. The aqueous extract (AECc), its aqueous, n-butanol (nBFCc), Ethyl-acetate (EtFCCc) and Chloroform fractions of *C. colebrookianum* leaves were evaluated for antihypertensive potential by using fructose-induced hypertension model in rats and in isolated frog heart. The *ex-vivo* muscarinic action in isolated rat ileum, *in-vitro* assay for Rho-kinase (ROCK II), phosphodiesterase-5 (PDE-5) and angiotension converting enzyme (ACE) were also carried out to establish the mechanism of action of samples. The total phenolic and flavonoied contents in test samples were estimated to establish phyto-pharmacological relationship. The 100 µg/mL test samples were showed calcium antagonism in rat ileum and at 50 µg/mL and 75 µg/mL doses exhibited ROCK-II and PDE-5 inhibition respectively where, EtFCCc was caused maximum 68.62% (ROCK-II) and 52.28% (PDE-5) inhibition, but none of the sample was exhibit effect in ACE at 100 µg/mL. The test samples also showed negative inotropic and chronotropic effect on isolated frog heart and significant (P<0.001) reduction in systolic blood pressure and heart rate in hypertensive rats compared to control. The total phenolic content maximum 80 µg gallic acid equivalents in nBFCc and flavonoids content maximum 69.57 µg Quercetin equivalent in AECc were estimated. These observations established the traditional claim and thus *C. colebrookianum* could be a potent antihypertensive agent for use in future. The antihypertensive effect mediated by cholinergic action and following ROCK-II, PDE-5 inhibition of *C. colebrookianum*. The present investigation was aimed to justify the pharmacological basis in traditional use of *Clerodendrum colebrookianum* as antihypertensive agent in north-east India. The aqueous extract (AECc), its aqueous, n-butanol (nBFCc), Ethyl-acetate (EtFCCc) and Chloroform fractions of *C. colebrookianum* leaves were evaluated for antihypertensive potential by using fructose-induced hypertension model in rats and in isolated frog heart. The *ex-vivo* muscarinic action in isolated rat ileum, *in-vitro* assay for Rho-kinase (ROCK II), phosphodiesterase-5 (PDE-5) and angiotension converting enzyme (ACE) were also carried out to establish the mechanism of action of samples. The total phenolic and flavonoied contents in test samples were estimated to establish phyto-pharmacological relationship.
respectively where, EtFCc was caused maximum 68.62% (ROCK-II) and 52.28% (PDE-5) inhibition, but none of the sample was exhibit effect in ACE at 100 μg/mL. The test samples also showed negative inotropic and chronotropic effect on isolated frog heart and significant \( (P<0.001) \) reduction in systolic blood pressure and heart rate in hypertensive rats compared to control. The total phenolic content maximum 80 μg gallic acid equivalents in nBFCc and flavonoids content maximum 69.57 μg Quercetin equivalent in AECc were estimated. These observations established the traditional claim and thus \( C. \) colebrookianum could be a potent antihypertensive agent for use in future. The antihypertensive effect mediated by cholinergic action and following ROCK – II, PDE-5 inhibition of \( C. \) colebrookianum [Deb Lokesh and Dutta Amitsankar (Pharmacology Laboratory, Medicinal Plants and Horticultural Resources Division, Institute of Bioresources and Sustainable Development (IBSD), \textit{Journal of Ethnopharmacology}, 2012, \textbf{143}(1), 207-212].

\textit{NPARR} 3(4), 2012-0412 \textbf{Antimalarial alkaloids from a Bhutanese traditional medicinal plant Corydalis dubia}

\textit{Corydalis dubia} is used in Bhutanese traditional medicine as a febrifuge and for treating infections in the blood, liver and bile which correlate to the signs and symptoms of malarial and microbial infections. To validate the ethnopharmacological uses of the plant and to discover potential new therapeutic drug leads. \( C. \) \textit{dubia} was collected from Bhutan and the alkaloids were obtained using acid–base fractionation and separation by repeated column and preparative plate chromatography. The alkaloids were identified from analysis of their physiochemical and spectroscopic data and were tested for antiplasmodial, antimicrobial and cytotoxicity activities. A systematic extraction and isolation protocol yielded one new natural product, dubiamine, and seven known isoquinoline alkaloids, scoulerine, cheilanthifoline, protopine, capnoidine, bicuculline, corydecumbine and hydrastine. Among the four alkaloids tested, scoulerine showed the best antiplasmodial activity with IC\(_{50}\) values of 5.4 μM and 3.1 μM against the antifolate sensitive and the multidrug resistant \( P. \) \textit{falciparum} strains: TM4/8.2 and K1CB1, respectively. None of the alkaloids tested showed significant antimicrobial or cytotoxicity activities. The antiplasmodial test results, of the isolated alkaloid components, are commensurate with the ethnopharmacological uses of this plant [Phurpa Wangchuk, Paul A. Keller, Stephen G. Pyne* Anthony C. Willis and Sumalee Kamchomwongpaisan (School of Chemistry, University of Wollongong, Wollongong, NSW 2522, Australia), \textit{Journal of Ethnopharmacology}, 2012, \textbf{143}(1), 310-313].

\textit{NPARR} 3(4), 2012-0413 \textbf{Uterine contractility of plants used to facilitate childbirth in Nigerian ethnomedicine}

Pregnant women in Nigeria use plant preparations to facilitate childbirth and to reduce associated pain. The rationale for this is not known and requires pharmacological validation. Obtain primary information regarding the traditional use of plants and analyze their uterine contractility at cellular level. Semi-structured, open interviews using questionnaires of traditional healthcare professionals and other informants triggered the collection and identification of medicinal plant species. The relative traditional importance of each medicinal plant was determined by its use-mention index. Extracts of these plants were analyzed for their uterotonic properties on an \textit{in vitro} human uterine cell collagen model. The plants \textit{Calotropis procera}, \textit{Commelina africana}, \textit{Duranta repens}, \textit{Hyptis suaveolens}, \textit{Ocimum gratissimum}, \textit{Saba comorensis}, \textit{Sclerocarya birrea}, \textit{Sida corymbosa} and \textit{Vernonia amygdalina} were documented and characterized. Aqueous extracts from these nine plants induced significant sustained increases in human myometrial smooth muscle cell
contractility, with varying efficiencies, depending upon time and dose of exposure. The folkloric use of several plant species during childbirth in Nigeria has been validated. Seven plants were for the first time characterized to have contractile properties on uterine myometrial cells. The results serve as ideal starting points in the search for safe, longer lasting, effective and tolerable uterotonic drug leads. Pregnant woman in Nigeria rely on traditional herbal medicine to induce or ease labor, and to treat childbirth-related complications. Nine plant species have been documented and characterized for their uterotonic properties [Alfred F. Attah, Margaret O'Brien, Johannes Koehbach, Mubo A. Sonibare, Jones O. Moody, Terry J. Smith and Christian W. Gruber*(Medical University of Vienna, Center for Physiology and Pharmacology, Schwarzspanierstr. 17, A-1090 Vienna, Austria), Journal of Ethnopharmacology, 2012, 143 (1), 377-382].

NPARR 3(4), 2012-0414 Olive leaf extract as a hypoglycemic agent in both human diabetic subjects and in rats

Olive tree (Olea europaea L.) leaves have been widely used in traditional remedies in European and Mediterranean countries as extracts, herbal teas, and powder. They contain several potentially bioactive compounds that may have hypoglycemic properties. To examine the efficacy of 500 mg oral olive leaf extract taken once daily in tablet form versus matching placebo in improving glucose homeostasis in adults with type 2 diabetes (T2DM). In this controlled clinical trial, 79 adults with T2DM were randomized to treatment with 500 mg olive leaf extract tablet taken orally once daily or matching placebo. The study duration was 14 weeks. Measures of glucose homeostasis including HbA1c and plasma insulin were measured and compared by treatment assignment. In a series of animal models, normal, streptozotocin (STZ) diabetic and sand rats were used in the inverted sac model to determine the mechanism through which olive leaf extract affected starch digestion and absorption. In the randomized clinical trial, the subjects treated with olive leaf extract exhibited significantly lower HbA1c and fasting plasma insulin levels; however, postprandial plasma insulin levels did not differ significantly by treatment group. In the animal models, normal and STZ diabetic rats exhibited significantly reduced starch digestion and absorption after treatment with olive leaf extract compared with intestine without olive leaf treatment. Reduced digestion and absorption was observed in both the mucosal and serosal sides of the intestine. Though reduced, the decline in starch digestion and absorption did not reach statistical significance in the sand rats. Olive leaf extract is associated with improved glucose homeostasis in humans. Animal models indicate that this may be facilitated through the reduction of starch digestion and absorption. Olive leaf extract may represent an effective adjunct therapy that normalizes glucose homeostasis in individuals with diabetes [Julio Wainstein, Tali Ganz, Mona Boaz, Yosefa Bar Dayan, Eran Dolev, Zohar Kerem, and Zecharia Madar.( M.D., Diabetes Unit, E. Wolfson Medical Center, Holon, 58100, Israel), Journal of Medicinal Food, 2012, 15(7), 605-610].

NPARR 3(4), 2012-0415 Rosmarinic acid content in antidiabetic aqueous extract of Ocimum canum Sims grown in Ghana

Rosmarinic acid (RA) is an important antioxidant polyphenol that is found in a variety of spices and herbs, including Ocimum canum Sims (locally called eme or akokobesa in Ghana). Aqueous extracts from the leaves of O. canum are used as an antidiabetic herbal medicine in Ghana. Analytical thin-layer chromatography was used to examine the composition of the polyphenols in leaf extracts. The polyphenol content in the aqueous and methanol extracts from the leaf, as determined by the Folin–Ciocalteu method, were 314 and 315 mg gallic acid equivalent/g leaf sample, respectively. The total flavonoid concentration as determined by
the aluminum (III) chloride method was 135 mg catechin equivalent/g leaf sample. High-performance liquid chromatography coupled to an electrospray Quadrupole time-of-flight mass spectrometer was also used to determine the polyphenol fingerprint profile in the leaf extracts of *O. canum*. Although the average RA concentration in the *O. canum* leaf extracts from Ghana was 1.69 mg/g dry weight (reported values range from 0.01 to 99.62 mg/g dry weight), this polyphenol was still a prominent peak in addition to caffeic acid derivatives [Mark A. Berhow, Andrews Obeng Affum, and Ben A. Gyan (Chemistry Department, National Nuclear Research Institute, Ghana Atomic Energy Commission, P.O. Box LG 80, Legon-Accra, Ghana), *Journal of Medicinal Food*, 2012, 15(7), 611-620].

*NPARR* 3(4), 2012-0416 The aqueous extract of *Withania coagulans* fruit partially reverses nicotinamide/streptozotocin-induced diabetes mellitus in rats

*Withania coagulans* fruit has been shown to possess antihyperglycemic properties and is used in the traditional Indian system of medicine. However, there has no systematic study of its mechanism of action. In a rat model diabetes mellitus (DM) was induced by intraperitoneal injection of nicotinamide (230 mg/kg of body weight) followed by streptozotocin at 55 mg/kg of body weight. After 96 h, mildly diabetic (MD) (fasting plasma glucose [FPG]=7–11.1 mmol/L) and severely diabetic (SD) (FPG>11.1 mmol/L) rats were treated with aqueous extract of *W. coagulans* fruit at doses of 125, 250, and 500 mg/kg of body weight/day orally. FPG, postprandial plasma glucose (PPPG), glycosylated hemoglobin (HbA1c), plasma insulin, tissue glycogen, and glucose-metabolizing enzymes were assayed at Day 30. Treatment of diabetic animals (MD and SD) with different doses of aqueous *W. coagulans* resulted in significantly decreased FPG, PPPG, and HbA1c (P<.01), whereas serum insulin increased significantly compared with that in diabetic-untreated rats (P<.01). MD and SD animals treated with aqueous *W. coagulans* also showed significant increases in liver and muscle glycogen compared with diabetic-untreated animals (P<.01). Moreover, activities of glucokinase and phosphofructokinase were also significantly increased (P<.01), whereas glucose-6-phosphatase activity was significantly decreased (P<.01) in MD and SD groups treated with aqueous *W. coagulans* compared with diabetic-untreated groups. The most effective dose of aqueous *W. coagulans* was 250 mg/kg of body weight. These results show that the aqueous extract of *W. coagulans* fruit has significant antihyperglycemic effects, which may be through the modulation of insulin levels and related enzyme activities [Kirtikar Shukla, Piyush Dikshit, Rimi Shukla and Jasvinder K. Gambhir. (Department of Biochemistry, University College of Medical Sciences (University of Delhi) and GTB Hospital, Delhi-110095, India), *Journal of Medicinal Food*, 2012, 15(8), 718-725].

*NPARR* 3(4), 2012-0417 Evaluation of the anti diabetic activity of column fractions obtained from the bark extract of *Soymida febrifuga* A. Juss.

Diabetes has become a worldwide problem afflicting humans irrespective of age. Even though a number of synthetic drugs are available for the treatment of diabetes, plant drugs are generally preferred due to the assumption that they have less side effects and low cost. This study reports the hypoglycaemic and antihyperglycaemic actions of the methanolic bark extract of *Soymida febrifuga* A. Juss. (Fam: Meliaceae) in euglycaemic and alloxan-induced diabetic rats, respectively. The results revealed that three column fractions obtained from the methanol extract of *S. febrifuga* possess maximum hypoglycaemic and antihyperglycaemic activities 6 h after treatment. At a dose of 200 mg/kg, the relatively nonpolar column fraction obtained by using 20% chloroform in
acetone as an eluent was by far the most potent fraction which showed comparable activity with that of the standard drug glibenclamide (10 mg/kg). At a dose of 200 mg/kg, the same column eluate showed maximum antihyperglycaemic effect reducing blood glucose level by 33.00%. At a dose of 10 mg/kg, the reference drug glibenclamide brought about 33.46% reduction of blood glucose level. In light of the results obtained from the current study, it could be concluded that the bark of *S. febrifuga* has genuine antidiabetic activity. Diabetes has become a worldwide problem afflicting humans irrespective of age. Even though a number of synthetic drugs are available for the treatment of diabetes, plant drugs are generally preferred due to the assumption that they have less side effects and low cost. This study reports the hypoglycaemic and antihyperglycaemic actions of the methanolic bark extract of *Soymida febrifuga* A. Juss. (Fam: Meliaceae) in euglycaemic and alloxan-induced diabetic rats, respectively. The results revealed that three column fractions obtained from the methanol extract of *S. febrifuga* possess maximum hypoglycaemic and antihyperglycaemic activities 6 h after treatment. At a dose of 200 mg/kg, the relatively nonpolar column fraction obtained by using 20% chloroform in acetone as an eluent was by far the most potent fraction which showed comparable activity with that of the standard drug glibenclamide (10 mg/kg). At a dose of 200 mg/kg, the same column eluate showed maximum antihyperglycaemic effect reducing blood glucose level by 33.00%. At a dose of 10 mg/kg, the reference drug glibenclamide brought about 33.46% reduction of blood glucose level. In light of the results obtained from the current study, it could be concluded that the bark of *S. febrifuga* has genuine antidiabetic activity.

To evaluate health benefits attributed to *Hibiscus sabdariffa* L. a randomized, open-label, two-way crossover study was undertaken to compare the impact of an aqueous *H. sabdariffa* L. extract (HSE) on the systemic antioxidant potential (AOP; assayed by ferric reducing antioxidant power (FRAP)) with a reference treatment (water) in eight healthy volunteers. The biokinetic variables were the areas under the curve (AUC) of plasma FRAP, ascorbic acid and urate that are above the pre-dose concentration, and the amounts excreted into urine within 24 h (Ae0–24) of antioxidants as assayed by FRAP, ascorbic acid, uric acid, malondialdehyde (biomarker for oxidative stress), and hippuric acid (metabolite and potential biomarker for total polyphenol intake). HSE caused significantly higher plasma AUC of FRAP, an increase in Ae0–24 of FRAP, ascorbic acid and hippuric acid, whereas malondialdehyde excretion was reduced. Furthermore, the main hibiscus anthocyanins as well as one glucuronide conjugate could be quantified in the volunteers' urine (0.02% of the administered dose). The aqueous HSE investigated in this study enhanced the systemic AOP and reduced the oxidative stress in humans. Furthermore, the increased urinary hippuric acid excretion after HSE consumption indicates a high biotransformation of the ingested HSE polyphenols, most likely caused by the colonic microbiota. The aqueous HSE studied here increased the systemic antioxidant potential and enhanced the systemic AOP and reduced the oxidative stress in humans, indicating a high biotransformation of the ingested HSE polyphenols, most likely caused by the colonic microbiota.
**Hypocholesterolaemic and antioxidant activities of chickpea (Cicer arietinum L.) protein Hydrolysates**

Some dietary proteins possess biological properties which make them potential ingredients of functional or health-promoting foods. Many of these properties are attributed to bioactive peptides that can be released by controlled hydrolysis using exogenous proteases. The aim of this work was to test the improvement of hypocholesterolaemic and antioxidant activities of chickpea protein isolate by means of hydrolysis with alcalase and flavourzyme. All hydrolysates tested exhibited better hypocholesterolaemic activity when compared with chickpea protein isolate. The highest cholesterol micellar solubility inhibition (50%) was found after 60 min of treatment with alcalase followed by 30 min of hydrolysis with flavourzyme. To test antioxidant activity of chickpea proteins three methods were used: β-carotene bleaching method, reducing power and 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging effect since antioxidant activity of protein hydrolysates may not be attributed to a single mechanism. Chickpea hydrolysates showed better antioxidant activity in all assays, especially reducing power and DPPH scavenging effect than chickpea protein isolate. The results of this study showed the good potential of chickpea protein hydrolysates as bioactive ingredients. The highest bioactive properties could be obtained by selecting the type of proteases and the hydrolysis time. [María del Mar Yust*, María del Carmen Millán-Linares, Juan María Alcaide-Hidalgo, Francisco Millán and Justo Pedroche (Instituto de la Grasa-CSIC, Av. Padre García Tejero, 4, 41012-Seville, Spain.), *Journal of the Science of Food and Agriculture*, 2012, 92(9), 1994-2001].

**Assessment of In vitro antioxidant, antibacterial and immune activation potentials of aqueous and ethanol extracts of Phyllanthus niruri**

Recently much attention has been paid to biologically active plants because of their low production cost and fewer adverse effects compared with chemical drugs. In the present investigation the bioactivity of Phyllanthus niruri ethanol and aqueous extracts was evaluated *in vitro*. The ethanol extract of *P. niruri* showed a high level of flavonoid content (123.9 ± 0.002 mg g$^{-1}$), while the aqueous extract showed the highest 2,2-diphenyl-1-picrylhydrazyl (DPPH; IC$_{50}$6.85 ± 1.80 µmol L$^{-1}$) and 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS; 46.44 ± 0.53 µmol L$^{-1}$) free radical scavenging activities with high phenol content (376 ± 0.02 mg g$^{-1}$) and elevated levels of ferric reducing antioxidant power (FRAP; 23 883 ± 0.019 mmol g$^{-1}$) with excellent antibacterial activity against *Staphylococcus aureus* (20 mm inhibition zone) and *Streptococcus agalactiae* (12 mm inhibition zone), respectively, in addition to the best immune activation potential of human peripheral blood mononuclear cells (450.5%). It is clear from our results that both extracts of *P. niruri* has excellent bioactivity roles via elevated levels of antibacterial, antioxidant and percentage of peripheral blood mononuclear cell proliferation, which could lead to the development of medications for clinical use [Zahra A Amin*Mahmood A Abdulla, Hapipah M Ali, Mohammed A Alshawsh and Suhailah W Qadir(Department of Molecular Medicine, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia.), *Journal of the Science of Food and Agriculture*, 2012, 92(9), 1874-1877].

**Comparison of chemical composition and antioxidant potential of volatile oil from fresh, dried and cured turmeric (Curcuma longa) rhizomes**

The present work was conducted to assess and compare the chemical composition of volatile oils from fresh, dried and cured turmeric (*Curcuma longa*) rhizomes from a selected single
source. In addition, their antioxidant and radical scavenging potentials were correlated with chemical composition. Major components were \( \alpha \)-turmerone (21.0-30.3\%), \( \alpha \)-turmerone (26.5-33.5\%) and \( \beta \)-turmerone (18.9-21.1\%). Trolox equivalent antioxidant capacity (TEAC) values were 38.9, 68.0 and 66.9 \( \mu \)M at 1 mg of oil/ml for fresh, dried and cured rhizome respectively in ABTS assay. IC\(_{50}\) values for fresh, dried and cured rhizome oil to quench DPPH radicals were 4.4, 3.5 and 3.9 mg of oil/ml respectively. Fresh, dried and cured rhizome oils showed antioxidant capacity of 358, 686 and 638 mM of ascorbic acid equivalents per 1 mg of oil, respectively. The rhizome oil shows good reducing potential and was concentration dependent. It is inferred that the cured rhizomes provided high yield of volatile oil with appreciably high antioxidant potential.

The present work was conducted to assess and compare the chemical composition of volatile oils from fresh, dried and cured turmeric (Curcuma longa) rhizomes from a selected single source. In addition, their antioxidant and radical scavenging potentials were correlated with chemical composition. Major components were \( \alpha \)-turmerone (21.0–30.3\%), \( \alpha \)-turmerone (26.5–33.5\%) and \( \beta \)-turmerone (18.9–21.1\%). Trolox equivalent antioxidant capacity (TEAC) values were 38.9, 68.0 and 66.9 \( \mu \)M at 1 mg of oil/ml for fresh, dried and cured rhizome respectively in ABTS assay. IC\(_{50}\) values for fresh, dried and cured rhizome oil to quench DPPH radicals were 4.4, 3.5 and 3.9 mg of oil/ml respectively. Fresh, dried and cured rhizome oils showed antioxidant capacity of 358, 686 and 638 mM of ascorbic acid equivalents per 1 mg of oil, respectively. The rhizome oil shows good reducing potential and was concentration dependent. It is inferred that the cured rhizomes provided high yield of volatile oil with appreciably high antioxidant potential.

Hypothalamic insulin inhibits food intake, preventing obesity. High-fat feeding with polyunsaturated fats may be obesogenic, but their effect on insulin action has not been elucidated. The present study evaluated insulin hypophagia and hypothalamic signaling after central injection in rats fed either control diet (15% energy from fat) or high-fat diets (50% energy from fat) enriched with either soy or fish oil. Soy rats had increased fat pad weight and serum leptin with normal body weight, serum lipid profile and peripheral insulin sensitivity. Fish rats had decreased body and fat pad weight, low leptin and corticosterone levels, and improved serum lipid profile. A 20-mU dose of intracerebroventricular (ICV) insulin inhibited food intake in control and fish groups, but failed to do so in the soy group. Hypothalamic protein levels of IR, IRS-1, IRS-2, Akt, mTOR, p70S6K and AMPK were similar among groups. ICV insulin stimulated IR tyrosine phosphorylation in control (68\%) soy (36\%) and fish (34\%) groups. Tyrosine phosphorylation of the pp185 band was significantly stimulated in control (78\%) and soy (53\%) rats, but not in fish rats. IRS-1 phosphorylation was stimulated only in control rats (94\%). Akt serine phosphorylation was significantly stimulated only in control (90\%) and fish (78\%) rats. The results showed that, rather than the energy density, the fat type was a relevant aspect of high-fat feeding, since blockade of hypothalamic insulin signal transmission and insulin hypophagia was promoted only by the high-fat soy diet, while they were preserved in the rats fed with the high-fat fish diet [Gustavo D. Pimentel, Ana P.S. Dornellas, José C. Rosa, Fábio S. Lira, Cláudio A. Cunha, Valter T. BoldarineGabriel I.H. de