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nparr@niscair.res.in

# Natural Products and Resources Repository

**A Quarterly Electronic Repository of Current Information on  
Natural Products and Resources**



**National Institute of Science Communication And Information Resources**  
CSIR, New Delhi, INDIA

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## From the Director's Desk

India is one of the richest and most diversified countries as far as biodiversity, natural products and resources are concerned. Dissemination of information on various topics related to these subjects has acquired unprecedented prominence in the last two decades as every field, be it science, technology or engineering, look to natural resources as a safe source, both environmentally as well as technologically.

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Gangan Prathap

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**(A Quarterly Electronic Repository of Current Information on  
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Compilation/Editor: Dr (Mrs) Sunita Garg

Director

Dr Gangan Prathap

*(ex-officio)*

National Institute of Science Communication and Information Resources (NISCAIR), CSIR,

Dr K. S. Krishnan Marg, New Delhi-110012, INDIA;

Phone: 91-011-25846301 ext 258, 25846001;

Fax: 91-011 2584 7062;

Website; <http://nopr.niscair.res.in>

E-mail: [sunitag@niscair.res.in](mailto:sunitag@niscair.res.in); [sunita.niscair@gmail.com](mailto:sunita.niscair@gmail.com); [nparr@niscair.res.in](mailto:nparr@niscair.res.in); [sanjayburde@niscair.res.in](mailto:sanjayburde@niscair.res.in)

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# NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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## NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

### BEVERAGES (incl. Juices, Tea /Coffee, Yoghurt and other natural soft drinks)

#### **NPARR 1(3), 2010-0336, Effect of pectinase treatment and concentration of litchi juice on quality characteristics of litchi juice**

Litchi (*Litchi chinensis* Linn) juice concentrate was prepared from pulp extracted from ripe fruits. Clarification of litchi pulp was optimized using pectinase at different concentrations. Litchi pulp treated with pectinase enzyme facilitated the removal of insoluble solids and extraction of juice. Vacuum concentration of clarified juice was carried out in a pilot scale turbafilm vacuum evaporator to obtain litchi juice concentrate with total soluble solids of 60°Brix. The litchi juice concentrate contained 49.9% total sugars, 47% reducing sugars, 32.7mg/100g ascorbic acid and its titratable acidity was 0.73%. The litchi juice concentrate was stored at -20°C for 6 months and analyzed at regular intervals for changes in quality. No significant changes in the composition of juice concentrate was observed during storage except tannin content and non-enzymatic browning which increased during storage. Single strength litchi juice reconstituted from juice concentrate was highly acceptable sensorily during 6 months storage [P. Vijayanand\*, S.G. Kulkarni and G.V. Prathibha (Department of Fruit and Vegetable Technology, Central Food Technology Research Institute, (Council of Scientific and Industrial Research), Mysore, 570 020, India), *Journal of Food Science and Technology*, 2010, **47**(2), 235-239].

#### **NPARR 1(3), 2010-0337, Effect of processing of dates into date juice concentrate and appraisal of its quality characteristics**

Date palm (*Phoenix dactylifera* Linn.) is widely cultivated in Kutch district of Gujarat, India and the fruits are harvested at immature stage before the

onset of monsoon to prevent spoilage. The immature date fruits with less commercial value were used for processing into date juice concentrate. Immature dates were crushed and treated with 0.1% pectinase enzyme for 120 min to obtain maximum juice. Date juice was found to be rich in reducing sugars (16.1%) and total sugars (18.3%). Juice was pasteurized at 85°C to inactivate the enzyme, cooled and centrifuged at 3000 rpm to get clear juice. The juice was concentrated in a thin film evaporator to a total soluble solids (TSS) of 76°Brix in 2 passes. Chemical composition of date juice during different stages of concentration was determined. Date juice concentrate was packed in low density polyethylene bags of size (22 cm × 14 cm) and frozen in blast freezer at -40°C and stored at -20°C. Storage of date juice concentrate at -20°C for 6 months indicated no significant changes in TSS, acidity, ascorbic acid, total sugars and pH. Hunter colour lightness L, and redness a values of date juice concentrate decreased whereas b values increased during storage. Date juice concentrate was stable during 6 months storage could be reconstituted for preparing ready-to-serve beverages with acceptable sensory quality [S. G. Kulkarni, P. Vijayanand\* and L. Shubha (Fruit and Vegetable Technology, Central Food Technological Research Institute (Council of Scientific and Industrial Research), Mysore, 570 020, India), *Journal of Food Science and Technology*, 2010, **47**(2), 157-161].

#### **NPARR 1(3), 2010-0338, Colour and texture of apples high pressure processed in pineapple juice**

Cubes of Granny Smith and Pink Lady apples were vacuum packed in barrier bags with 0% to 50% (v/v) pineapple juice (PJ) at 20°Bx and subjected to high pressure processing (HPP) at 600MPa for 1-5min (22°C). The in-pack total colour change ( $\Delta E$ ) was observed over 4 weeks at 4°C. Within <1week of storage at 4°C, texture, polyphenoloxidase,

pectinmethylesterase activities, changes in  $\Delta E$  and visual browning after opening the bags during air exposure (22°C; 21% O<sub>2</sub>) for 5h were also monitored. During the 4 weeks storage in bag visible colour changes were not observed. Texture and  $\Delta E$  after 5h air exposure were significantly affected by the apple variety, HPP time and % PJ used. The combined treatment significantly reduced residual PPO activity while PME activity was not affected in both varieties. Pineapple juice in combination with HPP could be used as a natural preservation system for minimally processed apples [Niranjala Perera\*, T.V. Gamage, L. Wakeling, G.G.S. Gamlath and C. Versteeg (School of Science and Engineering, University of Ballarat, Mt. Helen Campus, Ballarat, VIC 3350, Australia), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 39-46].

**NPARR 1(3), 2010-0339, Properties of low-fat stirred yoghurts made from high-pressure-processed skim milk**

Physical properties of stirred yoghurt made from reconstituted skim milk that was high-pressure (HP)-treated at 100, 250 or 400MPa, at 25, 70 or 90°C, for 10min, prior to inoculation with yoghurt cultures, were studied; portions of milk HP-treated at 25°C were also heat-treated at 90°C for 10 min before or after pressure treatment. Control yoghurts were made from skim milk given a heat treatment at 90°C for 10min. Fermentation time was not affected by treatment applied to the milk. HP treatment of skim milk at 25°C, before or after heat treatment, gave stirred yoghurts of similar viscosities to that made from conventionally heat-treated milk. Lower viscosities were obtained when stirred yoghurts were made with milk HP-treated at elevated temperatures. A model is proposed to correlate properties of yoghurt with HP/heat-induced changes in interactions and structures of protein in the milk samples [Punsandani Udabage\*, Mary Ann Augustin, Cornelis Versteeg, Amirtha Puvanenthiran, Jin Ah Yoo, Narissara Allen, Ian McKinnon, Mary Smiddy and Alan L. Kelly (CSIRO Food Futures Flagship, 671 Sneydes Road, Werribee, VIC 3030, Australia), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 32-38].

**NPARR 1(3), 2010-0340, Suppression of blood glucose level by a new fermented tea obtained by tea-rolling processing of loquat (*Eriobotrya japonica*) and green tea leaves in disaccharide-loaded Sprague-Dawley rats**

In the field of food science, much interest has been focused on the development of alternative medicinal foods with the ability to regulate excess blood glucose level (BGL) rise. The authors have successfully developed a new fermented tea product (LG tea) by co-fermentation of loquat (*Eriobotrya japonica* Lindl.) leaf and summer-harvested green tea leaf. The objective of this study was to examine the acute suppression effect of LG tea on BGL rise in disaccharide-loaded Sprague-Dawley (SD) rats and to evaluate its possible usage as an antidiabetic functional food material. As a result of single oral administration of hot water extract of LG tea (50 mg kg<sup>-1</sup>) to maltose-loaded SD rats, BGL at 30 min was significantly decreased by 23.8% ( $P < 0.01$ ) compared with the control. A corresponding reduction in serum insulin secretion was also observed. The ED<sub>50</sub> value of LG tea (50.7 mg kg<sup>-1</sup>) was estimated to be about 16-fold higher than that of the therapeutic drug acarbose (3.1 mg kg<sup>-1</sup>). No significant change in BGL was observed when sucrose or glucose was administered, suggesting that the suppression effect of LG tea was achieved by maltase inhibition, not by sucrase inhibition or glucose transport inhibition at the intestinal membrane [Kei Tamaya\*, Toshiro Matsui, Asami Toshima, Mai Noguchi, Qiu Ju, Yuji Miyata, Takashi Tanaka and Kazunari Tanaka (Industrial Technology Center of Nagasaki, 2-1303-8 Ikeda, Ohmura, Nagasaki 856-0026, Japan), *Journal of the Science of Food and Agriculture*, 2010, **90**(5), 779-783].

**NPARR 1(3), 2010-0341, Influence of drying on the content of sugars in wet processed green Arabica coffees**

When wet processed coffee beans are dried, the resulting decrease

the water potential induces various metabolic responses. This study was aimed at elucidating the impact of these reactions on the composition of sugars, representing potential aroma precursors. Wet processed green

coffees were dried under defined conditions, and the relevant sugars were analysed. Special emphasis was put on the influence of the drying regime, i.e. continuous dryings and such interrupted by pauses in order to mimic sun dryings. The contents of fructose and glucose decreased significantly within the first day of drying. This diminution for the first time proves that the lower contents of glucose and fructose generally present in wet processed coffee beans in comparison to dry processed ones are – at least in part – due to metabolic processes and are not related to the leaching of sugars into the process water in the course of wet processing [Maik Kleinwächter and Dirk Selmar\* (Institute for Plant Biology, Technische Universität Braunschweig, Mendelssohnstr 4, 38106 Braunschweig, Germany), *Food Chemistry*, 2010, **119**(2), 500-504].

**NPARR 1(3), 2010-0342, Addition of milk or caseinophosphopeptides to fruit beverages to improve iron bioavailability**

A study has been made of the influence of caseinophosphopeptides (CPPs) added to a fruit beverage versus milk based fruit beverages upon iron retention, transport and uptake, using a combined simulated gastrointestinal digestion/Caco-2 cell system. Grape concentrate, orange concentrate, and apricot puree were used for sample formulation. Eight samples were assayed with/without added Fe sulphate (3 mg/100 ml fruit beverage) and/or added Zn sulphate (1.6 mg/100 ml fruit beverage), with/without skimmed milk (11% v/v). The addition of milk to fruit beverages exerted a positive effect on iron retention, transport and uptake versus fruit beverages, and this effect was greater than that of CPPs added to soluble fractions of fruit beverages. The addition of CPPs to soluble fractions of fruit beverages improved iron transport. Iron supplementation increased Fe retention, transport and uptake – the effect being more notable in samples with milk. Zinc supplementation did not affect Fe retention, transport or uptake, [Maria José García-Nebot, Amparo Alegría, Reyes Barberá\*, Gonzalo Clemente and Fernando Romero (Nutrition and Food Chemistry, Faculty of Pharmacy, University of Valencia. Avda. Vicente Andrés Estellés s/n, 46100 Burjassot, Valencia, Spain), *Food Chemistry*, 2010, **119**(1), 141-148].

**NPARR 1(3), 2010-0343, Interaction mechanisms between caffeine and polyphenols in infusions of *Camellia sinensis* leaves**

Black tea infusions of *Camellia sinensis* (Linn.) O. Kuntze leaves were studied for the influence of water composition, especially calcium content, on the amount of extracted organic matter and on the interactions between caffeine and polyphenols. The higher the calcium content, the lower the extraction of caffeine and polyphenols in acidic media. In alkaline media, besides the calcium effect, polyphenols are oxidized. Caffeine NMR chemical shifts varied depending on the water used showing modified interactions. Using model solutions, polyphenols seem to be responsible for these changes in the case of ultra pure water, but in the case of alkaline solutions, the data in model solutions are different from tea infusions implying that other compounds should interact. Moreover, epigallocatechin gallate (EGCg) and epigallocatechin are the polyphenols interacting most strongly with caffeine in infusions and not EGCg and epicatechin gallate as thought before [Aurélien Couzinet-Mossion, Stéphane Balayssac, Véronique Gilard, Myriam Malet-Martino, Martine Potin-Gautier and Philippe Behra\* (Université de Toulouse, INPT, LCA (Laboratoire de Chimie AgroIndustrielle), ENSIACET, 4 allée Emile Monso BP 74233, F-31432 Toulouse Cedex 4, France), *Food Chemistry*, 2010, **119**(1), 173-181].

**NPARR 1(3), 2010-0344, Flavour characterisation of fresh and processed pennywort (*Centella asiatica* L.) juices**

The flavour characteristics of fresh and processed pennywort juices treated by pasteurisation, sterilisation and high pressure processing (HPP) were investigated by using solid-phase micro-extraction combined with gas chromatography–mass spectrometry. Sesquiterpene hydrocarbons comprise the major class of volatile components present and the juices had a characteristic smell due to the presence of volatile compounds including  $\beta$ -caryophyllene, humulene, *E*- $\beta$ -farnesene,  $\alpha$ -copaene, alloaromadendrene and  $\beta$ -elemene. All processing operations caused a reduction in the total volatile concentration, but HPP caused more volatile acyclic alcohols, aldehydes and oxygenated

monoterpenoids to be retained than pasteurisation and sterilisation. Ketones were not present in fresh pennywort juice, but 2-butanone and 3-nonen-2-one were generated in all processed juices, and 2-nonanone and 2-hexanone were present in pasteurised and sterilised juices. Other chemical changes including isomerisation were also reduced by HPP compared to pasteurisation and sterilization [Pronprapa Wongfhun, Michael H. Gordon\* and Arunee Apichartsrangkoon (Department of Food Biosciences, University of Reading, UK), *Food Chemistry*, 2010, **119**(1), 69-74].

**NPARR 1(3), 2010-0345, Properties of low-fat stirred yoghurts made from high-pressure-processed skim milk**

Physical properties of stirred yoghurt made from reconstituted skim milk that was high-pressure (HP)-treated at 100, 250 or 400MPa, at 25, 70 or 90°C, for 10min, prior to inoculation with yoghurt cultures, were studied; portions of milk HP-treated at 25°C were also heat-treated at 90°C for 10 min before or after pressure treatment. Control yoghurts were made from skim milk given a heat treatment at 90°C for 10min. Fermentation time was not affected by treatment applied to the milk. HP treatment of skim milk at 25°C, before or after heat treatment, gave stirred yoghurts of similar viscosities to that made from conventionally heat-treated milk. Lower viscosities were obtained when stirred yoghurts were made with milk HP-treated at elevated temperatures. A model is proposed to correlate properties of yoghurt with HP/heat-induced changes in interactions and structures of protein in the milk samples [Punsandani Udabage\*, Mary Ann Augustin, Cornelis Versteeg, Amirtha Puvanenthiran, Jin Ah Yoo, Narissara Allen, Ian McKinnon, Mary Smiddy and Alan L. Kelly (CSIRO Food Futures Flagship, 671 Sneydes Road, Werribee, VIC 3030, Australia), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 32-38 ].

**NPARR 1(3), 2010-0346, Comparative study on cloudy apple juice qualities from apple slices treated by high pressure carbon dioxide and mild heat**

Qualities of cloudy apple juices from apple slices treated by high pressure carbon dioxide (HPCD) and mild heat (MH) were evaluated. Temperatures were from 25 to 65°C, time 20min, and pressure 20MPa. Polyphenol oxidase (PPO) was completely inactivated by HPCD and its minimal residual activity (RA) by MH at 65°C was 38.6%. RA of pectin methylesterase (PME) with HPCD was significantly lower than MH and its minimum was 18%. *L* value of cloudy apple juice from HPCD-treated apple slices was significantly greater than that from MH-treated apple slices, however, *b* value, browning degree (BD) and turbidity were lower. And no differences in *a* value, total soluble solids, pH and conductivity were observed. After 7-day storage at 4°C, HPCD caused no BD alteration but a significant turbidity loss. MH increased BD at 55 and 65 °C, and led to turbidity loss from 35 to 65°C. The turbidity was not well related to RA of PME [Shuang Niu, Zenghui Xu, Yudan Fang, Liyun Zhang, Yingjie Yang, Xiaojun Liao and Xiaosong Hu, (College of Food Science and Nutritional Engineering, China Agricultural University, Key Laboratory of Fruit and Vegetable Processing, Ministry of Agriculture, Engineering Research Center for Fruit and Vegetable Processing, Ministry of Education, Beijing 100083, China), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 91-97].

**NPARR 1(3), 2010-0347, Separation of casein from whey proteins by dynamic filtration**

It has been proven that functional properties of milk proteins can improve the quality and nutritional value of foods. This paper investigates the separation of whey proteins from casein micelles using a Multi Shaft Disk (MSD) module and a rotating disk dynamic filtration module. The MSD module was equipped with 6 ceramic membranes of 0.2µm pores. PVDF and Nylon membranes of 0.2µm pores were tested in the rotating disk module. Permeate flux with the MSD module increased with TMP and rotation speed, reaching a maximum of 132L h<sup>-1</sup> m<sup>-2</sup> at 1931rpm. α-Lactalbumin (α-La) and β-Lactoglobulin (β-Lg) transmissions also increased with rotation speed, ranging from 25% at 1044 rpm to 40% at 1931rpm. With a Nylon membrane, the rotating disk module yielded lower permeate fluxes than

the MSD module, while when equipped with a PVDF membrane it provided higher permeate fluxes than the MSD, but casein micelles rejection was lower.  $\alpha$ -La and  $\beta$ -Lg transmissions were higher with the rotating disk module, using Nylon and PVDF membranes, than for the MSD. From this comparison, it can be concluded that the MSD module gave the best compromise between high permeate flux, high  $\alpha$ -La and  $\beta$ -Lg transmissions and high casein micelles rejection [V. Espina\*, M.Y. Jaffrin, M. Frappart and L.H. Ding (Équipe d'Accueil "Transformations Intégrées de la Matière Renouvelable", Université de Technologie de Compiègne, France), *Desalination*, 2010, **250**(3), 1109-1112].

**NPARR 1(3), 2010-0348, Evaluation of pervaporation process of kiwifruit juice by SPME-GC/Ion Trap Mass Spectrometry**

The processing of kiwifruit for obtaining products with a higher sensory quality, to be used in the food industry, is associated with the use of techniques which can limit the physical and chemical losses of aroma compounds. Pervaporation (PV) represents an alternative to the techniques based on distillation/evaporation or partial condensation to concentrate the aroma compounds preserving the molecule integrity (mild operational conditions used), having a high selectivity towards the organic volatile compounds, and respecting also the environment. The most representative volatile compounds of the kiwifruit aroma was chosen for evaluating the pervaporation process. SPME-GC/ion trap mass spectrometry method was exploited to determine the amounts of these compounds. The approach was based on chemical ionization acquisition with isobutane as reagent gas and 1-heptanol and (Z)-3-hexen-yl acetate as internal standards. In these conditions, the calibration curves were satisfactory as demonstrated by the  $R^2$  values of the straight lines (0.9937–0.9999). A kiwifruit fresh juice was processed by pervaporation through the composite commercial membrane (GFT1070) and the one self-prepared, made of styrene butadiene co-styrene (SBS), at three different feed temperatures. Marked effects for both membranes were observed in the total and partial fluxes of aroma compounds as the temperature was increased. The

studied aroma compounds were differently affected by the temperature changes during PV process, with the result of a change in concentration in the permeate of the aroma compounds recovered [A. Figoli\*, A. Tagarelli, B. Cavaliere, C. Voci, G. Sindona, S.K. Sikdar and E. Drioli (Research Institute on Membrane Technology, ITM-CNR, at University of Calabria, Via P. Bucci cubo 17/c, I-87030 Arcavacata di Rende (CS), Italy), *Desalination*, 2010, **250**(3), 1113-1117].

**NPARR 1(3), 2010-0349, Physico-chemical parameters of cactus pear [*Opuntia ficus-indica* (Linn.) Mill.] juice clarified by microfiltration and ultrafiltration processes**

The health-promoting capacity of cactus pear fruit is highly attractive for the development of nutraceutical foods. The increasing market demand towards this fruit and products, which combine added value with a fresher taste, has challenged researchers to develop procedures to lengthen storage life. In addition, the possibility to obtain natural colorants from the cactus pear fruit rather than synthetic colorants for drinks and dairy products represents another interesting perspective. In this study the effect of microfiltration (MF) and ultrafiltration (UF) processes on the physico-chemical composition of the cactus pear juice produced from fruits of Italian (Sicily) origin was investigated in order to evaluate the influence of the clarification treatment on the content of main parameters characterizing the nutritional and functional properties of the fruit. Effects of operating parameters on the performance of both processes in terms of permeate fluxes were also evaluated [Alfredo Cassano\*, Carmela Conidi and Enrico Drili (Institute on Membrane Technology, ITM-CNR, c/o University of Calabria, via P. Bucci, 17/C, I-87030 Rende (Cosenza), Italy), *Desalination*, 2010, **250**(3), 1101-1104].

**2NPARR 1(3), 2010-0350, Effect of prebiotics on viability and growth characteristics of probiotics in soymilk**

Soy products have attracted much attention lately as carriers for probiotics. This study was aimed at enhancing the growth of probiotics in soymilk via

supplementation with prebiotics. *Lactobacillus* sp. FTDC 2113, *Lactobacillus acidophilus* FTDC 8033, *Lactobacillus acidophilus* ATCC 4356, *Lactobacillus casei* ATCC 393, *Bifidobacterium* FTDC 8943 and *Bifidobacterium longum* FTDC 8643 were evaluated for their viability and growth characteristics in prebiotic-supplemented soymilk. In the presence of fructooligosaccharides (FOS), inulin, mannitol, maltodextrin and pectin, all strains showed viability exceeding  $7 \log_{10}$  colony-forming units  $\text{mL}^{-1}$  after 24h. Their growth was significantly ( $P < 0.05$ ) increased on supplementation with maltodextrin, pectin, mannitol and FOS. Additionally, supplementation with FOS, mannitol and maltodextrin increased ( $P < 0.05$ ) the production of lactic acid. Supplementation with FOS and maltodextrin also increased the -galactosidase activity of probiotics, leading to enhanced hydrolysis and utilization of soy oligosaccharides. Finally, prebiotic supplementation enhanced the utilization of simpler sugars such as fructose and glucose in soymilk. Thus, supplementation with prebiotics enhances the potential of soymilk as a carrier for probiotics [Siok-Koon Yeo, Min-Tze Liong \* (School of Industrial Technology, Universiti Sains Malaysia, 11800 Penang, Malaysia), *Journal of the Science of Food and Agriculture*, 2010, **90**(2), 267-275].

**NPARR 1(3), 2010-0351, Yogurt protects against growth retardation in weanling rats fed diets high in phytic acid**

The purpose of this study was to determine the effects of adding yogurt to animal diets that were high in phytic acid (PA) and adequate in zinc ( $38 \mu\text{g Zn/g}$ ). The PA:Zn molar ratio was 60:1. Zinc status was determined by documenting growth and measuring the zinc concentration in bone (tibia) and plasma. For 25 days, six groups ( $n=6$ ) of Sprague–Dawley weanling rats were fed one of six AIN-76 diets. Half of the diets contained PA. Four of the diets contained yogurt with either active or heat-treated (inactive) cultures added at 25% of the diet. The diets were as follows: (a) AIN, (b) AIN with active yogurt, (c) AIN and inactive yogurt, (d) AIN with PA, (e) AIN with PA plus active yogurt and (f) AIN with PA plus inactive yogurt. Body weight, weight gain and zinc concentration in bone and plasma

were measured, and food efficiency ratio was calculated. Rats fed diets with PA and yogurt had normal growth compared to the control group. Growth retardation was evident in the group fed the diet with PA and no yogurt. This group had significantly lower body weight compared to all other groups ( $P < 0.05$ ). Rats fed diets with PA, with or without yogurt, had significantly lower zinc concentration in bone and plasma ( $P < 0.05$ ). Adding yogurt to diets high in PA resulted in normal growth in weanling rats; however, zinc concentration in bone and plasma was still suboptimal [Lisa M. Gaetke\*, Craig J. McClain, C. Jean Toleman and Mary A. Stuart (Department of Nutrition and Food Science, University of Kentucky, Lexington, KY 40506, USA), *The Journal of Nutritional Biochemistry*, 2010, **21**(2), 147-152].

**NPARR 1(3), 2010-0352, Quantitative modelling approaches for ascorbic acid degradation and non-enzymatic browning of orange juice during ultrasound processing**

The objective of this study was to develop a deterministic modelling approach for non-enzymatic browning (NEB) and ascorbic acid (AA) degradation in orange juice during ultrasound processing. Freshly squeezed orange juice was sonicated using a 1500W ultrasonic processor at a constant frequency of 20 kHz and processing variables of amplitude level (24.4-61.0  $\mu\text{m}$ ), temperature (5-30°C) and time (0-10min). The rate constants of the NEB and AA were estimated by a primary model (zero and first order) while their relationship with respect to the processing factors was tested for a number of models, i.e., second order polynomial, different types of Ratkowsky-type model, and an Arrhenius-type model. The non-monotonic behaviour of NEB has been described more accurately by the use of a polynomial model. The rate constants of AA were described by a similar type of model having a monotonic behaviour. A synergistic effect of temperature for different amplitudes on the rate constant of both NEB and AA was observed, while an antagonistic effect of amplitude on the rate of NEB was evident. The models with the best fit were integrated to produce contour plots for the combined amplitude and temperature. The constructed contour plots illustrate that low tempera-

tures and intermediate amplitudes, i.e., 42.7 $\mu$ m, result in lower NEB and AA deterioration and consequently better quality orange juice. The overall developed modelling approaches exploit quality data in order to identify the optimal processing regions for eliminating quality deterioration of orange juice during ultrasound processing which is of high importance to the food industry [V.P. Valdramidis, P.J. Cullen\*, B.K. Tiwari and C.P. O'Donnell (School of Food Science and Environmental Health, Dublin Institute of Technology, Cathal Brugha Street, Dublin 1, Ireland), *Journal of Food Engineering*, 2010, **96**(3), 449-454].

**NPARR 1(3), 2010-0353, Influence of gas sparging on clarification of pineapple wine by microfiltration**

A microfiltration process with a tubular ceramic membrane was applied for clarification of pineapple wine. The process was operated with the membrane pore size of 0.2 $\mu$ m at transmembrane pressure of 2 bar and crossflow velocity of 2.0m/s. The effects of gas sparging on permeate flux, fouling and quality of clarified wine were studied. It was found that a relatively low gas sparging rate could increase permeate flux up to 138%. Further increase of the gas sparging rate did not improve permeate flux compared with that without gas sparging. Gas sparging affected the density of cake layer. Increasing gas sparging rate led to an increase in specific cake resistance. It was observed that increasing gas sparging rate could reduce reversible fouling rather than irreversible fouling. The turbidity of pineapple wine was reduced and a clear product with bright yellow color was obtained after microfiltration. The negative effect of gas sparging which caused a loss of alcohol content in the wine was also observed [Wirote Youravong\*, Zhenyu Li and Aporn Laorko (Department of Food Technology, Faculty of Agro-Industry, Prince of Songkla University, Hat Yai 90112, Thailand), *Journal of Food Engineering*, 2010, **96**(3), 427-432].

**NPARR 1(3), 2010-0354, Quality evaluation of grape juice concentrated by reverse osmosis**

The objective of this work was to evaluate the concentration of grape juice by reverse osmosis (RO). Preliminarily, a factorial design was carried out in which

the independent variables were transmembrane pressure (40, 50 and 60 bar) and temperature (20, 30 and 40°C) of the process, and the dependent variables were pH, content of soluble solids, acidity, concentration of phenolic compounds and those of monomeric and total anthocyanins, colour index, colour density, and permeate flux. None of the experiments resulted in significant changes in the juice characteristics. The best process conditions, 60 bar transmembrane pressure and 40°C, was selected based on the resulting high permeate flux value. Subsequently, a new trial was performed in order to determine whether increasing the temperature from 40 to 50°C would result in any changes in the juice characteristics. The transmembrane pressure was kept at 60bar, which was also the maximum value that could be applied by the equipment. Under these conditions, an increase in permeate flux was achieved with no significant difference in the physical or chemical parameters of the product compared to the best condition corresponding to the factorial design. The physical and chemical properties of the concentrated juice increased in proportion to the volumetric concentration factor, indicating the technical feasibility of reverse osmosis for pre-concentrating grape juice [Poliana D. Gurak, Lourdes M.C. Cabral\*, Maria Helena M. Rocha-Leão, Virgínia M. Matta and Suely P. Freitas (Embrapa Food Technology, Av das Américas, 29501, 23020-470, Rio de Janeiro, RJ, Brazil), *Journal of Food Engineering*, 2010, **96**(3), 421-426].

**NPARR 1(3), 2010-0355, Species, roasting degree and decaffeination influence the antibacterial activity of coffee against *Streptococcus mutans***

Coffee beverage has been associated with antibacterial activity against *Streptococcus mutans*, a cariogenic bacterium. This study aimed at identifying natural compounds in coffee that contribute to such activity and investigate the influence of species, roasting and decaffeination on it. Coffee chemical compounds and aqueous extracts of green and roasted regular and decaffeinated *Coffea arabica* Linn. and *Coffea canephora* beans were tested. MIC, biofilm inhibition and biofilm reduction results were correlated with the

concentration of coffee compounds in the extracts. 5-Caffeoylquinic acid, trigonelline and caffeic acid solutions showed bacteriostatic activity (MIC=0.8mg/ml). Lighter and regular extracts showed higher inhibitory activity than darker and decaffeinated extracts, with an inverse correlation between bacterial colony-forming units and roasting degree. Only regular *C. canephora* extracts showed biofilm formation inhibition. The joint effect of chlorogenic acids, trigonelline and caffeine or other compounds removed by decaffeination seems to be one of the causes for coffee antibacterial activity against *S. mutans* [Andréa G. Antonio, Renata S. Moraes, Daniel Perrone, Lucianne C. Maia, Kátia Regina N. Santos, Natália L.P. Iório and Adriana Farah\*(Laboratório de Bioquímica Nutricional e de Alimentos, Departamento de Bioquímica, Instituto de Química, Universidade Federal do Rio de Janeiro, Ilha do Fundão, RJ 21949-900, Brazil), *Food Chemistry*, 2010, **118**(3), 782-788].

**NPARR 1(3), 2010-0356, Influence of environmental factors, wet processing and their interactions on the biochemical composition of green Arabica coffee beans**

Although cultivation of Arabica coffee trees at high elevation is known to favourably affect the final quality of the beverage, quantitative data describing the influence of climatic conditions on the chemical composition of the seed are still lacking. Similarly, post-harvest treatments of the beans are known to affect the generation of flavour, but the chemical transformations that occur during wet processing are poorly understood. To better characterise the effects of the environment, wet processing and their possible interactions, we quantified the changes in the main chemical components of the coffee seed (lipids, chlorogenic acids, sugars and caffeine) caused by wet processing, and analysed how these changes were affected by the variations induced by the environment before harvest. Using 16 experimental plots in Reunion Island displaying broad climatic variations, we showed that chlorogenic acids and fatty acids in the seed were controlled by the mean air temperature during seed development. By contrast, total lipid, total soluble sugar, total polysaccharide and total chlorogenic acid contents were not influenced by cli-

mate. Glucose content was positively affected by altitude, while sorbitol content after wet processing depended directly on the glucose content in fresh seeds [Thierry Joët\*, Andréina Laffargue, Frédéric Descroix, Sylvie Doulbeau, Benoît Bertrand, Alexandre de Kochkow and Stéphane Dussert (IRD, UMR DIA-PC, Pôle de Protection des Plantes, 97410 Saint Pierre, La Réunion, France), *Food Chemistry*, 2010, **118**(3), 693-701].

**NPARR 1(3), 2010-0357, Effect of thermal treatment and storage on the stability of organic acids and the functional value of grapefruit juice**

The effect of conventional and microwave pasteurisation on the main bioactive compounds of grapefruit juice and their stability during 2 months' refrigerated and frozen storage was evaluated. Ascorbic acid (AA), vitamin C and organic acids were analysed by HPLC, whereas total phenols and antioxidant capacity (%DPPH) were measured by spectrophotometry. The results showed that conventional treatment led to a significant decrease in citric acid (from 1538 to 1478mg/100g) and AA (from 36 to 34.3mg/100g), whilst microwave pasteurisation preserved these compounds. Frozen storage maintained AA and vitamin C, especially in treated samples. Frozen non-treated samples and conventional pasteurised ones preserved about a 75% and 20% of the total phenols and antioxidant capacity, respectively, whilst in frozen microwave pasteurised juices this preservation was of 82% and 33%. From these results, the use of microwave energy may be proposed as an alternative to traditional heat pasteurisation in order to preserve the natural organoleptic characteristics and essential thermolabile nutrients of grapefruit juice [M. Igual, E. García-Martínez, M.M. Camacho and N. Martínez-Navarrete\*(Universidad Politécnica de Valencia, Food Technology Department, Food Investigation and Innovation Group, Camino de Vera s/n, 46022 Valencia, Spain), *Food Chemistry*, 2010, **118**(2), 291-299].

**NPARR 1(3), 2010-0358, Berry juices, teas, antioxidants and the prevention of atherosclerosis in hamsters**

The effects of raspberry, strawberry and bilberry juices and green and black tea on early atherosclerosis in hamsters were investigated. They received an atherogenic diet and at the same time either a juice or a tea at a daily dose corresponding to the consumption of 275ml by a 70kg human. After 12 weeks berry juices and teas inhibited aortic lipid deposition by 79-96% and triggered reduced activity of hepatic antioxidant enzymes, not accompanied by lowered plasma cholesterol. These findings suggest that moderate consumption of berry juices and teas can help prevent the development of early atherosclerosis. There were substantial differences between the five beverages in terms of composition and concentration of individual phenolic compounds that were present. This indicates that anti-atherosclerotic effects can be induced by a diversity of phenolic compounds rather than a few specific components. The possible mechanisms by which this is brought about are discussed [Jean-Max Rouanet\*, Kelly Décorde, Daniele Del Rio, Cyril Auger, Gina Borges, Jean-Paul Cristol, Michael E.J. Lean and Alan Crozier (Unité Mixte de Recherche 204-Prévention des Malnutritions et des Pathologies Associées, CC 023, Université Montpellier, 2, Place Eugène Bataillon, 34095 Montpellier, France), *Food Chemistry*, 2010, **118**(2), 266-271].

**NPARR 1(3), 2010-0359, Determination of thiourea in fruit juice by a kinetic spectrophotometric method**

A catalytic kinetic method is described for determination of trace levels of thiourea based on its catalytic effect on the oxidation of Janus green (JG) by potassium iodate in hydrochloric acid media. The reaction was monitored by measuring the decrease in absorbance of the dye at 610 nm after 25 min. The effect of some factors on the reaction speed was investigated. The developed method allowed the determination of thiourea in range of 0.01-12.00 mg L<sup>-1</sup> with good precision, accuracy and the detection limit was 0.008 mg L<sup>-1</sup>. Most of foreign species do not interfere with the determination. The method was found to be sensitive, selective and was applied to the determination of thiourea in fruit juices and orange peel

[Abbasi S, Khani H, Hosseinzadeh L, Safari Z. (Department of Chemistry, Ilam University, Ilam, Iran), *Journal of Hazardous Material*, 2010, **174**(1-3), 257-62].

## COSMECEUTICALS

**NPARR 1(3), 2010-0360, Dietary extra-virgin olive oil rich in phenolic antioxidants and the aging process: long-term effects in the rat**

The aim of the present work was to verify whether extra-virgin olive oil, a food naturally containing phenolic antioxidants, has the potential to protect from the pro-aging effects of a high-calorie diet. Male rats were fed from age 12 months to senescence a high-calorie diet containing either corn oil (CO), or extra-virgin olive oil with high (H-EVOO) or low (L-EVOO) amounts of phenols. The prolonged high fat intake led to obesity, liver lipid degeneration and insulin resistance, which were not counteracted by high phenol intake. No difference in overall survival was found at the end of the experiment in the animals treated with H-EVOO compared to the other groups. However, we did detect a protective effect of olive oil on some age-related pathologies and on blood pressure, of which the former was associated with the antioxidant content. Concomitantly, a decrease in DNA oxidative damage in blood cells and plasma TBARS and an increase in liver superoxide dismutase were detected following H-EVOO consumption. Thus, although olive oil phenols cannot reverse the detrimental effects of a prolonged intake of high amounts of fat, improving the quality of olive oil in terms of antioxidant content can be beneficial [Michela Jacomelli\*, Vanessa Pitozzi, Mohamed Zaid, Mar Larrosa, Giulia Tonini, Andrea Martini, Stefania Urbani, Agnese Taticchi, Maurizio Servili, Piero Dolara and Lisa Giovannelli ((Department of Preclinical and Clinical Pharmacology, University of Florence, Italy), *The Journal of Nutritional Biochemistry*, 2010, **21**(4), 290-296].

**NPARR 1(3), 2010-0361, Protective effect of *Calendula officinalis* extract against UVB-induced oxidative stress in skin: Evaluation of reduced glutathione levels and matrix metalloproteinase secretion**

*Calendula officinalis* Linn. flowers have long been employed time in folk therapy, and more than 35 properties have been attributed to decoctions and tinctures from the flowers. The main uses are as remedies for burns (including sunburns), bruises and cutaneous and internal inflammatory diseases of several origins. The recommended doses are a function both of the type and severity of the condition to be treated and the individual condition of each patient. Therefore, the present study investigated the potential use of *C. officinalis* extract to prevent UV irradiation-induced oxidative stress in skin.

Firstly, the physico-chemical composition of marigold extract (ME) (hydroalcoholic extract) was assessed and the *in vitro* antioxidant efficacy was determined using different methodologies. Secondly, the cytotoxicity was evaluated in L929 and HepG2 cells with the MTT assay. Finally, the *in vivo* protective effect of ME against UVB-induced oxidative stress in the skin of hairless mice was evaluated by determining reduced glutathione (GSH) levels and monitoring the secretion/activity of metalloproteinases. The polyphenol, flavonoid, rutin and narcissin contents found in ME were 28.6mg/g, 18.8mg/g, 1.6mg/g and 12.2mg/g, respectively and evaluation of the *in vitro* antioxidant activity demonstrated a dose-dependent effect of ME against different radicals. Cytotoxicity experiments demonstrated that ME was not cytotoxic for L929 and HepG2 cells at concentrations less than or equal to of 15mg/ml. However, concentrations greater than or equal to 30mg/ml, toxic effects were observed. Finally, oral treatment of hairless mice with 150 and 300mg/kg of ME maintained GSH levels close to non-irradiated control mice. In addition, this extract affects the activity/secretion of matrix metalloproteinases 2 and 9 (MMP-2 and -9) stimulated by exposure to UVB irradiation. However, additional studies are required to have a complete understanding of the protective effects of ME for skin [Yris Maria Fonseca, Carolina Dias Catini, Fabiana T.M.C. Vicentini, Auro Nomizo, Raquel Fernanda Gerlach and Maria José Vieira Fonseca\* (Faculdade de Ciências Farmacêuticas de Ribeirão Preto, Universidade de São Paulo, Avenida do Café s/n, 14040-903 Ribeirão Preto,

São Paulo, Brazil), *Journal of Ethnopharmacology*, 2010, **127**(3), 596-601].

## DYES (incl. Food colorants)

*NPARR* 1(3), 2010-0362, **Identification and antioxidant activity of anthocyanins extracted from the seed and cob of purple corn (*Zea mays* Linn.)**

In the last decades, in interest in anthocyanin pigments has increased because of their possible utilization as natural food colorants and especially as antioxidant and anti-inflammatory agents. Purple corn is a pigmented variety of *Z. mays* Linn., originally cultivated in Latin America. Now, this corn variety is mainly grown in China, especially in Shanxi and Anhui Province, could be new and interesting sources to obtain extracts rich in anthocyanins for their use in food, pharmaceutical and cosmetic industries. The total anthocyanin content (TAC) and the antioxidant activity of the seed and cob from Chinese purple corn (*Zea mays* Linn. cv Zihei) extracts were determined by pH-differential method, and DPPH, FRAP, and TEAC methods, respectively. TAC in purple corn cob anthocyanins (PCCAs) extract was higher than TAC in purple corn seed anthocyanins (PCSAs) extract. Compared to butylated hydroxytoluene (BHT), PCCAs and PCSAs possessed significantly higher antioxidant activities, according to the DPPH, FRAP and TEAC assays. A satisfactory correlation between TAC and antioxidant activity was observed. Result indicated that cyanidin-3-glucoside, pelargonidin-3-glucoside and peonidin-3-glucoside were components in PCSAs extracts, and seven kinds of anthocyanin had been detected and six kinds of anthocyanin in PCCAs extracts were separated and identified them as cyanidin-3-glucoside, pelargonidin-3-glucoside and peonidin-3-glucoside, and their respective malonated counterparts as their anthocyanins using HPLC-MS analysis. The results indicated that the seed and cob of purple corn possessed excellent antioxidant activity, which could lead to increased application of these natural food colorants by the food industry [Zhendong Yang\* and Weiwei Zhai (Food Engineering Department of Jiangsu Food Science College, Huaian, Jiangsu 223003, China), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 169-176].

**NPARR 1(3), 2010-0363, Evaluation of Raman and SERS analytical protocols in the analysis of Cape Jasmine dye (*Gardenia augusta* Linn.)**

The identification of organic colorants in works of art (such as dyes on textiles or organic pigments) by Raman spectroscopy is generally limited by the presence of a strong fluorescence background. In this paper, the effectiveness of minimizing fluorescence in the analysis of Cape Jasmine (*Gardenia augusta* Linn.) by dispersive Raman spectroscopy at three different excitation wavelengths (633, 785 and 1064 nm) and by surface-enhanced Raman spectroscopy (SERS) with and without acid hydrolysis is evaluated and compared. It is shown that these vibrational techniques offer an alternative analytical approach, when, as is particularly the case of Cape Jasmine, sample preparation procedures that are routinely applied for natural organic dyes and pigments cause alterations that lead to low sensitivity in the more classical high-performance liquid chromatography-photodiode array (HPLC-PDA) analytical protocols. Samples of the yellow dye *G. augusta* Linn. in the following forms were analyzed: dyed on alum mordanted wool, dyed on nonmordanted and alum mordanted silk, pigment precipitated on hydrated aluminum oxide, extract mixed with a protein binder and painted on glass, and as a water-based glaze applied on a mock-up of a typical Chinese wall-painting. Raman bands at 1537, 1209 and 1165  $\text{cm}^{-1}$  are identified as discriminating markers for the carotenoid colorant components crocetin and crocin [M. V. Cañamares\*, M. Leona, M. Bouchard, C. M. Grzywacz, J. Wouters and K. Trentelman (Department of Chemistry and Center for Analysis of Structures and Interfaces (CASI), The City College of New York, New York, NY 10031, USA), *Journal of Raman Spectroscopy*, 2010, **41**(4), 391-397].

**NPARR 1(3), 2010-0364, Natural colorant from the bark of *Macaranga peltata*: kinetic and adsorption studies on silk**

The colour component from the bark of *Macaranga peltata* has been extracted and, using spectral techniques, the main colouring ingredient has

been identified as ellagic acid. The dyeing properties of the extract on silk have been studied. The colour coordinates of the dyed samples were found to be in the yellow–red quadrant of the colour space diagram and the dyed samples exhibited acceptable fastness properties. The effect of temperature and dye concentration on the rate of dyeing has been studied. Adsorption studies revealed that the process fits well with the Langmuir isotherm model. The thermodynamic parameters of the dyeing process have been evaluated using an Arrhenius plot. The experimental results revealed that the adsorption was exothermic and spontaneous in nature, and exhibited first-order kinetics. Further, the effect of electrolyte on rate of dyeing has also been recorded. The rate of adsorption increases as the disrupting effect of the added electrolyte cation increases and follows the order:  $\text{Al}^{3+} > \text{Ca}^{2+} > \text{Na}^+$  [Konaghatta Narayanachar Vinod, Puttaswamy\*, Kurikempanadoddi Ningegowda Ninge Gowda and Rajagopal Sudhakar (Department of Postgraduate Studies in Chemistry, Central College Campus, Bangalore University, Bangalore-560 001, India), *Coloration Technology*, 2010, **126**(1), 48-53].

**ESSENTIAL OILS (incl. Flavour and Fragrance)**

**NPARR 1(3), 2010-0365, Antioxidant activity and lipid-lowering effect of essential oils extracted from *Ocimum sanctum* Linn. leaves in rats fed with a high cholesterol diet**

It has been reported that *Ocimum sanctum* Linn. (OS) leaves decrease serum lipid profile in normal and diabetic animals. No experimental evidences support the anti-hyperlipidemic and antioxidative actions against hypercholesterolemia. Moreover, the identity of the specific chemical ingredients in OS leaves responsible for these pharmacological effects are unknown. Since OS leaves are rich in essential oil (EO). Therefore the present study was conducted to investigate the anti-hyperlipidemic and antioxidative activities of EO extracted from OS leaves in rats fed with high cholesterol (HC) diet. EO was extracted by the hydrodistillation method and the chemical constituents

were then identified by Gas Chromatography-Mass Spectrometry. The experiment was performed in Male Wistar rats fed with 2.5g% (w/w) of cholesterol diet for seven weeks. During the last 3 weeks, rats were daily fed with EO. The results showed that phenyl propanoid compounds including eugenol and methyl eugenol were the major constituents of EO. EO suppressed the high serum lipid profile and atherogenic index as well as serum lactate dehydrogenase and creatine kinase MB subunit without significant effect on high serum levels of aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase in rats fed with HC diet. In addition, EO was found to decrease the high levels of thiobarbituric acid reactive substances (TBARS), glutathione peroxidase (GPx) and superoxide dismutase (SOD) without impacting catalase (CAT) in the cardiac tissue while in the liver, it decreased high level of TBARS without significantly effecting GPx, SOD and CAT. Histopathological results confirmed that EO preserved the myocardial tissue. It can be concluded that EO extracted from OS leaves has lipid-lowering and antioxidative effects that protect the heart against hypercholesterolemia. Eugenol that is contained in EO likely contribute to these pharmacological effects [Thamolwan Suanarunsawat\*, Watcharaporn Devakul Na Ayutthaya, Thanapat Songsak, Suwan Thirawarapan, and Somlak Pongshompoo (Physiology Unit, Department of Medical Sciences, Faculty of Science, Rangsit University, Pathumtani, 12000 Thailand), *J Clin Biochem Nutr*, 2010, **46**(1), 52-59].

**NPARR 1(3), 2010-0366, Comparative analysis of leaf essential oil constituents of *Piliostigma thonningii* and *Piliostigma reticulatum***

Hydro-distilled essential oils from leaves of *Piliostigma thonningii* and *P. reticulatum* (Caesalpinaceae) were studied by combined gas chromatography and gas chromatography-mass spectrometry for the first time. Both qualitative and quantitative differences existed in the composition of the two oils. While *P. thonningii* oil is composed of sesquiterpenes and monoterpene hydrocarbons, monoterpenes and sesquiterpene hydrocarbons represented the chief class of terpenoids in *P. reticulatum*. Major constituents in *P. reticulatum* leaf

oil were  $\gamma$ -muurolene (10.3%),  $\alpha$ -pinene (9.4%), tricyclene (7.2%),  $\delta$ -cadinene (5.6%),  $\alpha$ -terpineol (5.3%) and  $\beta$ -caryophyllene (4.2%). However, the sesquiterpene-rich *P. thonningii* oil was characterized by  $\beta$ -myrcene (13.3 %), limonene (8.6%),  $\alpha$ -pinene (7.6%),  $\beta$ -caryophyllene (7.1%),  $\gamma$ -muurolene (6.1%), caryophyllene oxide (5.2%) and spathulenol (4.0%) [Viana Tira-Picos, Joseph M.F Nogueira and Adebayo A Gbolade\* (Department of Pharmacognosy, Faculty of Pharmacy, Olabisi Onabanjo University, Sagamu Campus, Nigeria), *International Journal of Green Pharmacy*, 2010, **4**(2), 67-70].

**NPARR 1(3), 2010-0367, Antiaflatoxic and antioxidant activity of an essential oil from *Ageratum conyzoides* Linn.**

Aflatoxin contamination of various commodities can occur as a result of infection, mainly by *Aspergillus flavus* and *Aspergillus parasiticus*. Every year, almost 25% of the world's food supply is contaminated by mycotoxins. Aflatoxins B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub> and G<sub>2</sub>, which occur naturally, are significant contaminants of a wide variety of commodities. A number of biological activities have been associated with *Ageratum conyzoides*. Authors have therefore investigated the antiaflatoxic, antioxidant and antimicrobial activity of essential oils of *A. conyzoides*. This could help to turn *A. conyzoides*, a nuisance weed, into a resource.

The essential oil of *Ageratum conyzoides* Linn. shows the presence of 12 compounds when analyzed by gas chromatography-mass spectrometry. The growth and aflatoxin production of the toxigenic strain *Aspergillus parasiticus* was completely inhibited by essential oil. All the studied concentrations of the oil demonstrate a reduction in mycelia growth and decreased production of different aflatoxins in fungi, as revealed by liquid chromatographic-tandem mass spectrometric analysis. Volatiles from macerated green leaf tissue of *A. conyzoides* were also effective against *A. parasiticus*. The strongest antibacterial activity was observed against the bacteria *Staphylococcus aureus* and *Bacillus subtilis* in a disk diffusion bioassay. Essential oil and methanol extract of *A. conyzoides* Linn. were assayed for their antioxidant activity. Methanol extract showed the highest antioxidant activity in FRAP

and DPPH assay, whereas essential oil showed greater lipid peroxidation inhibition than methanol extract.

The plant's ethno-medicinal importance, antioxidant potential, inhibitory activity against the *Aspergillus* group of fungi and production of aflatoxins may add a new dimension to its usefulness in the protection of stored product [Rajaram P Patil\*, Mansingraj S Nimbalkar, Umesh U Jadhav, Vishal V Dawkar and Sanjay P Govindwar (Department of Agrochemicals and Pest Management, Shivaji University, Kolhapur-416 004, Maharashtra, India), *Journal of the Science of Food and Agriculture*, 2010, **90**(4), 608-614].

**NPARR 1(3), 2010-0368, Composition and antibacterial activities of essential oils of seven *Ocimum* taxa**

GC/MS was used to identify compounds of essential oils from seven *Ocimum* taxa (*O. americanum* Linn., *O. basilicum* Linn., *O. campechianum* Mill., *O. x citriodorum* Vis., *O. kilimandscharicum* Baker ex Gürke and three botanical varieties and cultivars of *Ocimum basilicum* Linn. 'Genovese', var. *difforme* and var. *purpurascens*). Preliminary screening of their antibacterial activity was done against a number of common pathogens (*Enterococcus faecalis*, *Enterococcus faecium*, *Escherichia coli* 0157:H7, *Listeria monocytogenes*, *Listeria ivanovii*, *Proteus vulgaris*, *Staphylococcus aureus*, *Staphylococcus epidermis*) using the filter paper disc agar diffusion technique, while further analyses were done by modification of the disc diffusion method. A broad variation in the antibacterial properties of investigated essential oils was observed. *E. coli* 0157:H7 was inhibited by *O. basilicum* 'Genovese' essential oil, while *Ocimum americanum* and *Ocimum x citriodorum* essential oils were the most effective against *Enterococcus faecalis*, *Enterococcus faecium*, *P. vulgaris*, *S. aureus* and *S. epidermis* [Klaudija Carovia-Stanko\*, Sandi Orlić, Olivera Politeo, Frane Strikić, Ivan Kolak, Mladen Milos and Zlatko Satovic (Department of Seed Science and Technology, Faculty of Agriculture, University of Zagreb, Svetosimunska 25, HR-10000 Zagreb, Croatia), *Food Chemistry*, 2010, **119**(1), 196-201].

## FEED/FODDER

**NPARR 1(3), 2010-0369, Effects of feeding ratio of beet pulp to alfalfa hay or grass hay on ruminal mat characteristics and chewing activity in Holstein dry cows**

The influence of the feeding ratio of a non-forage fiber source and hay on ruminal mat characteristics and chewing activity was evaluated in dairy dry cows. Cows were fed four different diets: the ratios of alfalfa hay (AH) to beet pulp (BP) were 8:2 (dry matter basis, A8B2) and 2:8 (A2B8), and those of grass hay (GH) to BP were 8:2 (G8B2) and 2:8 (G2B8). Total eating time was decreased with increasing BP content ( $P<0.01$ ). Total rumination time for AH was shorter than that for GH ( $P<0.01$ ) and it decreased with increasing BP content ( $P<0.01$ ). The ruminal mat was detected by using a penetration resistance test of the rumen digesta. Penetration resistance value (PRV) of ruminal mat was highest with the G8B2 diet and PRV decreased with increasing BP content ( $P<0.05$ ) and feeding AH ( $P<0.05$ ). Thickness of the ruminal mat was greater for increasing BP content ( $P<0.05$ ). Simple linear regression of ruminal mat PRV on total rumination time resulted in a high positive correlation ( $r=0.744$ ;  $P<0.001$ ;  $n=16$ ). The results demonstrated that increasing the PRV of the ruminal mat stimulated rumination activity and a ruminal mat could be formed, although it was soft even when cows were offered a large quantity of BP [Kenichi Izumi\* and Chigusa Unno (Research farm, Rakuno Gakuen University, Ebetsu-069-8501, Japan), *Animal Science Journal*, 2010, **81**(2), 180-186].

**NPARR 1(3), 2010-0370, Means to improve the nutritive value of flaxseed for broiler chickens: The effect of particle size, enzyme addition and feed pelleting**

Three experiments were conducted to explore dietary means (particle size, enzyme addition, bile salts addition and feed pelleting) of minimizing the antinutritive effects of cell wall-nonstarch polysaccharides of flaxseed. Broiler chickens were fed corn-soybean meal-based diets containing 15% of full-fat flaxseed from 5

to 18 d. The effects of 2 enzyme preparations containing viscosity-reducing or cell wall-degrading activities on growth performance and nutrient digestibility were evaluated in experiment 1. Enzyme addition had beneficial effects ( $P < 0.05$ ) in increasing non starch polysaccharide digestibility and reducing intestinal viscosity. However, no differences in growth performance or fat digestibility were observed between the enzyme types. Therefore, the enzyme supplement containing both viscosity-reducing and cell wall-degrading activities was used in subsequent studies. A 2 x 2 x 2 factorial arrangement was used in experiment 2 to investigate the effects of particle size (coarse vs. fine), enzyme supplementation, and bile salt addition on the nutritive value of flaxseed for broiler chickens. In experiment 3, a 4 x 2 factorial arrangement was used to further investigate the effects of feed processing (whole seed, coarsely ground seed, and finely ground seed in pelleted diets or finely ground seed in mash diets) and enzyme addition on growth performance and fat utilization. Bile salt addition did not improve fat digestibility. Particle size reduction via grinding had no significant effect on growth performance no matter if present in the mash or pelleted diets. When compared with grinding, feed pelleting showed more pronounced and beneficial effects on growth performance particularly when whole, intact seeds were used, indicating a potential for using whole flaxseed in the pelleted diets. Enzyme addition resulted in an increase in total tract fat digestibility by 3 to 6%, which was reflected in an improved feed conversion ratio by 1 to 3%, regardless of the processing method used ( $P < 0.05$ ). In conclusion, enzyme addition and feed pelleting offer practical solutions to improve the nutritive value of flaxseed for broiler chickens [W. Jia and B. A. Slominski\* (Department of Animal Science, University of Manitoba, Winnipeg, Canada R3T 2N2), *Poultry Science*, 2010, **89**, 261-269].

**NPARR 1(3), 2010-0371, Performance and antioxidant status of broiler chickens supplemented with dried mushrooms (*Agaricus bisporus*) in their diet**

In this study, we evaluated the growth performance and antioxidant status of broiler chicken supplemented with the edible mushroom *Agaricus bisporus* were evaluated. Ninety 1-d-old female broiler

chickens randomly allotted to 3 dietary treatments were given either a nutritionally-balanced basal diet or the basal diet supplemented with 10 or 20g of dried mushroom/kg of feed for 6 wk on an *ad libitum* basis. Body weight, feed intake, and feed conversion ratio values were monitored weekly. To evaluate the antioxidant status of broiler chicken, refrigerated liver, breast, and thigh tissues were assayed for levels of glutathione, reduced glutathione, glutathione reductase, glutathione peroxidase, and glutathione S-transferase, as well as malondialdehyde at 6 wk of age. Results showed that dietary mushroom supplementation at both inclusion levels was accepted well by the broiler chicken and improved feed efficiency compared with the control diet. Dietary mushroom inclusion at 20 g/kg improved both growth performance and feed efficiency compared with control diet at 42d of age. Dietary mushroom at both inclusion levels reduced malondialdehyde production in liver, breast, and thigh tissues and elevated glutathione peroxidase, reduced glutathione, glutathione reductase, and glutathione S-transferase compared with the control treatment, the effects being dose-dependent. Thus *A. bisporus* mushroom exerts both a growth-promoting and tissue antioxidant-protective activity when supplemented in broiler chicken diets [I. Giannenas\*, I. S. Pappas, S. Mavridis, G. Kontopidis, J. Skoufos and I. Kyriazakis (Laboratory of Animal Nutrition and Husbandry, Veterinary Faculty, University of Thessaly, 43100 Karditsa, Greece; TEI Epirus, 47100 Arta, Greece), *Poultry Science*, 2010, **89**, 303-311].

**NPARR 1(3), 2010-0372, Production of single cell protein using waste capsicum powder produced during capsanthin extraction**

The extraction [CPM (capsicum powder medium)] from waste capsicum powder was used as culture medium to cultivate four yeast strains. The main composition of CPM was determined. The average concentration of total sugar, total nitrogen and phosphorous of CPM were 16.3, 3.7g l<sup>-1</sup> and 785.4 mg l<sup>-1</sup>, respectively. Four yeast strains were cultured in two CPMs, and the cell mass, protein content of cells and specific growth rate of cells were determined. Addition of corn steep liquor significantly increased the cell mass production. Presence of capsaicin in CPM

did not show inhibition of cell growth of yeast tested. CPM contained sufficient nutrients and could be used as a good medium to produce SCP. *Candida utilis* 1769 was chosen as the biomass producer because of its highest SCP formation ( $6.8\text{g l}^{-1}$ ) and higher specific growth rate ( $0.12\text{h}^{-1}$ ). The amino acid composition of its protein was well balanced. Thus, utilization of waste capsicum powder can reduce environmental pollution and increase protein supply for animal feed [G. Zhao\*, W. Zhang and G. Zhang (Guoqun Zhao, College of Bioscience and Bioengineering, Hebei University of Science and Technology, 70, Yuhua East Road, Shijiazhuang 050018, China), *Letters in Applied Microbiology*, 2010, **50**(2),187-191].

**NPARR 1(3), 2010-0373, Effects of vegetable feed ingredients on bone health in Atlantic salmon**

The Dietary inclusion of vegetable lipids (VL) and proteins (VP) influenced markers of bone health in Atlantic salmon was investigated. Triplicate groups were fed one of four different diets; 100% fish protein (FP) and fish lipids (FL) (FPFL), 80% VP and 35% VL (80VP35VL), 40% VP and 70% VL (40VP70VL), or 80% VP and 70% VL (80VP70VL) for 12 months on-growth in sea water. Fish were analyzed for vertebral bone mineralization (mineral content, as % of bone dry weight), vertebral deformities (radiology), vertebral bone mRNA expression of factors involved in mineralization (bone gla protein, bgp) and growth regulation (igf-I and growth hormone receptor), as well as plasma vitamin D metabolites. The fish grew from 0.35 to 4kg during the experimental period. At the end of the experiment, significantly lower prevalence of fish with one or more deformed vertebrae was observed in the 80VP70VL group (11%) compared to the other groups (33-43%). There was a significant higher relative expression of igf-I mRNA in vertebral bone of fish fed the 80VP70VL diet compared to control fish (FPFL), while the other genes studied were unaffected. Elevated plasma 25-hydroxyvitamin D<sub>3</sub> recorded in the marine feed group is discussed as a predictor for later development of bone deformities. Thus high inclusion levels of vegetable lipids and proteins may have a positive effect on bone health in Atlantic salmon postsmolts [P. G. Fjellidal\*, U. Nordgarden, A. Wargelius, G. L. Taranger, R. Waagb

and R. E. Olsen (Institute of Marine Research, Matre, 5984 Matredal, Norway), *Journal of Applied Ichthyology*, 2010, **26**(2),327-333].

**NPARR 1(3), 2010-0374, Protection of fish feed, made directly from marine raw materials, with natural antioxidants**

The present experiments were designed to study the effects of different natural antioxidants in an experimental fish feed, made directly from marine raw materials. A rosemary extract (Herbalox®) and crystalline ascorbic acid were the most effective antioxidants in this feed and the effect of ascorbic acid was enhanced by adding a tocopherol mix. Ascorbyl palmitate, citric acid, a phosphate mix designed to enhance the effect of ascorbic acid, and spermine had minor antioxidant effects, no effect or pro-oxidant effects. It was necessary to add higher concentrations of the rosemary extract than the vitamin C/E combination to obtain an optimal antioxidant effect. A minor effect of adding ethoxyquin to a diet with tocopherol mix and ascorbic acid was detected in one of the experiments, but this effect was not reproduced in the other experiments. It is therefore concluded that the diet used in the present study can be protected against oxidation using natural antioxidants. Since antioxidants must be tested in the oxidizing system in which they are going to be used, the present results have to be confirmed before applying them to commercial fish feeds and feed ingredients [Kristin Hamre\*, Kjersti Kolås and Kjartan Sandnes (National Institute of Nutrition and Seafood Research (NIFES), P.O. Box 2029, N-5817 Bergen, Norway), *Food Chemistry*, 2010, **119**(1), 270-278].

**NPARR 1(3), 2010-0375, Evaluation and potential of cocoyam as carbohydrate source in catfish [*Clarias gariepinus* (Burchell, 1822)] juvenile diets**

The cost of feeding fish is about 60% of the total recurrent cost of fish farming, hence a need for non-conventional and cheaper ingredients to substitute the expensive ones. Seventy five juvenile of *Clarias gariepinus* mean weight 9.86g were randomly stocked at 5 juveniles per tank of dimension 40 × 56 × 31 cm and fed five isonitrogenous and isocaloric diets containing graded levels of cocoyam at 0, 25, 50, 75

and 100% substituted for maize meal over a period of 70 days. The result of the experiment showed that diet 1 had the highest specific growth rate (SGR), 1.47%/day and diet 4 had the lowest of 0.89%/day. The best Food conversion ratio (FCR), 1.81 was from diet 2 while the worst of 2.91 was from diet 4. Highest mean yield, net profit, benefit cost ratio and profit index of 26.58, 4.93, 1.23 and \$16.11, respectively, were from diet 2 while the lowest of 22.91, 0.49, 1.02 and \$9.47 were from diet 4. All indices considered were significantly different ( $p < 0.05$ ) between  $\leq 50\%$  cocoyam and  $\geq 75\%$  cocoyam treatments. The study showed that 25% replacement of cocoyam for maize is recommended for growth and economic benefit for sustainable aquaculture [Aderolu Ademola Zaid\* and O. A. Sogbesan (Department of Marine Sciences, University of Lagos, Akoka, Lagos State, Nigeria), *African Journal of Agricultural Research*, 2010, **5**(6), 453-457].

**NPARR 1(3), 2010-0376, Conversion of sorghum stover into animal feed with white-rot fungi: *Pleurotus ostreatus* and *Pleurotus pulmonarius***

Treatment of crop residues with some species of white-rot fungi can enhance the nutritive value. After the fungal treatment of sorghum (*Sorghum bicolor*) stover with two white-rot fungi in a solid state fermentation, the chemical composition and *in vitro* digestibility of the resultant substrate was determined. The results show a significant ( $P < 0.05$ ) increase in crude protein contents from 2.54% for the control to 4.51% for *Pleurotus ostreatus* (POS) and 4.59% for *Pleurotus sajor pulmonarius* (PPT). The nitrogen free extract (NFE) content also increased significantly ( $P < 0.05$ ). The crude fibre decreased significantly from 31.65% for the control to 27.49% for POS and 23.54% for PPS. There were also consistent significant decreases ( $P < 0.05$ ) in the values obtained for NDF, ADF ADL. Significant differences were also observed in the hemicellulose and cellulose contents. Fermentation of the insoluble fraction (b) was enhanced by the fungal treatment. Wide variations were also observed in the mineral contents of the different substrates. The estimated organic matter digestibility (OMD) ranged from 42.99

to 57.75%, short chain fatty acid ranged from 0.56 to 0.94  $\mu\text{M}$  and metabolisable energy (ME) ranged from 5.97 to 8.21 MJ/Kg DM. Fungal treatment of sorghum stover resulted in improved CP and digestibility, hence its potential in ruminant nutrition [Akinfemi A\*, Adu, O.A. and Doherty, F. (Department of Animal Science, Faculty of Agriculture, Nasarawa State University, PMB 135, Shabu-Lafia, Nasarawa State, Nigeria), *African Journal of Biotechnology*, 2010, **9**(11), 1706-1712].

**NPARR 1(3), 2010-0377, Effects of extracts of spices on rumen methanogenesis, enzyme activities and fermentation of feeds *in vitro***

An experiment was conducted to study the effects of boiling water, methanol and ethanol extracts (0, 0.25 and 0.50 ml) of seeds of *Foeniculum vulgare* Linn. (fennel), flower buds of *Syzygium aromaticum* (Linn.) Merrill & Perry (clove), bulbs of *Allium sativum* Linn. (garlic), bulbs of *Allium cepa* Linn. (onion) and roots of *Zingiber officinalis* Rosc. (ginger) on rumen methanogenesis, fibrolytic enzyme activities and fermentation characteristics *in vitro*. Ethanol and methanol extracts of fennel, clove and garlic at 0.50 ml and clove at 0.25 ml inhibited ( $P < 0.05$ ) methane production. Carboxymethylcellulase activity was reduced ( $P < 0.05$ ) by ethanol and methanol extracts (0.50 ml) of fennel and clove (0.25 and 0.50 ml). The extracts of clove reduced (0.25 and 0.50 ml) xylanase and acetylerase activities, and the fennel extract (0.50 ml) reduced ( $P < 0.05$ ) xylanase activity. However, the extracts of garlic (0.50 ml) increased ( $P < 0.05$ ) acetylerase activity. Concentrations of volatile fatty acids were reduced ( $P < 0.05$ ) by the extracts of garlic and onion. The extracts of garlic caused a decrease ( $P < 0.05$ ) in acetate: propionate ratio (A:P) at 0.50 ml, whereas A:P was increased ( $P < 0.05$ ) by the inclusion of 0.50 ml extracts of clove. Methanol and ethanol extracts of clove decreased ( $P < 0.05$ ) *in vitro* organic matter degradability. Extracts (0.50 ml) of clove decreased ( $P < 0.05$ ) the numbers of total protozoa, small entodiniomorphs and holotrichs, whereas extracts of onion, ginger and garlic enhanced ( $P < 0.05$ ) protozoal numbers (both entodiniomorphs and holotrichs). Ethanol and methanol extracts of fennel and garlic have potential to inhibit

rumen methanogenesis without adversely affecting rumen fermentation [Amlan Kumar Patra\*, Devki Nandan Kamra, Neeta Agarwal (Department of Animal Nutrition, West Bengal University of Animal and Fishery Sciences, 37, K. B. Sarani, Belgachia, Kolkata 700037, India), *Journal of the Science of Food and Agriculture*, 2010, **90**(3), 511-520].

**NPARR 1(3), 2010-0378, Effect of dietary level of methionine on growth performance and immune response in Japanese quails (*Coturnix coturnix japonica*)**

Methionine (Met) being the first limiting amino acid in maize/soybean-based quail diets, its supplementation provides scope for improvement of protein quality and reduction of dietary protein concentration. The question remains to what extent it can be incorporated in the diet of genetically improved quails. Therefore, the effect of dietary Met level was assessed on growth performance and immune response in growing Japanese quails ( $n = 400$ ) divided equally into 20 groups. Five dietary treatments (230 g kg<sup>-1</sup> crude protein and 12.14 MJ kg<sup>-1</sup> metabolisable energy) were formulated with 3.5, 4.5, 5.0, 5.5 and 6.0 g kg<sup>-1</sup> Met respectively, and each was offered to four groups of birds from 0 to 35 days of age.

Live weight at day 35 increased ( $P < 0.0001$ ) up to 5.0 g kg<sup>-1</sup> dietary Met level but did not improve further at higher Met levels (5.5 and 6.0 g kg<sup>-1</sup>). Improved ( $P < 0.039$ ) feed conversion ratio was achieved at 5.5 g kg<sup>-1</sup> Met level, which was statistically similar to that at 5.0 g kg<sup>-1</sup> Met level during 0-14 days of age. Cellular (phytohaemagglutinin from *Phaseolus vulgaris* Linn.) immune response increased ( $P < 0.0001$ ) with increasing dietary Met concentration, whereas humoral (sheep red blood cells) immune response did not differ. The optimal requirement of Met was 5.0 g kg<sup>-1</sup> for growth and 5.5 g kg<sup>-1</sup> for maximum cellular immune response [Rana Parvin\*, Asit B Mandal, Satyendra M Singh and Rakesh Thakur (Department of Animal Science, MJP Rohilkhand University, Bareilly 243 006, India), *Journal of the Science of Food and Agriculture*, 2010, **90**(3), 471-481].

**FIBRES (incl. Textile and other utility fibres)**

**NPARR 1(3), 2010-0379, Influence of Eri silk fibre on the physical characteristics and dyeing properties of Eri silk/cotton blended yarn**

Different blending ratios of Eri silk and cotton fibres were prepared. The optimum bleaching condition chosen for the blends containing 0-25% silk content was the oxidative bleaching method, whereas the blends at 50-100% should be bleached using the two-stage bleaching method (oxidative bleaching followed by reductive bleaching). These conditions did affect the force-displacement characteristics of the fibres with no yield point. X-Ray diffraction results showed that the percentage of crystallinity of the cotton yarn tended to increase after bleaching, whereas the percentage of crystallinity of the Eri yarn decreased marginally. Dyeing properties of the blended yarns were investigated using warm-dyeing reactive dyes. Percentage exhaustion and the colour yield of the blends tended to decrease with the increasing silk content. Shade variation was observed on the yarns at different blend ratios. This was expected to be caused by the different physical nature of Eri silk and cotton fibres. Consequently, the dye uptake and visual shade of each dye on the two fibres were different [Rungsima Chollakup\*, Jantip Suesat and Suchada Ujjin (Kasetsart Agro-industrial and Agricultural Product Improvement (KAPI), Kasetsart University, 50 Phaholyotin Road, Chatuchak, Bangkok 10900, Thailand), *Coloration Technology*, 2010, **126**(1), 42-47].

**NPARR 1(2), 2010-0380, Effective antibacterial adhesive coating on cotton fabric using ZnO nanorods and chalcone**

Chalcone ((E)-1-(3-hydroxyphenyl)-3-(4-methoxyphenyl) prop-2-en-1-one) and ZnO flower-like nanorods were prepared and coated on cotton cloth with acacia as binder. The surface was characterized by FT-IR, AFM, goniometer and SEM-EDAX. The antibacterial activity of the coated cotton was tested against three organisms namely *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* in terms of live bacterial load, as measured by the colony

forming units (CFU), adhered on the cotton surface. More than 99% reduction in bacterial load was observed against all three organisms. Viability of the bacterial cells was tested using a dual staining BacLight Kit. Majority of the cells adhered on the coated cotton surface were dead and on uncoated were live. *S. aureus* was found to be most hydrophobic organism. The chalcone showed 48, 45 and 35% reduction in slime produced by *S. aureus*, *E. coli* and *P. aeruginosa*, respectively [P.M. Sivakumar, S. Balaji, V. Prabhawathi, R. Neelakandan, P.T. Manoharan and M. Doble\* (Department of Biotechnology, Indian Institute of Technology Madras, Adyar, Chennai 600 036, India), *Carbohydrate Polymers*, 2010, **79**(3), 717-723].

**NPARR 1(3), 2010-0381, Jute-fiber-reinforced polyurethane green composites based on *Mesua ferrea* Linn. seed oil**

Two types of environmentally friendly jute-fiber-reinforced green composites based on *Mesua ferrea* Linn. were prepared with poly(urethane ester) and poly(urethane amide) resin blends with commercially available partially butylated melamine-formaldehyde and epoxy resins through solution impregnation and hot-curing methods. The composites were cured at a temperature of about 130-140°C under a pressure of  $35 \pm 5$  kg/cm<sup>2</sup> for about 2 h. The mechanical properties, such as tensile strength, flexural strength, elongation at break, hardness, and density, of all of the composites were measured and compared. The mode of interaction between the filler and the matrix were studied by Fourier transform infrared spectroscopy and scanning electron microscopy of the fractured composite samples. The water uptake in different chemical media was observed, and it was that all of the composites possessed excellent hydrolytic stability against almost all of the media except the alkali. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) were used to analyze the thermal behavior of the composites. TGA of the composites showed degradation much above that of the virgin blends, which indicated their high thermostability. The glass-transition temperatures, as shown by DSC analysis, were found to be much higher [Suvangshu Dutta, Niranjana Karak

and Sasidhar Baruah\* (Department of Chemical Sciences, Tezpur University, Tezpur 784028, Assam, India), *Journal of Applied Polymer Science*, 2010, **115**(2), 843-850].

**NPARR 1(3), 2010-0382, Preparation and characterizations of polycaprolactone/green coconut fiber composites**

The mechanical and thermal and morphological properties of polycaprolactone (PCL) and green coconut fiber (GCF) composites were evaluated. Blends containing acrylic acid-grafted PCL (PCL-*g*-AA/GCF) exhibited noticeably better mechanical properties due to better compatibility between the two components. The dispersion of GCF in the PCL-*g*-AA matrix was significantly more homogeneous due to the creation of branched and cross-linked macromolecules via reactions between carboxyl groups in PCL-*g*-AA and hydroxyl groups in GCF. The tensile strength of the PCL-*g*-AA/GCF composites at break was considerably greater than that of PCL/GCF composites. In addition, the PCL-*g*-AA/GCF blend was more easily processed due to lower melt viscosity. Biodegradation tests were performed with each composite in an *Acinetobacter baumannii* BCRC 15556 environment. The mass of both composites was reduced by the GCF content within 4 weeks [Chin-San Wu\* (Department of Chemical and Biochemical Engineering, Kao Yuan University, Kaohsiung County, Taiwan 82101, Republic of China), *Journal of Applied Polymer Science*, 2010, **115**(2), 948-956].

**NPARR 1(2), 2010-0383, Effects of recycled fiber addition on high-density fiber board for laminated flooring bonded with phenol-formaldehyde resin adhesive**

The effects of old corrugated cardboard (OCC) fiber addition on high-density fiberboard (HDF) were investigated in this study. A phenol-formaldehyde (PF) resin was synthesized in the laboratory with resin solids at 50% content as an HDF binder. The physical characteristics and molecular weight of the PF resin are described herein. The laboratory HDFs were made using the OCC fiber based on 0, 20, 40, and 60% oven-dry weight addition with the laboratory-synthesized PF

resin. The HDFs were tested for physical strength and dimensional stability properties according to the procedure of ASTM D 1037-99. Evaluation of the HDFs manufactured using the PF resin showed that the internal bond and bending strength properties were decreased gradually with increasing OCC fiber content. Overall, the OCC fiber can be used at a content of 40% in the substitution of raw materials for HDF manufacture [Yong-Sung Oh\* (Department of Forest Resources, College of Natural Resources, Yeungnam University, Kyongsan 712-749, Korea), *Journal of Applied Polymer Science*, 2010, **115**(2), 641-645].

**NPARR 1(3), 2010-0384, Sisal fibers treated with NaOH and benzophenonetetracarboxylic dianhydride as reinforcement of phenolic matrix**

In this work, composites based on a phenolic matrix and untreated- and treated sisal fibers were prepared. The treated sisal fibers used were those reacted with NaOH 2% solution and esterified using benzophenonetetracarboxylic dianhydride (BTDA). These treated fibers were modified with the objective of improving the adhesion of the fiber-matrix interface, which in turn influences the properties of the composites. BTDA was chosen as the esterifying agent to take advantage of the possibility of introducing the polar and aromatic groups that are also present in the matrix structure into the surface of the fiber, which could then intensify the interactions occurring in the fiber-matrix interface. The fibers were then analyzed by SEM and FTIR to ascertain their chemical composition. The results showed that the fibers had been successfully modified. The composites (reinforced with 15%, w/w of 3.0 cm length sisal fiber randomly distributed) were characterized by SEM, impact strength, and water absorption capacity. In the tests conducted, the response of the composites was affected both by properties of the matrix and the fibers, besides the interfacial properties of the fiber-matrix. Overall, the results showed that the fiber treatment resulted in a composite that was less hygroscopic although with somewhat lower impact strength, when compared with the composite reinforced with untreated sisal fibers [Vagner R. Botaro\*, Gilberto Siqueira, Jackson D. Megiatto, Jr. and Elisabete Frollini

(Departamento de Físico-Química, Universidade Federal de São Carlos, Universidade Federal de São Carlos, Campus Sorocaba, Rod. João Leme dos Santos, Km110, CEP, Sorocaba 18052-780, SP, Brazil), *Journal of Applied Polymer Science*, 2010, **115**(1), 269-276].

**NPARR 1(3), 2010-0385, Bio-bleaching of dyed cotton fabric using a bacterial catalyst**

Anaerobically grown cells of *Shewanella* strain J18 143 were able to bio-bleach the color from cotton fabric that was dyed with Remazol Black B (C.I. Reactive Black 5), a common diazoreactive dye. This bio-bleaching process, involving a bacterial catalyst, offers potential benefits to the color industry as the removal of color from dyed fabric opens up the potential for fabric re-use. Growing cells removed the color with greater efficiency than that achieved using pre-grown "resting" cells. Assays of resting cells were used to determine the effect of cell concentration and depth of shade of the dyeing on the color removal process. Further resting cell assays were carried out to ascertain if an electron donor was required for the color removal process, and suggested that the cotton substrate could supply some reducing power to the biocatalyst, although dyereduction rates were maximal with added electron donor (formate). The *Shewanella* cells were also able to remove the color from dyed cotton fabric that was isolated inside a dialysis membrane to prevent contact with the cells. This indicates that *Shewanella* strain J18 143 is able to synthesize and excrete endogenous extracellular electron shuttles, eliminating the need for direct contact between the intracellular electron transport components and the extracellular terminal electron acceptors. The dyed cotton fabric was assessed visually, and by reflectance spectroscopy and environmental scanning electron microscopy [Carolyn I. Pearce\*, James T. Guthrie and Jonathan R. Lloyd (Department of Colour Science, School of Chemistry, University of Leeds, U.K.), *Textile Research Journal*, 2010, **80**(1), 63-76].

**NPARR 1(3), 2010-0386, Tensile Properties of Polycarbonate/Polymethyl Methacrylate Blend Coated Natural Fabric *Hildegardia populifolia***

The uniaxial natural fabric *Hildegardia populifolia* was coated with polycarbonate/polymethyl methacrylate blend and its tensile strength, modulus and percentage of elongation at break were determined. The effect of alkali treatment on the tensile properties of the fabric was also studied. The tensile properties were enhanced by alkali treatment. The morphology of the fabric before and after coating was studied by microscopic technique [D. Jagadeesh\*, A. Varada Rajulu and B. R. Guduri (Department of Polymer Science and Technology, Sri Krishnadevaraya University, Anantapur, India), *Journal of Natural Fibers*, 2010, 7(2), 93-99].

**NPARR 1(3), 2010-0387, Analysis of mechanical, thermal, and dynamic mechanical behaviors of different polymer-coated sisal fibers**

In this study, the surface of sisal fiber has been modified by coating with different polymers. The influence of surface modification on tensile strength, thermal behavior, storage modulus, and dissipation factors has been determined by using fiber tensile tester, differential scanning calorimetry, and dynamic mechanical analysis. Tensile strengths of uncoated sisal fiber and sisal coated with low-density polyethylene, polystyrene (PS), polyvinyl alcohol, polypropylene, polyester, and araldite epoxy are 593.0, 280, 381, 184.8, 198.3, 273.6, and 104.1 MPa, respectively. In the coated fibers, the maximum tensile strength was found for PS-coated sisal fiber and minimum for epoxy-coated sisal fiber, which is explained based on their fractured microstructures. The storage modulus value of PS-coated sisal fiber determined at 100°C for all frequency was maximum [Navin Chand\* and Ruchi Joshi (Polymer Composite Group, Advanced Materials and Processes Research Institute, CSIR, Bhopal, India), *Journal of Natural Fibers*, 2010, 7(2), 100-110].

**NPARR 1(3), 2010-0388, A study of the relationship between bending rigidity and the ease of decortication of Flax (*Linum usitatissimum*) straw**

Sustainable crops such as flax can supplement world cotton supplies. Recovery of the fibers from the plants is a critical stage in the process and optimization of the harvesting time is a significant factor. The mechanical decortication process is strongly influenced by

the degree of retting and the mechanical properties of the flax straw. Changes in the plant morphology during maturation affect the stiffness of the straw and are assessed using three-point bending to determine the bending rigidity of the straw. Correlations between these data and the ease of decortication are investigated. [Dennis Waldron and Jane Harwood\* (TEAM Research Group, De Montfort University, The Gateway, Leicester, UK), *Journal of Natural Fibers*, 2010, 7(1), 42-60].

**NPARR 1(3), 2010-0389, Antibacterial activity of Zn-loaded grafted fibers—mechanical strength and biocidal action**

Apart from exhibiting excellent properties such as biocompatibility, feeling like human skin, sweat absorptivity, and comfort, cotton fabric also creates a suitable environment for microorganisms to grow because of their tendency to absorb moisture. Hence, in order to impart antibacterial properties to cotton fibers, in the current study microorganisms have been graft copolymerized with N-vinyl-2-pyrrolidone and acrylamide to produce micrometer-sized graft layer on the cotton fiber. The fibers have been loaded with Zn(II) ions to impart antibacterial character to them. The biocidal action of Zn(II) has been investigated as a function of percent grafting of polymeric chains on fibers and the concentration of Zn(II) ions in the immersion media, using zone inhibition method. Growth rates of bacterial colonies have been found to be appreciably low in the presence of Zn(II)-loaded grafted fibers. However, the grafting of cotton fibers has been found to decrease the mechanical strength of the resulting fibers [Grace Mary\*; S. K. Bajpai and Navin Chand (Polymer Research Laboratory, Department of Chemistry, Government Model Science College, Jabalpur, Madhya Pradesh, India), *Journal of Natural Fibers*, 2010, 7(1), 34-41].

**NPARR 1(3), 2010-0390, Honeybee silk: Recombinant protein production, assembly and fiber spinning**

Transgenic production of silkworm and spider silks as biomaterials has posed intrinsic problems due to the large size and repetitive nature of the silk proteins. In contrast the silk of honeybees (*Apis mellifera*) is

composed of a family of four small and non-repetitive fibrous proteins. We report recombinant production and purification of the four full-length unmodified honeybee silk proteins in *Escherichia coli* at substantial yields of 0.2-2.5g/l. Under the correct conditions the recombinant proteins self-assembled to reproduce the native coiled coil structure. Using a simple biomimetic spinning system we could fabricate recombinant silk fibers that replicated the tensile strength of the native material [Sarah Weisman, Victoria S. Haritos, Jeffrey S. Church, Mickey G. Huson, Stephen T. Mudie, Andrew J.W. Rodgers, Geoff J. Dumsday and Tara D. Sutherland\* (CSIRO Entomology, Clunies Ross St, Acton, ACT 2601, Australia), *Biomaterials*, 2010, **31**(9), 2695-2700].

**NPARR 1(3), 2010-0391, Process optimization for biosoftening of lignocellulosic fiber with white rot fungi and specific enzymatic systems**

Jute is a strong, stiff, natural fiber. Jute fibers are aggregates of single cells consisting of -cellulose, which are cemented by lignin and hemicellulose. Lignin is responsible for the dark color, branching patterns, and harshness. The spinnability of the fiber is greatly reduced because of poor elongation and high flexural rigidity. This research investigated the effect of using white rot fungi (namely, *Phanerochaete chrysosporium* and *Ceriporiopsis subvermispota*), cellulase enzyme, and a mixture of enzymes (cellulase, xylanases, and pectinases) under specific treatment conditions on the physical characteristics of jute fibers. The physical characteristics such as tenacity, elongation to break, flexural rigidity, and structural analysis using scanning electron microscopy were studied. The results show that these fungi and enzymes are able to degrade the lignin effectively, culminating in the reduction of flexural rigidity and tenacity and improvement in elongation percentage of the fiber. Scanning electron microscopy reveals the degradation of the jute fiber at the surface level and also reveals the removal of the gummy substances present on the surface. The prediction of the desired quality of the enzymatic systems, both cellulase and mixed enzyme systems, using artificial neural network was reported. The results obtained from the network give an

average training error of around 1% in the prediction of the process parameters for achieving the desired physical properties of the jute fibers [J. Jayapriya\* and C. Vigneswaran (Department of Biotechnology, PSG College of Technology, Coimbatore, Tamil Nadu, India), *Journal of Natural Fibers*, 2010, **7**(1), 17-33].

**NPARR 1(3), 2010-0392, Phenolic matrices and sisal fibers modified with hydroxy terminated polybutadiene rubber: Impact strength, water absorption and morphological aspects of thermosets and composites**

The aim of the present work was to investigate the toughening of phenolic thermoset and its composites reinforced with sisal fibers, using hydroxyl-terminated polybutadiene rubber (HTPB) as both impact modifier and coupling agent. Substantial increase in the impact strength of the thermoset was achieved by the addition 10% of HTPB. Scanning electron microscopy (SEM) images of the material with 15% HTPB content revealed the formation of some rubber aggregates that reduced the efficiency of the toughening mechanism. In composites, the toughening effect was observed only when 2.5% of HTPB was added. The rubber aggregates were found located mainly at the matrix-fiber interface suggesting that HTPB could be used as coupling agent between the sisal fibers and the phenolic matrix. A composite reinforced with sisal fibers pre-impregnated with HTPB was then prepared; its SEM images showed the formation of a thin coating of HTPB on the surface of the fibers. The ability of HTPB as coupling agent between sisal fibers and phenolic matrix was then investigated by preparing a composite reinforced with sisal fibers pre-treated with HTPB. As revealed by its SEM images, the HTPB pre-treatment of the fibers resulted on the formation of a thin coating of HTPB on the surface of the fibers, which provided better compatibility between the fibers and the matrix at their interface, resulting in a material with low water absorption capacity and no loss of impact strength [Jackson D. Megiatto Jr., Elaine C. Ramires and Elisabete Frollini\* (Instituto de Química de São Carlos, Universidade de São Paulo, C.P. 780, CEP 13560-970 São Carlos, São Paulo, Brazil), *Industrial Crops and Products*, 2010, **31**(1), 178-184].

**NPARR 1(3), 2010-0393, Cell wall ultrastructure, anatomy, lignin distribution, and chemical composition of Malaysian cultivated kenaf fiber**

The basic characteristics and physical properties of kenaf (*Hibiscus cannabinus* Linn.) fibers cultivated in the region of Penang, Malaysia were analyzed. For fundamental analysis, which includes nano-scale viewing for identification of kenaf cell wall ultra structure, fibers were viewed under transmission electron microscopy (TEM). Light microscopy (LM) was used to observe the physical characteristics, anatomy, and lignin distribution. Anatomical study was further carried out by scanning electron microscopy (SEM). Kenaf plants had a maximum height of 2.50m, with a mean basal diameter of 1.74cm. The wood (core) is the most abundant tissue with proportions up to 78% in cross-section area and up to 68.5% in weight. The mean dry density of stems was found to be 0.29g/cm<sup>3</sup>, while that of core was 0.21g/cm<sup>3</sup> along the stems. A combination of LM and image analysis techniques was used to measure cell wall thickness and fiber length of the bast and core fibers. The fiber length of the bast was found to be longest (3637µm) as compared to the core (1100µm). Vessel members average 284µm in length and 72µm in diameter. The chemical composition was determined according to Technical Association of Pulp and Paper Industry (TAPPI) methods. Fourier transform infrared (FT-IR) spectroscopy was used to determine the functional groups present in the kenaf fiber samples [H.P.S. Abdul Khalil\*, A.F. Ireana Yusra, A.H. Bhat and M. Jawaid (Bioresource, Paper and Coating Division, School of Industrial Technology, Universiti Sains Malaysia, Minden, 11800 Penang, Malaysia), *Industrial Crops and Products*, 2010, **31**(1), 113-121].

**NPARR 1(3), 2010-0394, Mechanical modification of degummed jute fibre for high value textile end uses**

The effects of pretreatment and mechanical modification on characteristics of jute fibre were evaluated in this paper. The experimental results show that pretreatments and mechanical modifications both have obvious effects on the characteristics of jute fibre.

The blended agent used for pretreatment can form a thin film on the surface of jute fibre to make it smoother, so the fibre can be refined by further mechanical modification. Regarding the four process routes used for mechanical modification discussed in this study, the process of draft-cutting and speedily carding can produce jute fibre with finer diameter, lower average length, higher percentage of short fibre, and lower tenacity. The jute fibre pretreated with blended agent and mechanically modified by Process I has linear density of 16.1dtex, average length of 35.2mm, and tenacity of 3.4cN/dtex, indicating that it is available for high value textile end uses [Lifang Liu, Qianli Wang, Zhaopeng Xia, Jianyong Yu\* and Longdi Cheng (The Key Lab of Textile Science & Technology, Ministry of Education, Donghua University, Shanghai 201620, China), *Industrial Crops and Products*, 2010, **31**(1), 43-47].

**FOOD (incl. Dairy, Fishery, Poultry and other Plant and Animal products)**

**NPARR 1(3), 2010-0395, Development of a nutritious acceptable snack bar using micronized flaked lentils**

Study objectives were to formulate a nutritious acceptable snack bar partially replacing oats with micronized flaked lentils (MFL), and to identify the sensory attributes that contribute to consumer acceptability. Six MFL snack bar formulations exhibiting a wide range of flavor and textural characteristics were developed from a mixture designed experiment. These bars and two commercial bars were evaluated by a consumer panel ( $n=62$ ) and a descriptive panel ( $n=11$ ). The highest mean acceptability values for one commercial sample (6.5) and three MFL bars (6.0) were not significantly different and corresponded to 'like slightly' on the 9-point hedonic scale. External preference mapping determined that sweetness, grainy and lentil flavors, hardness, cohesiveness, cohesiveness of mass and moistness had the greatest influence on consumer acceptability. MFL bars contained more dietary fibre, protein and iron in addition to an approximate sevenfold increase in folate over the all oat counterpart [Donna Ryland\*, Marion Vaisey-Genser,

Susan D. Arntfield and Linda J. Malcolmson (Faculty of Human Ecology, Department of Human Nutritional Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2), *Food Research International*, 2010, **43**(2), 642-649].

**NPARR 1(3), 2010-0396, Functional properties of corn and corn-lentil extrudates**

Functional properties of corn and corn-lentil extrudates were investigated as a result of extrusion conditions, including feed rate (2.5-6.8kg/h), feed moisture (13-19% wet basis) and extrusion temperature (170-230°C). Lentil was used in mixtures with corn flour at a ratio of 10-50% (legume/corn). The water absorption index of extrudates increased with extrusion temperature and feed moisture content and decreased with feed rate and lentil/corn ratio. The water solubility index of extrudates increased with temperature, but decreased with feed moisture content and feed rate. The oil absorption index of extrudates increased with extrusion temperature and decreased with feed rate, feed moisture content and lentil/corn ratio. Generally, the use of lentil flour led to products with lower values for functional properties. Principal component analysis of functional properties discriminated samples with appropriate functionality based on industrial use [Andriana Lazou\* and Magdalini Krokida (Laboratory of Process Analysis and Design, School of Chemical Engineering, National Technical University of Athens, Zografou Campus, 15780 Athens, Greece), *Food Research International*, 2010, **43**(2), 609-616].

**NPARR 1(3), 2010-0397, Concentrations of condensed tannins and anthocyanins in common bean seed coats**

Seed coat colour in common bean (*Phaseolus vulgaris* Linn.) is determined by activity of the flavonoid biosynthetic pathway resulting in the presence or absence of specific anthocyanins, tannins and glycosidic flavanols. These secondary metabolites have anti-oxidant properties in the case of anthocyanins and glycosidic flavanols and strongly influence dietary mineral bioavailability in the case of tannins. The modification of tannin content is a goal of biofortification breeding programs, while almost all bean improvement considers

seed colour in selection priorities as this affects consumer preference and food quality. In the present study, we analyzed condensed tannins, tannin monomers and anthocyanin levels in an inter-gene pool population derived from the cross DOR364 × G19833 using HPLC and spectrophotometric methods. The overall average for condensed tannins expressed as percentage in seed coats was 20.04%. The ranges were between 8.0% and 27.9% for soluble tannins (ST), 1.5% and 5.4% for insoluble tannins (IT), and 10.7% and 30.9% for total tannins (TT). Anthocyanins in seed coats averaged 0.08% (0.013–0.21% range) expressed as delphinidin-3-glucoside equivalents for the population with the distribution biased towards low content. All traits had large variability between genotypes and showed transgressive segregation, indicating quantitative inheritance for tannin content and oligogenic control of anthocyanins. Condensed tannins in the genotypes were mainly composed of catechin (60.3%), gallicocatechin (25%), and afzelechin (14.7%) as monomeric units [Aura M. Díaz, Gina V. Caldas and Mathew W. Blair\* (International Center for Tropical Agriculture (CIAT), AA 6713, Cali, Colombia), *Food Research International*, 2010, **43**(2), 595-601].

**NPARR 1(3), 2010-0398, Effect of cooking on the composition of beans (*Phaseolus vulgaris* Linn.) and chickpeas (*Cicer arietinum* Linn.)**

The effect of cooking on levels of nutrients and anti-nutritional factors in beans and chickpeas was investigated. Significant ( $p < 0.05$ ) variation existed among the beans and chickpeas with respect to their crude protein, starch, soluble dietary fiber (SDF), insoluble dietary fiber (IDF), total dietary fiber (TDF), resistant starch (RS), trypsin inhibitor activity (TIA), mineral, phytic acid, tannin, sucrose and oligosaccharide (raffinose, stachyose and verbascose) contents. Cooking beans and chickpeas in water significantly increased protein, starch, SDF, IDF, TDF, Mn and P contents (on a dry weight basis), whereas reduced ash, K, Mg, TIA, tannin, sucrose and oligosaccharide contents were observed. Colored beans (black, cranberry, dark red kidney, pinto and small red bean) contained tannins, whereas little tannin in white-colored beans (great northern and white pea bean) and chickpeas (Desi and Kabuli

type) was detected (Grain Research Laboratory, Canadian Grain Commission, 1404-303 Main Street, Winnipeg, Manitoba, Canada R3C 3G8), *Food Research International*, 2010, **43**(2), 589-594 ].

**NPARR 1(3), 2010-0399, Functional properties of yellow field pea (*Pisum sativum* Linn.) seed flours and the *in vitro* bioactive properties of their polyphenols**

Functional and bioactive properties of yellow field pea (*Pisum sativum* Linn.) seed flour, protein isolate (PPI), two high fibre products (Centara III, Centara IV) and one high fibre–starch ingredient (Uptake 80), were determined. The whole seed flour had superior water and oil absorption capacities but the high fibre flours had significantly higher ( $p < 0.05$ ) swelling ability. Centara IV and Uptake 80 had the highest gel clarity while Centara IV gel was the most resistant to freeze–thaw treatment. Polyphenolic constituents were extracted singly or sequentially with aqueous methanol and acetone; the whole pea seed flour and the pea protein isolate had significantly more polyphenolic constituents than the fibre products, which also resulted in higher *in vitro* antioxidant activities (trolox equivalent antioxidant capacity and diphenyl-picrylhydrazyl free radical scavenging ability). Results of renin- and ACE-inhibitory activities were mixed and did not correspond to the overall polyphenolic content and antioxidant test results, probably indicating the importance of components specific to individual extracts [Samson O. Agboola\*, Olawunmi A. Mofolasayo, Beverley M. Watts and Rotimi E. Aluko (School of Agricultural and Wine Sciences, Charles Sturt University, Private Bag 588, Wagga Wagga 2678, Australia), *Food Research International*, 2010, **43**(2), 582-588].

**NPARR 1(3), 2010-0400, Effect of pulse consumption on perceived flatulence and gastrointestinal function in healthy males**

Despite their demonstrated health benefits, consumption of pulses in Western societies has traditionally been low. This is, in part, due to the perception that pulses cause flatulence and gastrointestinal upset. This randomized, double-blind placebo-controlled, cross-

over study assessed the impact of 28 consecutive days consumption of 100g dry weight Kabuli chickpeas, green Laird lentils, and green peas, in comparison to a potato control, on perceived flatulence, abdominal comfort, bowel movements and overall gastrointestinal function using a questionnaire with yes/no and visual analog rankings, in 21 healthy males between the ages of 19-40. Questionnaires were completed during three phases (PRE, EARLY, LATE) of each treatment period. Chi-square (occurrence) and Wilcoxon test (severity rank) analyses revealed minor changes in occurrence and/or severity of flatulence and abdominal comfort, but no changes in overall gastrointestinal function. These results demonstrate that pulses containing oligosaccharides are well tolerated with negligible perceived changes in flatulence and overall gastrointestinal function when incorporated into the diet of healthy adult males [J.M. Veenstra\*, A.M. Duncan, C.N. Cryne, B.R. Deschambault, J.I. Boye, M. Benali, M. Marcotte, S.M. Tosh, E.R. Farnworth and A.J. Wright (Department of Human Health and Nutritional Sciences, University of Guelph, Guelph, ON, Canada N1G 2W1), *Food Research International*, 2010, **43**(2), 553-559].

**NPARR 1(3), 2010-0401, Carbohydrate composition of raw and extruded pulse flours**

Extrusion cooking technology is commercially used in the fabrication of a variety of snack-type and ready-to-eat foods made from cereal grains. However, with the exception of soybean, pulses such as lentil, dry pea and chickpea have not been used for the development of extruded food products. In this study, total carbohydrates, mono-, di- and oligosaccharides and soluble and insoluble dietary fiber were determined before and after extrusion cooking under specific processing conditions. Concentrations of total available carbohydrates (TAC) in lentil, chickpea and dry pea flours ranged from 625g/kg to 657g/kg dry matter. Dry pea showed the highest concentration of TAC, followed by chickpea and lentil. Extrusion processing did not significantly ( $p < 0.05$ ) affect the TAC content of dry pea and lentil flours. However, extrusion processing decreased the concentration of the raffinose family of oligosaccharides (raffinose and stachyose) in pulse extrudates. Formulated pulse flours demonstrated a beneficial increase in

dietary fiber. This research indicates that value-added, nutritious snacks with reduced levels of flatulence factors and higher contents of dietary fiber can be fabricated successfully by extrusion processing of formulations based on lentil, dry pea or chickpea, and represent good alternatives to traditional cereal-based snacks. Also, the commercialization of value-added, pulse-based snacks would increase pulse consumption [J. De J. Berrios, P. Morales, M. Cámara and M.C. Sánchez-Mata (USDA, ARS, WRRRC, Albany, California 94710, USA), *Food Research International*, 2010, **43**(2), 531-536].

**NPARR 1(3), 2010-0402, Polyphenols and tannins in Indian pulses: Effect of soaking, germination and pressure cooking**

Polyphenols and tannins have implications for health and nutrition. There is limited information on their content in pulses, raw or post-processing. We estimated the concentrations of polyphenols and tannins in different cultivars of four pulses commonly consumed in India. *Phaseolus aureus*, *Cajanus cajan*, *Lens esculenta* and *Cicer arietinum*— and examined the effects of domestic processing. Means and standard deviations were calculated and results were analyzed by ANOVA. There were significant differences ( $P < 0.001$ ) in the polyphenol and tannin contents of cultivars of the same pulse, with the exception of the tannin contents of pressure-cooked red gram cultivars ( $P = 0.3103$ ). Processing reduced the concentrations of polyphenols by 19-59% and of tannins by 22-59%. A trend was observed in the degree to which processing reduced polyphenol and tannin contents (germination > pressure-cooking > soaking). Soaking, germination and pressure-cooking proved to be effective household strategies to reduce the levels of polyphenols and tannins in pulse-based foods, thereby enhancing the bioavailability of pulse protein. There is a need to determine the extent to which the remaining polyphenols and tannins are rendered unavailable by these processing techniques [Shweta Khandelwal, Shobha A. Udipi and Padmini Ghugre (Public Health Foundation of India, New Delhi, India), *Food Research International*, 2010, **43**(2), 526-530].

**NPARR 1(3), 2010-0403, Microwave-assisted extraction of phenolics from bean (*Phaseolus vulgaris* Linn.)**

Phenolic phytochemicals are associated with many health benefits, and it would be useful to develop improved methods for their extraction from bean. In this work, we showed that microwave-assisted extraction was an effective method. Eight bean types important in the Northarvest region of North America, which includes North Dakota and Minnesota, were chosen for this study. Four temperatures (25, 50, 100 and 150°C) and three solvents (water, 50% ethanol in water and 100% ethanol) were investigated. As expected, colored beans contained higher concentrations of extractable phenolics, and in most cases the concentration of phenolics was much higher in the hull (testa) than in the cotyledon. Extraction efficiency was superior at higher extraction temperatures. The most effective extraction was achieved at a temperature of 150°C using 50% ethanol. Total phenolics contents determined by microwave-assisted extraction with water at 100°C were two to three times those determined by conventional extraction with water at the same temperature [N. Sutivisedsak\*, H.N. Cheng, J.L. Willett, W.C. Lesch, R.R. Tangsrud and Atanu Biswas (Plant Polymer Research Unit, National Center for Agricultural Utilization Research, USDA/Agricultural Research Service, 1815 N. University Street, Peoria, IL 61604, USA), *Food Research International*, 2010, **43**(2), 516-519].

**NPARR 1(3), 2010-0404, Optimisation of hydrothermal treatment for dehulling pigeon pea**

This study was carried out to investigate the effect of hydrothermal treatment and drying time at a constant drying temperature of 50°C on the dehulling behavior of pigeon pea seed. Response surface methodology (RSM) based on a two-factor, five-level, central composite design was employed to study the effect of the independent variables and optimize processing conditions. A second-order polynomial model described dehulling quality in terms of: (1) dehulled seeds, (2) undeulled seeds, (3) broken seeds, (4) powder loss and (5) dehulling efficiency. The process parameters showed significant effects on dehulled seeds and dehulling

efficiency. The optimized processing conditions for maximum dehulled seeds, dehulling efficiency and minimum powder loss were a hydrothermal treatment time of 10.2min and a drying time of 2.9h [B.K. Tiwari, R. JaganMohan, N. Venkatachalapathy, M. Tito Anand, A. Surabi and K. Alagusundaram (Indian Institute of Crop Processing Technology, Pudukkottai Road, Thanjavur 613 005, India), *Food Research, International*, 2010, **43**(2), 496-500].

**NPARR 1(3), 2010-0405, Bioactive proteins and peptides in pulse crops: Pea, chickpea and lentil**

Pulse crops are cool season, annually grown legume crops, which are harvested for their seeds. They are invaluable agricultural commodities which are produced and imported by many regions of the world. Pulse seeds are a valuable source of dietary protein, carbohydrates, fiber and an important source of essential vitamins and minerals. Their nutritional characteristics have been associated with a reduction in the incidence of various cancers, HDL cholesterol, type-2 diabetes and heart disease. Pulses also contain protein and non-protein antinutritional factors, which may cause deleterious effects on the host when the seeds or processed seeds are consumed raw. Conversely, recent studies have demonstrated that protein antinutritional compounds such as lectins, protease inhibitors and the non-antinutritional component, angiotensin I-converting enzyme (ACE) inhibitor may have beneficial properties. Lectins have been associated with reducing certain forms of cancer, activating innate defense mechanisms and managing obesity. Protease inhibitors such as trypsin and chymotrypsin inhibitors have been demonstrated to reduce the incidence of certain cancers and demonstrate potent anti-inflammatory properties. Angiotensin I-converting enzyme (ACE) inhibitor has been associated with a reduction in hypertension [F. Roy, J.I. Boye and B.K. Simpson (Food Science & Agricultural Chemistry Department, McGill University, Macdonald Campus, 21,111 Lakeshore Road, Ste. Anne de Bellevue, Quebec, Canada H9X 3V9), *Food Research International*, 2010, **43**(2), 432-442].

**NPARR 1(3), 2010-0406, Effect of pH on the functional behaviour of pea protein isolate–gum Arabic complexes**

The functional behaviour (solubility, emulsifying and foaming properties) of pea protein isolate (PPI) and gum Arabic (GA) mixtures were investigated as a function of pH (4.30-2.40) within a region dominated by complex coacervation. Emulsion stability was also investigated using a one- and two-step emulsification approach. Complex coacervation was monitored by turbidimetric acid titration at a 2:1 PPI-GA ratio to reveal the formation of soluble (pH 4.23) and insoluble (pH 3.77) complexes, maximum biopolymer interactions (pH 3.60), and dissolution of complexes (pH 2.62). Emulsion stability was greater for mixed systems relative to PPI alone at pHs between 3.10 and 4.00, and in those prepared using the one-step method. Foam expansion was independent of both biopolymer content and pH, whereas foam stability was improved for the mixed system between pH 3.10 and 4.00. The pH-solubility minimum was broadened relative to PPI to more acidic pHs. Findings suggest that admixtures of PPI and GA under complexing conditions could represent a new blended food and/or biomaterial ingredient [S. Liu\*, C. Elmer, N.H. Low and M.T. Nickerson (Department of Food and Bioproduct Sciences, University of Saskatchewan, 51 Campus Dr., Saskatoon, SK, Canada S7N 5A8), *Food Research International*, 2010, **43**(2), 489-495].

**NPARR 1(3), 2010-0407, Effect of germination and probiotic fermentation on nutrient composition of barley based food mixtures**

Food mixtures formulated from non-germinated and germinated barley flour, whey powder and tomato pulp (2:1:1 w/w) were autoclaved, cooled and fermented with 5% *Lactobacillus acidophilus* curd ( $10^6$  cells/ml) at 37°C for 12h. The cell count was found significantly higher (8.88cfu/g) in the fermented food mixture formulated from germinated flour as compared to the non-germinated barley based food mixture. A significant drop in pH with corresponding increase in titratable acidity was found in the germinated barley flour based food mixture. Processing treatments like germination, autoclaving and probiotic fermentation did not bring about any significant change in ash and fat contents, but significant decrease was noticed in crude protein, crude fibre, starch, total and insoluble dietary fibre contents.

The combined processing caused significant improvement in reducing sugar, thiamine, niacin, lysine and soluble dietary fibre contents of barley based food mixtures. Thus, it is concluded that a combination of germination and fermentation is a potential process for enhancing the nutritional quality of food mixtures based on coarse cereals [Sonia Arora, Sudesh Jood and N. Khetarpaul\* (Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar 125004, India), *Food Chemistry*, 2010, **119**(2), 779-784].

**NPARR 1(3), 2010-0408, Antioxidant capacities and phenolic compounds of the husk, bran and endosperm of Thai rice**

Four fractions, namely, rice bran, rice husk, brown rice and milled rice of a Thai rice variety (Khao Dawk Mali 105), collected from three different growth sites, were analysed to determine phenolic acid composition,  $\gamma$ -oryzanol and tocopherols content and their antioxidant capacity using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging and ferric reducing ability power (FRAP) assays. The bran and husk fractions showed higher values of antioxidant activity based on the DPPH and FRAP assays, compared to the other fractions. In addition, the bran fraction had the highest  $\gamma$ -oryzanol and tocopherols content. On the other hand, the husk fraction showed greater phenolic acids concentration than the other fractions. The three major phenolic acids found in all fractions, despite different growth sites, were ferulic, vanillic and *p*-coumaric acids. Ferulic acid was most evident in the bran, whereas vanillic and *p*-coumaric acids were mostly found in the husk. Significant differences ( $p < 0.05$ ) in the antioxidant capacities of each fraction depended on the growth sites and antioxidant components. Thus the variation in phenolic acid content could be affected by the growth sites. This study demonstrates that rice bran and husk can be considered as valuable sources of bioactive components with high antioxidant properties [Sunan Butsat and Sirithon Siriamornpun\* (Department of Food Technology and Nutrition, Mahasarakham University, Mahasarakham 44000, Thailand), *Food Chemistry*, 2010, **119**(2), 606-613].

**NPARR 1(3), 2010-0409, Effect of moist or dry heat cooking procedures on carotenoid retention and**

**colour of fillets of rainbow trout (*Oncorhynchus mykiss*) fed astaxanthin or canthaxanthin**

Rainbow trout were pigmented with diets containing astaxanthin or canthaxanthin for 100 days and then they were moist or dry heat-cooked. Fish fillet weight, fillet colour and fillet biochemical contents (moisture, canthaxanthin and astaxanthin contents and total lipid content) were analyzed. There was no significant effect of using astaxanthin or canthaxanthin on moisture, lipid or carotenoid contents of fish fillet. Giving astaxanthin or canthaxanthin to fish resulted in different hues; astaxanthin-fed fish yielded fillets that were visually more red than those of canthaxanthin-fed fish. The dry heat-cooking procedure showed the highest impact on the fillet colour. Carotenoid retention was affected by carotenoid source and cooking procedure. Canthaxanthin appeared more stable after heat processing than did astaxanthin [Georges Choubert\* and Michel Baccaunaud (INRA, UMR 1067 Nutrition, Aquaculture et Génomique, Pôle d'Hydrobiologie, 64310 Saint Pée-sur-Nivelle, France), *Food Chemistry*, 2010, **119**(1), 265-269]

**NPARR 1(3), 2010-0410, Antioxidant properties of commercial, regular- and whole-wheat spaghetti**

Whole grains contain more vitamins, minerals, natural antioxidants and dietary fibre than regular, refined grain products. Therefore, consumption of whole grain products is associated with beneficial health effects. The present investigation evaluated the antioxidant properties of 10 samples of regular- and whole-wheat spaghetti that are commercially available. The methods employed were total phenolic content (TPC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity, oxygen radical absorbance capacity (ORAC) and ferulic acid content by HPLC analysis. The effects of cooking on the antioxidant properties of spaghetti were also studied. Whole wheat spaghetti exhibited significantly higher levels of total phenolic content (1389  $\mu\text{g/g}$ ) than regular wheat spaghetti (865  $\mu\text{g/g}$ ); however, TPC in both regular and whole wheat spaghetti was 48-78% of the original content after cooking. There were no significant differences in ORAC values (34.3-100.4  $\mu\text{mol Trolox equivalents/g}$ ) or DPPH scavenging activity (1.0-2.3  $\mu\text{mol Trolox equivalents}$ )

among whole wheat and regular spaghetti. Whole wheat spaghetti (234  $\mu\text{g/g}$ ) had significantly higher content of ferulic acid than regular spaghetti ( $p < 0.05$ ). TPC and ferulic acid content were found to be good indicators of the antioxidant capacity of spaghetti with both indices demonstrating the superiority of whole wheat over regular pasta products. The current findings on spaghetti add to the mounting evidence on the potential health benefits to be derived from consuming whole grain products [Rhanissa Hirawan, Wan Yui Ser, Susan D. Arntfield and Trust Beta\* (Department of Food Science, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2), *Food Chemistry*, 2010, **119**(1), 258-264].

**NPARR 1(3), 2010-0411, Generation of meat-like flavourings from enzymatic hydrolysates of proteins from *Brassica* sp.**

Proteins from *Brassica* sp. were prepared by alkaline extraction followed by acid precipitation. A double-enzyme (As1.398 and Flavourzyme) two-stage hydrolysis was used to hydrolyse *Brassica* sp. proteins and the hydrolysates were used to generate meat-like flavourings. The effect of processing conditions on the volatile products generated from the thermal reaction between the protein hydrolysates and other additives was studied. The results indicated that temperature and pH influenced not only the number but also the amount of products. Those with the most favourite flavour and the highest volatile amount were generated at 160°C, pH 4.0, whereas a burnt odour was produced at 180°C, pH 8.0. Analysis using response surface methodology showed that the interaction of pH and temperature had a significant influence on the total amount of volatile products ( $P < 0.01$ ). GC-MS analysis demonstrated that most of the components in the reaction products occur in food flavourings which had been identified in model systems [Xingfeng Guo, Shaojun Tian\* and Darryl M. Small (School of Food Science and Technology, Henan University of Technology, ZhengZhou 450052, PR China), *Food Chemistry*, 2010, **119**(1), 167-172].

**NPARR 1(3), 2010-0412, Structural characterisation of pentosans from hemicellulose**

**B of wheat varieties with varying chapati-making quality**

Wheat varieties, such as 'DWR-162' and 'GW-322' (good chapati-making quality), and 'MACS-2496' and 'HD-2189' (poor chapati-making quality), were used to study the structural features of pentosans. Structural features of the purified pentosans from hemicellulose B were elucidated by a combination of methods, such as methylation analysis,  $^1\text{H NMR}$ , FT-IR, periodate oxidation, Smith degradation and optical rotation measurements. Pentosans from hemicellulose B were mainly arabinoxylan type polysaccharides with xylan backbone in  $\beta$ -(1 $\rightarrow$ 4) linkages. Mono, and di-substituted xylosyl residues were present in these polysaccharides. Variations in structural features of pentosans could be responsible for the differences in chapati-making qualities of wheat [S.B. Revanappa, C.D. Nandini and P.V. Salimath\* (Department of Biochemistry and Nutrition, Central Food Technological Research Institute, Mysore 570 020, India), *Food Chemistry*, 2010, **119**(1) 27-33].

**NPARR 1(3), 2010-0413, Effects of banana flour and  $\beta$ -glucan on the nutritional and sensory evaluation of noodles**

The purpose of this study is to determine the nutritional and sensory attributes of the yellow alkaline noodle (YAN) prepared from 30% matured green banana (*Musa acuminata*  $\times$  *balbisiana* Colla cv. *Awak*) flour (BF) and with addition of 10% oat  $\beta$ -glucan. The substitution of wheat flour with BF resulted in significantly ( $p < 0.05$ ) higher total dietary fibre (TDF), and especially insoluble dietary fibre (IDF), resistant starch (RS) and total starch contents. Thirty percent of BF significantly ( $p < 0.05$ ) improved the antioxidant properties (AP) of noodles in terms of the total phenolic (TP) content and inhibition of peroxidation. Noodle incorporated with 30% BF and added oat  $\beta$ -glucan showed the lowest GI and carbohydrate digestibility rate, and higher concentrations of essential minerals (magnesium, calcium, potassium and phosphorus) and proximate components, with the exception of crude fat, when compared to the control. Sensory evaluation indicated that the quality of the 30% BF-substituted noodle was comparable to the control [Chong Li Choo

and Noor Aziah Abdul Aziz\* (Food Science and Technology Division, School of Industrial Technology, University Science Malaysia, 11800 Minden, Penang, Malaysia), *Food Chemistry*, 2010, **119**(1), 34-40].

**NPARR 1(3), 2010-0414, The effects of grape seed extract fortification on the antioxidant activity and quality attributes of bread**

The antioxidant activity change of breads added with grape seed extract (GSE) was investigated. The results showed that bread with the addition of GSE had stronger antioxidant activity than that of blank bread, and increasing the level of GSE addition further enhanced the antioxidant capacity of the bread was also studied. However, thermal processing caused antioxidant activity of GSE added to bread to decrease by around 30-40%. The effect of GSE on the formation of detrimental  $N^{\epsilon}$ -(carboxymethyl) lysine (CML), a famous advanced glycation endproduct in bread was also studied. According to the results, GSE could reduce CML in bread and acted in a dose-dependent manner. Meanwhile, except for an acceptable colour change, adding GSE to bread had only little effect on the quality attributes of the bread. Altogether, our findings indicate that GSE-fortified bread is promising to be developed as a functional food with relatively lower CML-related health risks, yet a high antioxidant activity [Xiaofang Peng, Jinyu Ma, Ka-Wing Cheng, Yue Jiang, Feng Chen and Mingfu Wang\* (School of Biological Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong, PR China), *Food Chemistry*, 2010, **119**(1), 49-53].

**NPARR 1(3), 2010-0415, Milk-clotting potential of fruit extracts from *Solanum esculentum*, *Solanum macrocarpon* Linn. and *Solanum melongena* Linn.**

Fruit extracts from *Solanum esculentum*, *Solanum macrocarpon* and *Solanum melongena* were tested for their milk-clotting potential. The release of substances associated with milk-clotting was highly dependent upon quantity of berries, extraction duration and sodium chloride concentration. The highest milk-clotting activity was obtained after 8 h (for *S. esculentum* and *S. melongena*), and 12h (for *S. macrocarpon*) of soaking 20g of fruit in 6% NaCl 4°C. In these conditions, there was a non linear relationship between the

milk-clotting time and the amount of fruit extracts from each species. The loss of milk-clotting activity was dramatic after wet-heating of extracts from *S. esculentum* and *S. macrocarpon* at 80°C for 10 min and after dry-heating of fruits at 100°C for 24h. Heat treatment did not significantly affect the clotting activity of extract from *S. melongena*. Fruit extracts from *S. esculentum* had the greatest milk-clotting activity followed by extracts from *S. macrocarpon* and *S. melongena*. Extracts from *S. esculentum* and *S. macrocarpon* exhibited a proteolytic activity on the casein [V. D. Guiana\*, D. G. Libouga, E. Ngah, R. G. Beka, K. C. Ndi, B. Maloga, J. M. Bindzi, P. Donn and C. M. Mbofung (National Advanced School of Agro-Industrial Sciences, University of Ngaoundere P.O. Box 455 Ngaoundere – Cameroon.), *African Journal of Biotechnology*, 2010, **9**(12), 1797-1802].

**NPARR 1(3), 2010-0416, Influence of storing time and temperature on the viscosity of an egg yolk**

The influence of storing time and temperature on rheological behavior of egg yolk was investigated. The eggs of two brown egg-laying breeds (*Bar Plymouth Rock* and *Rhode Island Red*) were stored for 1, 2, 3, 4, and 8 weeks at constant temperatures: 4, 8, 12, and 16°C. The apparent viscosity was measured by a rotational viscometer as a function of shear rate. It was found that yolk samples exhibited shear-thinning (pseudoplastic) behavior. The shear-thinning behavior was fitted well into Herschel-Bulkley model (with a satisfying correlation of  $R^2 > 0.95$ ). For the selected shearing rate, viscosity was measured in relation to shearing time. The time-dependant viscosity decreased with time and, at lower shear rates, reached an equilibrium state. The time-dependant viscosity was also found to decrease with storage time. The value of pH changed (increased) during storing. No clear dependence between pH value and viscosity was confirmed [Libor Severa, Šárka Nedomová and Jaroslav Buchar (Department of Physics, Mendel University of Agriculture and Forestry in Brno, Zemědělská 1, 613 00 Brno, Czech Republic), *Journal of Food Engineering*, 2010, **96**(2), 266-269].

**NPARR 1(3), 2010-0417, The effects of maltodextrins on gluten-free dough and quality of bread**

The aim of the study was to check if maltodextrins of various dextrose equivalents (DE) could be used to improve stability and quality of gluten-free bakery products, and effectively reduce starch retrogradation. The maltodextrins, which were used for partial replacement of starch in the recipe for gluten-free dough, were characterised by DE 3.6, 15.3, 18.0 and 21.8. Basing on the obtained results it was concluded, that the addition of applied maltodextrins significantly influences starch gelatinisation, by increasing pasting temperature and reducing viscosity of the obtained pastes. Rheological properties of the obtained dough are also modified by maltodextrins, which weaken its structure and increase deformation sensitivity. The addition of maltodextrins with low DE (3.6) diminishes loaf volume and causes deterioration of bread quality. Maltodextrins with higher DE, especially 18.0 and 21.8, positively influence bread volume and have a beneficial influence on crumb hardening during storage. Maltodextrin with the highest DE is also an effective factor reducing recrystallisation enthalpy of amylopectin [Mariusz Witczak\*, Jarosław Korus, Rafał Ziobro and Lesław Juszcak (Department of Engineering and Machinery for Food Industry, Agricultural University, Balicka 122 Str., 30-149 Krakow, Poland), *Journal of Food Engineering*, 2010, **96**(2), 258-265].

**NPARR 1(3), 2010-0418, Agglomeration of a model food powder: Effect of maltodextrin and gum Arabic dispersions on flow behavior and compacted mass**

The process of agglomeration of particulate foods was studied by employing corn starch as a model system. The effect of different liquid binders (maltodextrin and gum Arabic) to the extent of 1-5% was used to study the changes in the characteristics of the powder. Rheological behavior of powder was quantified in terms of textural indices like maximum force, and energy of compression and decompression. The physical and functional properties of powder and that of the pressure-compacted masses were determined to understand the behavior of the particulate foods in

presence of binder liquid. The compacted masses were subjected to compression testing to obtain textural indices like strain at failure and Young's modulus. The different concentrations of gum and maltodextrin improved the wettability of powder. The electron micrographs were used to observe the characteristics of agglomerated particles including shape and size. The latter varied between 30 and 100µm for agglomerated masses compared to 12 µm for untreated corn starch powder [Sudeep Ghosal\*, T.N. Indira and Suwendu Bhattacharya (Central Food Technological Research Institute, Mysore 570 020, India), *Journal of Food Engineering*, 2010, **96**(2), 222-228].

**NPARR 1(3), 2010-0419, Effects of bacteriostatic emulsifiers on stability of milk-based emulsions**

For milk-based emulsion products such as canned coffee or tea, the addition of bacteriostatic emulsifiers is necessary to inhibiting the growth of heat-resistant sporeformers. Since bacteriostatic emulsifiers often cause the destabilization of emulsions, other type of emulsifiers, such as stability-enhancing ones, are necessary for the long-term stability of emulsions. Four milk-based emulsions were prepared from powdered milk combined with several types of emulsifiers. The long-term stability of emulsions, which was detected by the occurrence of a creaming layer after 3 months of storage, differed according to the composition of emulsifiers. To understand the reason for the differences in the stability of emulsions, particle size, distribution, potential, and the amount of proteins and phospholipids present in the cream layer (separated oil droplets) in the emulsions were measured. Only the amount of proteins adsorbed onto oil droplets was found to be closely related to the difference in emulsion stability, that is, the more proteins adsorbed, the higher the emulsion stability. SDS-PAGE analyses revealed that κ-casein and β-lactoglobulin play an important role in emulsion stability by adsorbing onto the oil droplet surface [Kentaro Matsumiya\*, Wataru Takahashi, Takashi Inoue and Yasuki Matsumura (Laboratory of Quality Analysis and Assessment, Division of Agronomy and Horticultural Science, Graduate School of Agriculture, Kyoto University, Gokasho, Uji, Kyoto 611-0011, Japan), *Journal of Food Engineering*, 2010, **96**(2), 185-191).

**NPARR 1(3), 2010-0420, Ultra-high-temperature processing of chocolate flavoured milk**

Chocolate milk with different carrageenans ( $\kappa$  and  $\lambda$ ) and sugar concentrations was heat treated indirectly at 145°C for 6s using a bench-top UHT plant. The temperature of the milk in the preheating and sterilizer sections, and the milk flow rate were determined to evaluate the overall heat transfer coefficient (OHTC) for monitoring fouling during UHT processing. Kappa-carrageenan was more effective than lambda-carrageenan in providing stability against fouling during UHT processing. By optimizing concentrations of  $\kappa$ -carrageenan and sugar, fouling could be minimized during UHT processing. The apparent viscosity and sedimentation of UHT-processed chocolate milk increased with increasing concentration of carrageenan and sugar [Sangeeta Prakash\*, Thom Huppertz, Olena Karvchuk and Hilton Deeth (School of Land, Crop and Food Sciences, University of Queensland, Brisbane 4072, Australia), *Journal of Food Engineering*, 2010, **96**(2), 179-184].

**NPARR 1(3), 2010-0421, Amaranth, quinoa and oat doughs: Mechanical and rheological behaviour, polymeric protein size distribution and extractability**

The rheological characteristics, static and dynamic mechanical properties of amaranth, quinoa and oat doughs and the relative size distribution of their polymeric proteins were evaluated. For the sake of comparison, semolina dough rheological and mechanical properties and the relative size distribution of proteins were also determined. From rheological results it was inferred that the tenacity of amaranth, oat and quinoa dough samples was lower than that of semolina dough. The elastic modulus ( $E_c$ ) of amaranth, oat and quinoa doughs was higher than that of semolina dough. Amaranth and quinoa  $G_2$  was found to be similar and significantly higher ( $p < 0.05$ ) with respect to that of oat dough at a moisture of 30%. The  $G_3$  of amaranth, quinoa and oat doughs showed different values. The highest  $G_3$  value was recorded for the amaranth dough while the lowest one was shown by oat. For semolina dough, the  $G_2$  and  $G_3$  values were significantly lower than those of all the other dough samples. Moreover, at

low and medium frequencies,  $\tan \Delta$  values of oat and quinoa doughs were statistically comparable and significantly lower ( $p < 0.05$ ) than that of amaranth and semolina doughs. At high frequencies,  $\tan \Delta$  values of investigated samples were different among them and the highest value was detected for amaranth, followed by semolina, quinoa and oat. Results of the size distribution of proteins in amaranth, quinoa, oat and semolina doughs were expressed as the proportion of unextractable polymeric protein (UPP). Unextractability of semolina dough proteins (61%) was greater with respect to the others, followed by amaranth (40.7%), oat (24%) and quinoa (10.1%) [C. Lamacchia\*, S. Chillo, S. Lamparelli, N. Suriano, E. La Notte and M.A. Del Nobile (Istituto per la Ricerca e le Applicazioni Biotecnologiche per la Sicurezza e la Valorizzazione dei Prodotti Tipici e di Qualità, Università degli Studi di Foggia, Via Napoli, 25-71100 Foggia, Italy), *Journal of Food Engineering*, 2010, **96**(1), 97-106].

**NPARR 1(3), 2010-0422, Effect of Lactobacillus-fermented adlay-based milk on lipid metabolism of hamsters fed cholesterol-enriched diet**

The aim of this study was to investigate the effect of adlay milk and adlay-soymilk fermented with *Lactobacillus plantarum* or *Lactobacillus paracasei* on lipid metabolism in hamsters fed with a cholesterol-enriched diet. Adlay milk and fermented adlay milk with or without soymilk administered to hamsters significantly decreased ( $p < 0.05$ ) serum cholesterol levels and ratio of low-density lipoprotein cholesterol to high-density lipoprotein cholesterol, when compared to a high-cholesterol diet group; there was also a significant ( $p < 0.05$ ) increase in the level of fecal cholesterol and triglycerides. The group administered adlay milk fermented with *L. plantarum* or *L. paracasei* presented increased superoxide dismutase and total antioxidant status activity in the blood, thus relieving the levels of thinobarbituric acid reactive substances as compared to other treatment groups. Adlay milk and *Lactobacillus*-fermented adlay milk with or without a soymilk supplement, could be used as a potential cholesterol-lowering ingredient; it could also relieve hyperlipidemia-induced oxidative stress to improve hypercholesterolemia [Chung-Yi Wang\*, She-Ching Wu, Chang-Chai Ng and Yuan-Tay

Shyu (Department of Horticulture, National Taiwan University, Taipei, Taiwan), *Food Research International*, 2010, **43**(3), 819-824].

## FRUITS

### **NPARR 1(3), 2010-0423, Firmness characteristics of mango hybrids under ambient storage**

A study was conducted to determine firmness of eight mango hybrids obtained from the crosses between Amrapali and Sensation and correlate it with TSS and peel thickness. The firmness was determined at top, middle and bottom positions of the fruit using *TA+Di* Texture Analyzer. The peel firmness at middle position of the hybrids varied from about 20 to 33N on harvest day, which decreased to 5-12N with increase in storage period. On 7th day of storage, the peel firmness became almost equal from top to bottom positions indicating the even ripening of fruit. Pulp firmness was found to vary from about 5 to 20N of freshly harvested fruit, which reduced to 0.3-3.5N during storage. Peel firmness of 5N and pulp firmness of 0.3N was found as threshold points below which the fruit may not be acceptable for consumption [S.K. Jha\*, S. Sethi, M. Srivastav, A.K. Dubey, R.R. Sharma, D.V.K. Samuel and A.K. Singh (Division of Post Harvest Technology, IARI, New Delhi 110012, India), *Journal of Food Engineering*, 2010, **97**(2), 208-212].

### **NPARR 1(3), 2010-0424, The effect of impact and fruit properties on the bruising of peach**

Peach fruit quality is adversely affected by bruise damage. In order to reduce this damage, it is necessary to know the influence of fruit properties on bruise susceptibility. Two bruise prediction models were constructed for the damage susceptibility of peach fruit (measured by bruise volume) using multiple linear regression analyses. In the first model, peak contact force and three fruit properties (acoustic stiffness, fruit temperature and radius of curvature) were used as independent variables. In the second model, peak contact force was replaced by the impact energy. Peaches were subjected to dynamic loading by means of a pendulum at three levels of impact. Significant effects of acoustic stiffness, temperature and the radius of curvature and

some interactions on bruising were obtained at 5% probability level with the coefficient of determination of 0.97 and 0.98 for models 1 and 2, respectively. It was concluded that lowering the temperature and increasing the radius of curvature and acoustic stiffness will reduce the bruise damage of the peach fruit [Ebrahim Ahmadi\*, Hamid Reza Ghassemzadeh, Morteza Sadeghi, Mohammad Moghaddam and Saeed Zarif Neshat (Department of Agricultural Machinery Engineering, Faculty of Agriculture, Bu-Ali Sina University, Hamedan, Iran), *Journal of Food Engineering*, 2010, **97**(1), 110-117].

### **NPARR 1(3), 2010-0425, Processing and quality characteristics of apple slices processed under simultaneous infrared dry-blanching and dehydration with intermittent heating**

This study investigated the effects of three processing parameters, e.g. product surface temperature, slice thickness and processing time, on blanching and dehydration characteristics of apple slices exposed to simultaneous infrared dry-blanching and dehydration (SIRDBD) with intermittent heating. A three-factor factorial experiment design was conducted to determine the influence of processing parameters on product temperature, moisture reduction, drying rate, residual polyphenol oxidase (PPO) and peroxidase (POD) activities and surface color change. Slice thickness had a significant effect on product quality and processing characteristics, as faster inactivation of enzymes and quicker moisture reduction took place in thinner slices. A Page model performed well for describing drying behavior during the treatment, and first-order kinetics and a biphasic model fit well for PPO and POD inactivation, respectively. Surface color changes ( $\Delta E$ ) of apple slices during prolonged heating resulted from non-enzymatic browning with an increase in *b* value was observed. In order to achieve a 1 log reduction in POD activity, the process resulted in a reduction in moisture from 20% to 59% and in  $\Delta E$  from 2.27 to 5.59. It is suggested that SIRDBD with intermittent heating could be used as an alternative to manufacture high quality blanched and partially dehydrated fruits and vegetables [Yi Zhu, Zhongli Pan\*, Tara H. McHugh and Diane M. Barrett (Processed Foods Research Unit, USDA-ARS-

WRRC, 800 Buchanan St., Albany, CA 94710, USA), *Journal of Food Engineering*, 2010, **97**(1), 8-16].

**NPARR 1(3), 2010-0426, Changes in respiration rate and physical properties of strawberries due to osmotic dehydration and storage**

The effect of osmotic dehydration on the respiration rate ( $R$ ) and the mechanical and optical properties of strawberry halves were evaluated throughout six days at 10°C. Two different dehydration levels (15 and 20°Brix) were considered, by applying (PVOD) or not (OD) a vacuum pulse and with and without calcium addition. Dehydrated samples showed a faster drop in  $R$  than non-treated samples, thus indicating a faster development of senescence. PVOD implied a greater reduction of  $O_2$  consumption. Calcium addition slightly reduced  $R$ . Osmotic treatments provoked a decrease in the puncture forces, especially in samples with 20°Brix, as a consequence of the structural collapse caused by treatments. After storage, calcium addition and PVOD treatments had beneficial effects on the maintenance of the sample texture. Colour of treated strawberries was modified, mainly in the parenchyma zone, when changes in the sample porosity were greater due to the treatment (vacuum impregnation) [M.L. Castelló, P.J. Fito and A. Chiralt\*(Universidad Politécnica de Valencia, Institute of Food Engineering for Development and Food Technology Department, Valencia, Spain), *Journal of Food Engineering*, 2010, **97**(1), 64-71].

**NPARR 1(3), 2010-0427, New edible coatings composed of galactomannans and collagen blends to improve the postharvest quality of fruits – Influence on fruits gas transfer rate**

The objective of this work was to produce new edible coatings, based on a mixture of galactomannans from novel sources (seeds of *Adenantha pavonina* and *Caesalpinia pulcherrima*), collagen and glycerol, and to determine their influence in gas transfer rates when they are applied on mangoes and apples. The first part of the work consisted in obtaining coating solutions with the convenient values of wettability for each fruit; such coating solutions were then characterized in terms of

their permeability (to  $CO_2$ ,  $O_2$  and water vapour), mechanical properties, colour and opacity. Gas transfer rates from mangoes coated with a solution of *A. pavonina* galactomannan (0.5%), collagen (1.5%) and glycerol (1.5%) were compared with those of mangoes without coating: 28% less  $O_2$  consumption and 11% less  $CO_2$  production were observed in coated mangoes. The same procedure was performed in apples (in this case using *C. pulcherrima* galactomannan (0.5%), collagen (1.5%) and no glycerol); the  $CO_2$  production and the  $O_2$  consumption was approximately 50% lower in apples with coating than in apples without coating. The results suggest that these coatings can reduce gas transfer rates in these fruits, and can be therefore important tools to extend their shelf life [Álvaro M. Lima, Miguel A. Cerqueira, Bartolomeu W.S. Souza, Ed Carlos M. Santos, José A. Teixeira, Renato A. Moreira and António A. Vicente\*(Departamento de Bioquímica e Biologia Molecular, Federal University of Ceará, Campus do Pici, CEP 60451-970 Fortaleza, CE, Brazil), *Journal of Food Engineering*, 2010, **97**(1), 101-109].

**NPARR 1(3), 2010-0428, Antioxidant activities and contents of polyphenol oxidase substrates from pericarp tissues of litchi fruit**

The experiments were performed to extract and purify substrates for polyphenol oxidase (PPO) from pericarp tissue of postharvest litchi fruit. Two purified PPO substrates were identified as (-)-epicatechin and procyanidin A2. The antioxidant properties of two PPO substrates were further evaluated in the present study. Variation in the content of the major substrate (-)-epicatechin of litchi fruit during storage at 25°C was analysed using the HPLC-UV method. The results showed that (-)-epicatechin exhibited stronger antioxidant capability than procyanidin A2, in terms of reducing power and scavenging activities of DPPH radical, hydroxyl radical and superoxide radical. Furthermore, (-)-epicatechin content in pericarp tissue tended to decrease with increasing skin browning index of litchi fruit during storage at 25°C. Thus, these two compounds can be used as potential antioxidants in litchi waste and the fresh pericarp tissue of litchi fruit exhibited a better utilisation value [Jian Sun, Yueming Jiang\*, John Shi,

Xiaoyi Wei, Sophia Jun Xue, Jinyu Shi and Chun Yi (South China Botanical Garden, The Chinese Academy of Sciences, 510650 Guangzhou, China), *Food Chemistry*, 2010, **119**(2), 753-757].

**NPARR 1(3), 2010-0429, Evaluation of antioxidant and anti-initiating activities of crude polyphenolic extracts from seedless and seeded Indian grapes**

The extracts of crude polyphenols (seeds, pulp+skin, whole) from four different cultivars of Indian grapes were used in this study. The total polyphenolic contents of grape polyphenolic extracts (GPEs) were determined and their *in vitro* antioxidant and anti-initiating activities evaluated. The total polyphenolic contents, expressed in terms of gallic acid/catechin/procyanidin B3 equivalents, were found to vary significantly. Antioxidant activity of GPEs, particularly the seedless variety, was evident from significant dose-dependent inhibition of lipid peroxidation and DPPH activity. GPEs and catechin inhibited the microsomal activity of cytochrome P450 isozymes (1A1, 1A2, 2B1) in a dose-dependent manner, by the decreased formation of resorufin. The inhibitory activity of GPEs on nitrite-mediated *N*-nitrosation of dimethylamine and *N*-methylaniline appears to correlate significantly with the total polyphenolic contents. Furthermore, six individual polyphenols present in GPEs were quantitated by HPLC, wherein procyanidin B3 was a major constituent [Asha G. Ramchandani\* Raghunathan S. Chettiyar and Shrirang S. Pakhale (Maru Lab, Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Tata Memorial Centre, Kharghar, Navi Mumbai 410 210, India), *Food Chemistry*, **119**(1), 298-305 ].

**NPARR 1(3), 2010-0430, Effect of frequency of copper applications on control of citrus canker and the yield of young bearing sweet orange trees**

The efficacy of different copper spray intervals for control of citrus canker caused by *Xanthomonas citri* subsp. *citri* (Xcc) was investigated in 3-to-4-year-old commercial citrus groves of 'Pera' sweet orange in a citrus canker endemic area in southern Brazil. Three independent trials were conducted in 2004/2005, 2005/2006 and 2006/2007. The first trial was located in

Ourizona, PR and the two following were established in Paranavaí, PR, in different locations. Trees were treated with copper oxychloride (1.8g/l) at intervals of 7, 14, 21, or 28 days. Control trees were sprayed with water every 28 days. Control of canker was evaluated as incidence of canker on leaves and fruit and as the amount of dropped and harvested fruit. Regardless of the spray interval, copper significantly decreased the incidence of citrus canker on leaves and harvested fruits, and reduced the number of prematurely dropped fruits and increased yield. Disease incidence on leaves of untreated trees in each season peaked at 37, 51, and 43% of infected leaves, whereas the incidence of canker on foliage of copper-treated trees was no higher than 12, 16, and 11%, respectively. For the second and third year trials, when disease incidence was comparatively higher, the shorter the spray interval, the lower the disease incidence and number of dropped fruit and the higher the yield per tree. Citrus canker incidence on the leaves was inversely related in a linear fashion to the total number of copper sprays in each trial. Coefficients of determination ( $R^2$ ) between disease incidence and number of sprays were 0.70, 0.92 and 0.80 in the respective seasons. The financial return due to increases in yield from copper sprays was significantly related to the number of sprays and disease levels only in the third trial. Although copper sprays at a 28-day-interval was satisfactory for reduction of citrus canker incidence on leaves and fruits, a shorter spray interval was required to significantly reduce yield loss [F. Behlau, J. Belasque Jr.\*, J.H. Graham and R.P. Leite Jr. (Fundecitrus, CP 391, 14901-870 Araraquara, Brazil), *Crop Protection*, 2010, **29**(3), 300-305].

**NPARR 1(3), 2010-0431, Influence of fumigation with high concentrations of ozone gas on postharvest gray mold and fungicide residues on table grapes**

To control postharvest decay, table grapes are commercially fumigated with sulfur dioxide. Ozone ( $O_3$ ) fumigation with up to 10,000 $\mu\text{LL}^{-1}$  of ozone for up to 2h to control postharvest gray mold of table grapes caused by *Botrytis cinerea* was evaluated. Fumigation for 1h with 2500 or 5000 $\mu\text{LL}^{-1}$  of ozone were equal in effectiveness. Both treatments reduced postharvest gray

mold among inoculated 'Thompson Seedless' grapes by approximately 50% when the grapes were examined after storage for 7d at 15°C following fumigation. In a similar experiment, 'Redglobe' grapes were stored for 28 d at 0.5°C following fumigation for 1h with 2500 or 5000 $\mu\text{LL}^{-1}$  of ozone. Both treatments were equal in effectiveness, but inferior to fumigation with 10,000 $\mu\text{LL}^{-1}$ . Ozone was effective when grapes were inoculated and incubated at 15°C up to 24h before fumigation. The cluster rachis sustained minor injuries in some tests, but berries were never harmed. Ozone was applied in three combinations of time and ozone concentration (10,000 $\mu\text{LL}^{-1}$  for 30min, 5000 $\mu\text{LL}^{-1}$  for 1h, and 2500 $\mu\text{LL}^{-1}$  for 2h) where each had a constant concentration  $\times$  time product ( $c \times t$ ) of 5000 $\mu\text{LL}^{-1} \times \text{h}$ . The effectiveness of each combination was similar. The incidence of gray mold was reduced by approximately 50% among naturally inoculated, organically grown 'Autumn Seedless' and 'Black Seedless' table grapes, and by 65% among 'Redglobe' table grapes, when they were fumigated with 5000 $\mu\text{LL}^{-1}$  ozone for 60min in a commercial ozone chamber and stored for 6 weeks at 0.5°C. Residues of fenhexamid, cyprodinil, pyrimethanil, and pyraclostrobin were reduced by 68.5, 75.4, 83.7, and 100.0%, respectively, after a single fumigation of table grapes with 10,000 $\mu\text{LL}^{-1}$  ozone for 1h. Residues of iprodione and boscalid were not significantly reduced. Ozone is unlikely to replace sulfur dioxide treatments in conventional grape production unless its efficacy is improved, but it could be an acceptable technology to use with grapes marketed under "organic" classification, where the use of  $\text{SO}_2$  is prohibited, or if  $\text{SO}_2$  use were to be discontinued [Franka Mlikota Gabler\*, Joseph L. Smilanick, Monir F. Mansour and Hakan Karaca (Institute for Adriatic Crops, Put Duilova 11, 21000 Split, Croatia), *Postharvest Biology and Technology*, 2010, **55**(2), 85-90].

*NPARR* 1(3), 2010-0432, **Impact device for measuring the flesh firmness of kiwifruits**

The device used in the present study consists of a conveyer belt that throws the fruit onto a flat horizontal plate connected to a load cell. The vertical distance between plate and conveyer belt (drop height) as well as the speed of the belt can be continuously

adjusted. Tests were carried out by selecting three different values of drop height and speed. The Magness-Taylor (MTf) index was used as reference, destructive parameter, to describe the flesh firmness and to set-up predictive models. The digitalized time history of the force was analysed to extract some mechanical indices (peak force, impact duration and impulse) used to predict MTf by simple or multiple regression analyses. Moreover, each point of the entire time history was processed by artificial neural network (ANN) software to predict MTf. The goodness of fit, expressed as  $R^2$ , was up to 0.823 with the regression models. On the whole, the peak force was the best predictor. The ANNs did not involve a substantial increase in goodness of fit with respect to the best regression models: +8.3%, as mean, 37% as maximum. The speed or position at which the fruit impacts the plate can represent an important parameter influencing the MTf prediction. Free dropping of the fruit instead of throwing onto the plate by the conveyer did not provide a better prediction. The impact device did not cause mechanical damage to the kiwifruits [Luigi Ragni, Annachiara Berardinelli\* and Adriano Guarnieri (Agricultural Economics and Engineering Department, University of Bologna, Food Science Campus, Piazza G. Goidanich, 60, 47023 Cesena (FC), Italy), *Journal of Food Engineering*, 2010, **96**(4), 591-597].

*NPARR* 1(3), 2010-0433, **Mass transfer kinetics of pulsed vacuum osmotic dehydration of guavas**

The effects of vacuum pulse and solution concentration on mass transfer of osmotically dehydrated guava slices were studied. Kinetics of weight reduction (WR), water loss (WL), solid gain (SG) and water activity were obtained using sucrose solutions at 40, 50 and 60°Brix and vacuum pulse of 100mbar for 0, 10 and 15min at the process beginning. Higher solution concentrations and the vacuum pulse application caused an increase on WL of osmotically dehydrated guavas and reduced the samples water activity. The SG was reduced by the increase on osmotic solution concentration and favored by vacuum application. Two different models of kinetics diffusion were tested to obtain diffusivity and to compare the accuracy of these models. The effective diffusivity estimated by

the hydrodynamic model well reproduced the effects of process variables on mass transfer kinetics and showed a better agreement to the experimental data than the diffusional model [Jefferson L.G. Corrêa\*, Leila M. Pereira, Gláucia S. Vieira and Míriam D. Hubinger (Department of Food Science, Federal University of Lavras, Lavras– MG, Brazil), *Journal of Food Engineering*, 2010, **96**(4), 498-504].

**NPARR 1(3), 2010-0434, Effect of temperature and pretreatment on water diffusion during rehydration of dehydrated mangoes**

The kinetics associated with rehydrating dehydrated mangoes was studied at three temperatures: 25, 40, and 60°C. Besides, we studied how rehydration was affected by pretreating the fruit with osmodehydration in either sucrose or glucose before it was thermally dehydrated. We show that rehydration can be interpreted by Fickian diffusion and that the effective water diffusion coefficient is larger at 40°C than at either 25 or 60°C. Consequently, during rehydration of untreated samples at 40°C, the weight gain, water gain and loss of solids attain optimal values. It was found that the rehydration kinetics of mango was not affected by osmodehydration pretreatments in sucrose. However, pretreatment in glucose significantly improved rehydration; for example, the effective diffusion coefficients of the glucose-treated samples were about twice as large as those of the untreated samples [S. Maldonado\*, E. Arnau and M.A. Bertuzzi (Laboratorio IDeAR, Centro de Investigación en Tecnología de Alimentos (CITA), Facultad de Ingeniería, Universidad Nacional de Jujuy, Av. Italia y Martiarena, 4600 S.S. de Jujuy, Jujuy, Argentina), *Journal of Food Engineering*, 2010, **96**(3), 333-341].

**NPARR 1(3), 2010-0435, Diffusivity, shrinkage and simulated drying of litchi fruit (*Litchi chinensis* Sonn.)**

Litchi (*Litchi chinensis* Sonn.) is an important commercial fruit in Thailand and Vietnam, consumed both as fresh and dried products. Also most of the export of litchi is in the form of dried whole litchi fruit. Thermo-physical properties and drying model of litchi fruit is important for optimum design of litchi dryer. This

paper presents moisture diffusivity, shrinkage and finite element simulated drying of litchi fruit. The moisture diffusivities of litchi were determined by minimizing the sum of square of deviations between the predicted and experimental values of moisture content of thin layer drying under controlled conditions of air temperature and relative humidity. The components in the form of cylinder for seed and seed stalk and slab for seed coat, shell and flesh were dried in thin layers at the air temperatures of 50, 60, 70 and 80°C and relative humidity in the range of 10-25%. The mean diffusivity of flesh, seed and shell of litchi fruit increased with temperature and was expressed by the Arrhenius-type equation, but the diffusivities of seed coat and seed stalk were independent of temperature. The moisture diffusivities of seed coat and seed stalk were much lower than those of the other parts of the litchi. The shrinkage of litchi fruit has also been determined experimentally and it was expressed as a function of moisture reduction. A two-dimensional finite element model has been developed to simulate moisture diffusion in litchi fruit during drying. Shrinkage of the flesh and different component diffusivities of litchi during drying were also taken into account. The finite element model was programmed in Compaq Visual FORTRAN version 6.5. This finite element model satisfactorily predicts the moisture diffusion during drying. Moisture contents in the different components in the litchi fruit during drying were also simulated. This study provides an understanding of the transport processes in the different components of the litchi fruit [S. Janjai\*, B. Mahayothee, N. Lamlert, B.K. Bala, M. Precoppe, M. Nagle and J. Müller (Solar Energy Research Laboratory, Department of Physics, Faculty of Science, Silpakorn University, Nakhon Pathom 73000, Thailand), *Journal of Food Engineering*, 2010, **96**(2), J214-221].

**NPARR 1(3), 2010-0436, The optimisation of solid-liquid extraction of antioxidants from apple pomace by response surface methodology**

Response surface methodology using two food grade solvents, acetone and ethanol, was used to optimise antioxidant extraction from industrially generated apple pomace. Efficiency of extraction was optimised by measuring antioxidant activity, phenol con-

tent and three individual polyphenol groups. Conditions for optimal antioxidant activity as measured by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay were 56% ethanol, 80°C and 31 min. Using these conditions an antioxidant value of 444 mg Trolox/100g DW was obtained. For acetone extraction the optimal conditions were 65% acetone, 25°C and 60min, resulting in an antioxidant value of 436mg Trolox/100g DW. Both ethanol and acetone would be suitable to replace methanol for a food grade and more environmental friendly solid-liquid extraction of antioxidants [Hilde Henny Wijngaard\* and Nigel Brunton (Teagasc Ashtown Food Research Centre, Ashtown, Dublin 15, Ireland), *Journal of Food Engineering*, 2010, **96**(1), 134-140].

**NPARR 1(3), 2010-0437, Strengthening the texture of dried guava slice by infiltration of phenolic compounds**

Phenol-pectin interaction was highlighted in plant texture maintenance during thermal processing. However, neither application nor significantly involved phenolic compounds other than ferulic acid have been reported. The aim of this study is to evaluate the contribution of this crosslink in strengthening the texture of guava slices with six phenolic compounds during processing. Results showed that samples treated with phenolics bearing a carboxyl group exhibited significantly higher hardness than control samples. Further pectin fractionation analysis and binding capacity tests in an artificial model system proved the existence of a higher ratio of hard pectin and greater binding capacity in phenolic treated samples. Sephadex G-75 purification and observation through fluorescence microscope and SEM confirmed the existence of phenol-pectin complex. Contribution of binding capacity to strengthen hardness was found highest in gallic acid treated samples, followed by those treated with ferulic acid, caffeic acid, coumaric acid, cinnamic acid or catechin. FRAP reducing power and DPPH scavenging ability showed the similar tendency. These results indicated that phenolic infiltration might improve the texture and antioxidant capacity of processed guava slices through phenol-pectin interaction [Pi-Jen Tsai\*, Ying-Fang Sun and Shu-Mien Hsiao (Department of Food Science, National Pingtung

University of Science and Technology, 1, Hsueh Fu Road, Nei-Pu Hsiang, 91207 Pingtung, Taiwan, ROC), *Food Research International*, 2010, **43**(3), 825-830].

**NPARR 1(3), 2010-0438, Yeast leavened banana-bread: Formulation, processing, colour and texture analysis**

Banana powder (BP) was added to hard-red spring wheat (HRSW) flour intended for yeast-leavened bread formulation. Five different formulations containing 10, 15, 20, 25 and 30% BP were prepared with varying amounts of base flour, while vital gluten was maintained at 25% in all blends. Based on the added BP amounts only, the prepared bread could deliver 42.87-128.6mg potassium/30g of bread (one regular slice) and 0.33-1.00g of fibre. Although the dough water absorption was increased, due to BP addition, the dough mixing tolerance (MTI) decreased. The bread loaf volume was significantly higher than the control except for the 30% blend, where the loaf volume was similar to the control. Bread staling increased with BP levels due to the high sugar content but, this effect was limited to the first two days of storage. Blends exhibited darker colour due to the high sugar and protein, while the 25 and 30% blends had the lowest percent of freezable water. The amounts of acetic acid extractable proteins from the dry blends and the dough decreased with increase in BP. The linear rheological properties of the control, 10 and 30% blends exhibited similar viscoelastic solid behaviour, where both  $G'$  and  $G''$  had plateaus ( $G' > G''$ ) and they were parallel to each other over three decades of the frequency. Blends showed higher moduli values than the control [Abdellatif Mohamed\*, Jingyuan Xu and Mukti Singh (Cereal Products and Food Science Unit, NCAUR, Agriculture Research Service, USDA, 1815 N. University St., Peoria IL 61604, USA), *Food Chemistry*, 2010, **118**(3), 620-626].

**NPARR 1(3), 2010-0439, Effect of methyl jasmonate on cell wall modification of loquat fruit in relation to chilling injury after harvest**

Loquat fruit were pretreated with 10 $\mu$ M methyl jasmonate (MeJA) for 24h at 20°C, and then stored at 1°C for 35days to investigate the effect of MeJA

treatment on cell wall modification in relation to chilling injury. Loquat fruit developed chilling injury, manifested as increased fruit firmness and internal browning, decreased extractable juice during storage. These chilling injury symptoms were significantly reduced by MeJA treatment. MeJA also markedly delayed the increases in lignin, alcohol insoluble residues, hemicellulose and cellulose. Meanwhile, the MeJA-treated fruit exhibited significantly lower activities of phenylalanine ammonia lyase, peroxidase, polyphenol oxidase and higher polygalacturonase activity than the control during storage. The levels of water- and CDTA-soluble pectins in MeJA-treated fruit were also significantly higher than that in the control. These results suggest that the reduction in chilling injury by MeJA may be due to inhibited lignin accumulation and enhanced cell wall polysaccharides solubilisation [Shifeng Cao, Yonghua Zheng\*, Kaituo Wang, Huaijin Rui and Shuangshuang Tang (College of Food Science and Technology, Nanjing Agricultural University, Weigang 1, Nanjing 210095, PR China), *Food Chemistry*, 2010, **118**(3),641-647].

### **FUEL (incl. Biogas, Biodiesel, Biomass energy, Ethanol, etc.)**

#### **NPARR 1(3), 2010-0440, The effect of biodiesel and bioethanol blended diesel fuel on nanoparticles and exhaust emissions from CRDI diesel engine**

Biofuel (biodiesel, bioethanol) is considered one of the most promising alternative fuels to petrol fuels. The objective of the work is to study the characteristics of the particle size distribution, the reaction characteristics of nanoparticles on the catalyst, and the exhaust emission characteristics when a common rail direct injection (CRDI) diesel engine is run on biofuel-blended diesel fuels. In this study, the engine performance, emission characteristics, and particle size distribution of a CRDI diesel engine that was equipped with warm-up catalytic converters (WCC) or a catalyzed particulate filter (CPF) were examined in an ECE (Economic Commission Europe) R49 test and a European stationary cycle (ESC) test. The engine performance under a biofuel-blended diesel fuel was similar to that under D100 fuel, and the high fuel consumption was due to the lowered calorific value that

ensued from mixing with biofuels. The use of a biodiesel–diesel blend fuel reduced the total hydrocarbon (THC) and carbon monoxide (CO) emissions but increased nitrogen oxide (NO<sub>x</sub>) emissions due to the increased oxygen content in the fuel. The smoke emission was reduced by 50% with the use of the bioethanol–diesel blend. Emission conversion efficiencies in the WCC and CPF under biofuel-blended diesel fuels were similar to those under D100 fuel. The use of biofuel-blended diesel fuel reduced the total number of particles emitted from the engine; however, the use of biodiesel–diesel blends resulted in more emissions of particles that were smaller than 50 nm, when compared with the use of D100. The use of a mixed fuel of biodiesel and bioethanol (BD15E5) was much more effective for the reduction of the particle number and particle mass, when compared to the use of BD20 fuel [Hwanam Kim and Byungchul Choi\*(Automobile Research Center, Chonnam National University, Gwangju 500-757, Republic of Korea), *Renewable Energy*, 2010, **35**(1), 157-163].

#### **NPARR 1(3), 2010-0441, Syngas from sugarcane pyrolysis: An experimental study for fuel cell applications**

The use of biomass for the production of electrical energy is a promising technological solution for those countries where there are problems with the disposal of agricultural waste and/or the production of low-cost energy. The gasification and/or pyrolysis of the biomass produce a gas rich in hydrogen that can be used in a fuel cell system to produce electrical energy with reduced environmental impact and significant energy recovery.

In this work, a study of the pyrolysis of Brazilian sugarcane bagasse was carried out. The experimental process consisted of the pyrolysis of the biomass material in a batch pyrolysis reactor. In some runs the biomass was dry, while in others it was pre-treated by the addition of water. It was noted that the water added to the biomass before the pyrolysis process resulted in a decrease in the quantity of steam added to the fuel cell feeding gas, necessary to avoid carbon deposition, and in an increase in cell power, but, at the same time, caused a decrease in the quantity of syngas produced.

Then, the composition of the gas obtained from the experimental pyrolysis of the sugarcane was inserted in a simulation tool of a molten carbonate fuel cell system in order to estimate the feasibility of the entire process in terms of operating conditions and electrical performance. The present study indicates that the syngas obtained from the sugarcane biomass (about 40%) can be converted into electricity using a fuel cell system with a high efficiency [Saleh Al Arni\*, Barbara Bosio and Elisabetta Arato (Department of Chemical and Process Engineering, University of Genoa, Via Opera Pia 15, 16145 Genoa, GE, Italy), *Renewable Energy*, 2010, **35**(1), 29-35].

**NPARR 1(3), 2010-0442, Features of sweet sorghum juice and their performance in ethanol fermentation**

As demand for and production of fuel ethanol increase to unprecedented levels, feedstocks for ethanol production will become more diverse. Sweet sorghum is an ideal feedstock for fuel ethanol production in the Southeast and Midwest. Sweet sorghum juices usually contain approximately 16-18% fermentable sugar, which can be directly fermented into ethanol by yeast. Technical challenges of using sweet sorghum for biofuels are a short harvest period for highest sugar content and fast sugar degradation during storage. This study showed that as much as 20% of the fermentable sugars can be lost in 3 days at room temperature because of activities of contaminating bacteria, which lead to significant increases in bacterial count and decreases in pH values. No significant changes in pH value, sugar contents, and sugar profiles were observed in juices stored in a refrigerator. Fermentation efficiencies of fresh juice, autoclaved juice, and concentrated juice with 20% sugar were higher than 93% in the laboratory shake flask batch process. Fermentation of concentrated juices with 25% and 30% sugars were not complete. Significant amount of fermentable sugars remained in the finished beers of these concentrated juices. Glycerol contents in finished beers from concentrated juices were higher than in beers from normal juices. These results help to identify the most important factors affecting the quality of sweet sorghum juice under different processing and storage conditions, enabling development of

effective strategies to process the juice, preserve fermentable sugars, and retain the processing properties of the juice during processing, transportation, and storage [Xiaorong Wu, Scott Staggenborg, Johathan L. Propheter, William L. Rooney, Jianming Yu and Donghai Wang\*(Department of Biological & Agricultural Engineering, Kansas State University, Manhattan, KS 66506, United States), *Industrial Crops and Products*, 2010, **31**(1), 164-170].

**NPARR 1(3), 2010-0443, Propagation techniques, evaluation and improvement of the biodiesel plant, *Pongamia pinnata* (L.) Pierre—A review**

The leguminous tree *Pongamia pinnata* (Linn.) Pierre has been receiving considerable attention since its role as a feed stock for biodiesel production was defined and confirmed. Policy makers, scientists as well as farmers have turned their attention to this species with great gusto since the benefits to be derived affect all the stakeholders. Tremendous interest has been generated for raising organized plantations of this untapped species. This has created the need for technology for its propagation and management. Though studies have been conducted on many aspects, the information is scattered. With this in view, the literature on important aspects of propagation, evaluation of genetic resources and improvement has been reviewed to glean the available information which can form the guidelines for raising of plantations to meet the current need. This review also aims to assist in the identification of gaps in information while preventing duplication of research efforts and unnecessary outflow of valuable resources [N. Mukta\* and Y. Sreevalli (Directorate of Oilseeds Research, Hyderabad 500 030, India), *Industrial Crops and Products*, 2010, **31**(1), 1-12].

**NPARR 1(3), 2010-0444, Chemical and thermal properties of fractionated bagasse soda lignin**

A major challenge of the 21st century will be to generate transportation fuels using feedstocks such as lignocellulosic waste materials as a substitute for existing fossil and nuclear fuels. The advantages of lignocellulosics as a feedstock material are that they are abundant, sustainable and carbon-neutral. To improve the economics of producing liquid transportation fuels

from lignocellulosic biomass, the development of value-added products from lignin, a major component of lignocellulosics, is necessary. Lignins produced from black liquor through the fractionation of sugarcane bagasse with soda and organic solvents have been characterised by physical, chemical and thermal means. The soda lignin fractions have different physico-chemical and thermal properties from one another. Some of these properties have been compared to bagasse lignin extracted with aqueous ethanol [P. Mousavioun and W.O.S. Doherty\* (Centre for Tropical Crops and Biocommodities, Queensland University of Technology, GPO Box 2343, Brisbane, Australia), *Industrial Crops and Products*, 2010, **31**(1), 52-58].

**NPARR 1(3), 2010-0445, Plant oils as fuels for compression ignition engines: A technical review and life-cycle analysis**

As an alternative fuel for compression ignition engines, plant oils are in principle renewable and carbon-neutral. However, their use raises technical, economic and environmental issues. A comprehensive and up-to-date technical review of using both edible and non-edible plant oils (either pure or as blends with fossil diesel) in CI engines, based on comparisons with standard diesel fuel, has been carried out. The properties of several plant oils, and the results of engine tests using them, are reviewed based on the literature. Findings regarding engine performance, exhaust emissions and engine durability are collated. The causes of technical problems arising from the use of various oils are discussed, as are the modifications to oil and engine employed to alleviate these problems. The review shows that a number of plant oils can be used satisfactorily in CI engines, without transesterification, by preheating the oil and/or modifying the engine parameters and the maintenance schedule. As regards life-cycle energy and greenhouse gas emission analyses, these reveal considerable advantages of raw plant oils over fossil diesel and biodiesel. Typical results show that the life-cycle output-to-input energy ratio of raw plant oil is around 6 times higher than fossil diesel. Depending on either primary energy or fossil energy requirements, the life-cycle energy ratio of raw plant oil is in the range of 2–6 times higher than corresponding biodiesel. Moreover, raw plant oil has

the highest potential of reducing life-cycle GHG emissions as compared to biodiesel and fossil diesel [A.K. Hossain and P.A. Davies\* (Sustainable Environment Research Group, Engineering Systems and Management, School of Engineering and Applied Science, Aston University, Birmingham B4 7ET, UK), *Renewable Energy*, 2010, **35**(1), 1-13 ].

**NPARR 1(3), 2010-0446, The effect of biodiesel and bioethanol blended diesel fuel on nanoparticles and exhaust emissions from CRDI diesel engine**

Biofuel (biodiesel, bioethanol) is considered one of the most promising alternative fuels to petrol fuels. The objective of the work is to study the characteristics of the particle size distribution, the reaction characteristics of nanoparticles on the catalyst, and the exhaust emission characteristics when a common rail direct injection (CRDI) diesel engine is run on biofuel-blended diesel fuels. In this study, the engine performance, emission characteristics, and particle size distribution of a CRDI diesel engine that was equipped with warm-up catalytic converters (WCC) or a catalyzed particulate filter (CPF) were examined in an ECE (Economic Commission Europe) R49 test and a European stationary cycle (ESC) test. The engine performance under a biofuel-blended diesel fuel was similar to that under D100 fuel, and the high fuel consumption was due to the lowered calorific value that ensued from mixing with biofuels. The use of a biodiesel-diesel blend fuel reduced the total hydrocarbon (THC) and carbon monoxide (CO) emissions but increased nitrogen oxide (NO<sub>x</sub>) emissions due to the increased oxygen content in the fuel. The smoke emission was reduced by 50% with the use of the bioethanol–diesel blend. Emission conversion efficiencies in the WCC and CPF under biofuel-blended diesel fuels were similar to those under D100 fuel. The use of biofuel-blended diesel fuel reduced the total number of particles emitted from the engine; however, the use of biodiesel-diesel blends resulted in more emissions of particles that were smaller than 50nm, when compared with the use of D100. The use of a mixed fuel of biodiesel and bioethanol (BD15E5) was much more effective for the reduction of the particle number and particle mass, when com-

pared to the use of BD20 fuel [Hwanam Kim and Byungchul Choi\*(School of Mechanical Systems Engineering, Chonnam National University, Gwangju 500-757, Republic of Korea), *Renewable Energy*, 2010, **35**(1), 157-163].

**NPARR 1(3), 2010-0447, Fatty acid methyl esters (FAMEs) from castor oil: Production process assessment and synergistic effects in its properties**

Fatty acid methyl esters (FAMEs) from castor oil have been synthesized by methanolysis catalyzed by sodium methoxide and the optimal transesterification conditions have been found. However, some properties of the castor FAME render it unsuitable in pure state for its direct use as fuel in internal combustion engines. Thus, blends with reference diesel have been prepared and their properties have been evaluated. Among these properties, the oxidative stability of the blends shows a negative anti-synergistic effect, that is, all the blends have an induction period lower than the pure reference diesel and the pure castor FAME. On the contrary, the lubricity shows a positive synergistic effect, the wear scar of the blends being always lower than those of the pure components. The cold-filter plugging point of the blends shows also a singular effect, since the filterability remains identical to that of the reference diesel until around 50vol% of castor FAME has been blended with it. The blends of castor FAME and reference diesel until approximately 40vol% of castor FAME meet most of the specifications of the EN 590 standard [e:Laureano Canoira\*, Juan García Galeán, Ramón Alcántara, Magín Lapuerta and Reyes García-Contreras (Department of Chemical Engineering and Fuels, ETS Ingenieros de Minas, Universidad Politécnica de Madrid, Ríos Rosas 21, 28003 Madrid, Spain), *Renewable Energy*, 2010, **35**(1), 208-217].

**NPARR 1(3), 2010-0448, Biodiesel production from residual oils recovered from spent bleaching earth**

This work was to study technical and economic feasibilities of converting residual oils recovered from spent bleaching earth generated at soybean oil refineries into useable biodiesel. Experimental results showed that fatty acids in the SBE residual oil were hexadecenoic acid (58.19%), stearic acid (21.49%) and oleic acid

(20.32%), which were similar to those of vegetable oils. The methyl ester conversion via a transesterification process gave a yield between 85 and 90%. The biodiesel qualities were in reasonable agreement with both EN 14214 and ASTM D6751 standards. A preliminary financial analysis showed that the production cost of biodiesel from SBE oils was significantly lower than the pre-tax price of fossil diesel or those made of vegetable oils or waste cooking oils. The effects of the crude oil price and the investment on the production cost and the investment return period were also conducted. The result showed that the investment would return faster at higher crude oil price [Yi-Pin Huang and James I. Chang\*(Department of Safety, Health and Environmental Engineering, National Kaohsiung First University of Science and Technology, #1, University Blvd., Yenchao, Kaohsiung, Taiwan ROC), *Renewable Energy*, 2010, **35**(1), 269-274].

**NPARR 1(3), 2010-0449, Assessment of cow dung as a supplementary fuel in a downdraft biomass gasifier**

A model of downdraft gasifier has been described considering thermodynamic equilibrium of species in the pyro-oxidation zone and kinetically controlled reduction reactions in the reduction zone. It is found that the sole use of cow dung as the gasifier fuel is not technically feasible. This is due to very low heating value of the producer gas with much carbon leaving the gasifier as char. However, cow dung can be used as a supplementary fuel blended with a conventional woody biomass, like sawdust. The increased fraction of cow dung in the fuel blend renders the gasification process less efficient, when the gasifier is operated at a particular equivalence ratio. Both the producer gas production rate and its heating value reduce with the increase in the cow dung content in the biomass fuel blend, leading to an overall reduction in the gasifier conversion efficiency. It is observed that an increase in the cow dung content from 0 to 90% in the blended fuel reduces the heating value by 46.8% and the conversion efficiency by 45%. The use of cow dung in between 40 and 50% by mass in the fuel mix would result in an overall fuel economy [Prokash C. Roy, Amitava Datta\*and Niladri

Chakraborty (Department of Mechanical Engineering, National Institute of Technology, Silchar, Assam 788010, India), *Renewable Energy*, 2010, **35**(2), 379-386].

### **GUM/RUBBER (incl. Latex, Resin, Pectin, Mucilage, Cellulose, etc.)**

#### **NPARR 1(3), 2010-0450, Comparing biosorbent ability of modified citrus and durian rind pectin**

Biosorbent ability of modified durian rind, durian rind, citrus and modified citrus pectin for removals of toxic heavy metals was investigated, and data were analyzed using multivariate analysis of variance (MANOVA) and cluster analysis (CA). Degree of esterification (% DE) of the biosorbents ranged between 22.33 and 60.81%, and was in the order; modified citrus pectin < modified durian rind pectin < durian rind pectin < citrus pectin. In most cases the order of biosorbent ability was; modified citrus pectin > modified durian rind pectin, citrus pectin > durian rind pectin. MANOVA showed a significant difference between samples and concentration of biosorbents, while CA classified the four biosorbent samples (based on biosorbent ability) into three different clusters; (1) citrus pectin and modified durian rind pectin, (2) durian rind pectin and (3) modified citrus pectin. The uptake of heavy metal by biosorbents was dependent on chemical structure of pectin and increased with biosorbent concentration and in most cases in accordance with the reduction in % DE [Wong Weng Wai, Abbas F.M. AlKarkhi and Azhar Mat Easa\* (School of Industrial Technology, 11800 USM, Minden, Penang, Malaysia), *Carbohydrate Polymers*, 2010, **79**(3), 584-589].

#### **NPARR 1(3), 2010-0451, Comparison of the effect of sugars on the viscoelastic properties of sweet potato starch pastes**

Viscoelastic properties of sweet potato starch (SPS) pastes (5% w/w) were studied in the presence of various sugars (sucrose, glucose, fructose, and xylose) at different concentrations (0, 10 and 20%) by small-deformation oscillatory measurements. Dynamic frequency sweeps at 20°C indicated that all SPS-sugar mixtures were more elastic than viscous with storage

moduli ( $G'$ ) higher than loss moduli ( $G''$ ) at all values of frequency with a frequency dependency. Dynamic moduli ( $G'$  and  $G''$ ) values increased with the increase in sugar concentration from 10 to 20%. Changes in the dynamic moduli were more pronounced with xylose in comparison to the control (no sugar) and other sugars.  $G'$  values as a function of ageing time (10h) at 4°C continuously increased with time during ageing without a plateau region. In general,  $G'$  values of SPS-sugar mixtures during ageing decreased in the following order: pentose (xylose) > hexose (glucose and fructose) > control > disaccharide (sucrose), indicating that the xylose had the greatest ability in retarding retrogradation of SPS [Sun-A Cho and Byoungseung Yoo\* (Department of Food Science and Technology, Dongguk University, 3 Pil-dong, Chung-gu, Seoul 100-715, Korea), *International Journal of Food Science & Technology*, 2010, **45**(2), 410-414].

#### **NPARR 1(3), 2010-0452, A study of the properties of starch isolated from three varieties of *Lablab purpureus* seeds**

Starch isolated from three varieties of *Lablab purpureus* (Linn.) Sweet: Rongai white, Rongai brown and Highworth black ranged from 13.2-15.8%. The starch granules were similar in shape (oval) and medium in size (12.51-20.56 $\mu$ m) but slightly differed in granule size distribution. The starches exhibited a C-type X-ray diffraction pattern with degree of crystallinity ranging from (37.0-46.3%). The apparent amylose ranged from 23.1-26.0% and absolute amylose was 17.5-23.5% and the two were significantly different ( $p < 0.05$ ). The starches had high onset gelatinization temperatures ( $T = 73.5-75.7^\circ\text{C}$ ), the gelatinization range and enthalpy change were 12.917.7°C and 12.3-18.8J/g, respectively. The starches had single stage swelling and amylose leaching patterns. The starch pastes exhibited significant shear thinning, low clarity and poor freeze-thaw stability [Louis M. Nwokocha, Kehinde O. Soetan and Peter A. Williams\* (Department of Chemistry, University of Ibadan, Ibadan, Nigeria), *Carbohydrate Polymers*, 2010, **79**(3), 685-693].

#### **NPARR 1(3), 2010-0453, Comparative study of the effect of drying temperatures and heat-moisture**

### **treatment on the physicochemical and functional properties of corn starch**

This manuscript compares the modifications induced by the heat-moisture treatment of native starch (HMT) and by the hot-air drying of corn on wet-milled starch granules. High temperatures applied during both corn drying and HMT reduced the swelling capacity of granules, increased the starch gelatinization temperatures and decreased their residual enthalpy. Pasting behaviour of pre-treated starch showed a decrease of peak and breakdown viscosity when corn drying and HMT temperatures increased. Microscopic analysis showed that after hydrothermal treatment, starch granules extracted from corn dried at lower temperature swell more significantly than those extracted from corn dried at higher temperature. All these changes suggest the occurring of structural modifications within starch granules during high-temperature pre-treatments. At similar temperatures and initial moisture contents, HMT affected the physicochemical and functional properties of cornstarch more dramatically than hot-air drying. Differences induced by these two treatments were attributed to the availability of water around granules during these two pre-treatment procedures [Paul Malumba\*, Sébastien Janas, Olivier Roiseux, Georges Sinnaeve, Thaddée Masimango, Marianne Sindic, Claude Deroanne and François Béra (University of Kinshasa, Agricultural Faculty, BP 14071 Kinshasa 1, Democratic Republic of the Congo), *Carbohydrate Polymers*, 2010, **79**(3), 633-641].

### **NPARR 1(3), 2010-0454, Synthesis, characterization and metal adsorption properties of tannin-phenol-formaldehyde resins produced using tannin from dried fruit of *Terminalia chebula* (Aralu)**

In this study, tannin extracted from *Terminalia chebula* (Aralu) was used to produce tannin-phenol-formaldehyde resins. They were produced to obtain resins with different tannin to phenol ratio in an attempt to optimize the ion exchange capacities of resins produced. The resins made were sulfonated to improve their properties further. Bivalent cations, such as  $Zn^{2+}$ ,  $Pb^{2+}$ ,  $Ca^{2+}$ ,  $Mg^{2+}$ , and  $Cu^{2+}$ , were used to estimate the adsorption properties of both unsulfonated and sulfonated resins. The glass transitions of representative resins were estimated using differential scanning calo-

rimeter thermograms. Fourier transform infrared spectroscopic analysis was used to gauge changes on resins by sulfonation and adsorption of cations. The glass transition values of un-sulfonated, sulfonated, and metal-adsorbed sulfonated resins showed a similar increasing trend with the increase of phenol content in the resin. The glass transition temperature values reach a plateau beyond the tannin/phenol ratio of 1: 0.5, indicating the formation of large molar masses facilitating entanglements beyond that ratio. The phenol ratio of 1: 0.5 has shown the highest adsorption capacity for all the metal ions used. The highest adsorption capacity was shown for sulfonated tannin-phenol-formaldehyde resin with the tannin/phenol ratio of 1: 0.5 for  $Pb^{2+}$ , which is 0.610meq/g. The adsorption equilibrium data obtained using the column technique were found fitting Freundlich isotherm [S Arasaretnam and L Karunanayake\* (Department of Chemistry, University of Sri Jayewardenepura, Gangodawila Nugegoda, Sri Lanka, *Journal of Applied Polymer Science*, 2010, **115**(2), 1081-1088].

### **NPARR 1(3), 2010-0455, Creaming of skim natural rubber latex with chitosan derivatives**

To recover residual rubber from skim natural rubber (SNR) latex, a novel method was developed on the basis of the use of water-soluble chitosan derivatives. An anionic chitosan derivative, N,O-carboxymethyl chitosan (CMCh), and a cationic chitosan derivative, N-(2-hydroxy)propyl-3-trimethylammonium chitosan chloride (HTACh), were prepared. It was found that the creaming process could be achieved with both chitosan derivatives. By the addition of 7.34-10.3-g/L CMCh, SNR latex was almost completely creamed, and no coagulation of SNR particles in the cream phase occurred. In the case of HTACh, the creaming process was achieved with a lower concentration (<3.70 g/l) than in the case of CMCh, but the size of SNR particles in the cream phase was larger. Solid-state  $^{13}C$ -NMR, thermogravimetric analysis, and  $\alpha$  potential measurement results provided evidence that the creaming of SNR latex with CMCh and HTACh was controlled by the depletion flocculation and adsorption mechanisms, respectively [Chaveewan Kongkaew, Surapich Loykulnant\*, Oraphin Chaikumpollert and Krisda Suchiva (National Metal and

Materials Technology Center, 114 Thailand Science Park, Paholyothin Road, Klong 1, Klong Luang, Pathumthani 12120, Thailand), *Journal of Applied Polymer Science*, 2010, **115**(2), 1022-1031].

**NPARR 1(2), 2010-0456, Influence of oil contents in dynamically cured natural rubber and polypropylene blends**

Mechanical, dynamic, thermal, and morphological properties of dynamically cured 60/40 NR/PP TPVs with various loading levels of paraffinic oil were investigated. It was found that stiffness, hardness, tensile strength, storage shear modulus, complex viscosity, glass transition temperature ( $T_g$ ) of the vulcanized rubber phase, degree of crystallinity and crystalline melting temperature ( $T_m$ ) of the polypropylene (PP) phase decreased with increasing loading levels of oil. This is attributed to distribution of oil into the PP and vulcanized rubber domains causing oil-swollen amorphous phase and vulcanized rubber domains. An increasing trend of elastic response in terms of tension set and damping factor was observed in the TPVs with loading levels of oil in a range of 0-20 phr. It is supposed that a major proportion of oil was first preferably migrated into the PP phase and caused an abrupt decreasing trend of degree of crystallinity and  $T_m$  of the PP phase. The dispersed vulcanized rubber domains remained small as particles with a low degree of swelling. Increasing loading levels of oil higher than 20 phr caused a decreasing trend of elongation at break and elastomeric properties. Saturation of oil in the PP phase was expected and the excess oil was transferred to the rubber phase which thereafter caused larger swollen vulcanized rubber domains. The remaining amount of oil was able to separate as submicron pools distributed in the PP matrix. This caused lowering of  $T_g$ ,  $T_m$ , crystallinity of PP phase as well as strength, elastomeric, and dynamic properties of the TPVs [Charoen Nakason\* and Wisut Kaewsakul (Center of Excellence in Natural Rubber Technology, Department of Rubber Technology and Polymer Science, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000, Thailand), *Journal of Applied Polymer Science*, 2010, **115**(1), 540- 548].

**NPARR 1(3), 2010-0457, Development of low-fat mayonnaise containing polysaccharide gums as functional ingredients**

The objective of this study was to develop a low-fat (LF) mayonnaise containing polysaccharide gums as functional ingredients. Xanthan gum (XG, 15 g kg<sup>-1</sup>), citrus fiber (CF, 100 g kg<sup>-1</sup>) and variable concentration of guar gum (GG) were used to formulate the optimum ratios of polysaccharide gums as fat replacers. The fat content in LF mayonnaise was reduced to 50% if compared with full-fat (FF) mayonnaise, and the products still maintained ideal rheological properties.

The rheological parameters showed that there were no ( $P>0.05$ ) differences in yield stress, viscosity and flow behavior index between XG + 10 g kg<sup>-1</sup> GG, CF + 5 g kg<sup>-1</sup> GG and FF control. LF mayonnaises had lower caloric values and higher dietary fiber content than the FF counterpart. Scanning electron microscopy (SEM) micrographs illustrated that the network of aggregated droplets in LF treatments contained a large number of interspaced voids of varying dimensions. Furthermore, in a comparison of sensory evaluation of LF treatments with commercial and our FF mayonnaises, there were no ( $P>0.05$ ) differences in any sensory scores among XG + 10 g kg<sup>-1</sup> GG control. This study shows that XG + 10g kg<sup>-1</sup> GG and CF + 5 g kg<sup>-1</sup> GG could be used in LF mayonnaise formulations based on its multiple functions on processing properties [Hou-Pin Su, Chuang-Ping Lien, Tan-Ang Lee, Jou-Hsuan Ho\* (Department of Nutrition and Health Science, Toko University, Chia-Yi, Taiwan 613, ROC), *Journal of the Science of Food and Agriculture*, 2010, **90**(5), 806-812].

**NPARR 1(3), 2010-0458, Characterisation of starches separated from sorghum cultivars grown in India**

Starches from 15 Indian sorghum cultivars were separated and evaluated for physicochemical, morphological, thermal, retrogradation, pasting and textural properties. The morphological characterisation revealed the presence of irregular-polyhedral as well as spherical shaped granules. A wide variation in amylose content ranging from 11.2 to 28.5% was observed. Ther-

mal, retrogradation, pasting and textural characteristics also showed significant differences amongst all the starch cultivars. Principal component analysis was carried out to extract five principal components that could explain 75% of the total variance. The first two principal components PC1 ( $T_o$ ,  $T_p$ ,  $T_c$  and  $\Delta H_{gel}$ ) and PC2 (amylose content, range of gelatinisation, PHI and pasting and textural properties) could explain a cumulative variance of 44%, indicating the importance of amylose, thermal and textural properties on the sorghum starch functionality [Harinder Singh, Navdeep Singh Sodhi\* and Narpinder Singh (Department of Food Science and Technology, Guru Nanak Dev University, Amritsar 143 005, Punjab, India), *Food Chemistry*, 2010, **119**(1), 95-100].

## INSECTICIDES (incl. Fungicides, Herbicides, Nematicides, Larvicides, etc.)

### NPARR 1(3), 2010-0459, **Herbicidal activity of a medicinal plant, *Peganum harmala* Linn., and decomposition dynamics of its phytotoxins in the soil**

This study evaluates the herbicidal potential of *Peganum harmala* Linn. (Zygophyllaceae) residues on seedling growth of *Avena fatua* Linn. (Poaceae) and *Convolvulus arvensis* Linn. (Convolvulaceae), and decomposition dynamics of its phytotoxins in the soil. Results show that among the different *P. harmala* plant parts used, leaves were the most toxic and caused the greatest negative effect on seedling length, seedling dry weight, leaf area and chlorophyll content of *A. fatua* and *C. arvensis*. Both weed species differed in their sensitivity to *P. harmala* residues. Higher reduction in plant growth parameters occurred in *C. arvensis*. In the presence of charcoal and depending on source of residue, receiver plants or amount of residues, the inhibitory effects of *P. harmala* on both test plants were eliminated or significantly reduced. Total phenolic acid content was higher in soil amended with leaf residues than that of soils with stem or root residues. Our findings revealed that a higher inhibitory effect *P. harmala* residues on both target species was obtained when weed seeds were sown 1 or 3 days after residue decomposition in the soil started. Total phenolic contents were maximum in the soil 1 day after decomposition, whereas

phenolic amounts rapidly decreased with increasing decomposition. In conclusion, *P. harmala* residues had potent herbicidal activity and could be used as a natural herbicide for weed control [Hamid Sodaieizadeh\*, Mohammad Rafieiohossaini and Patrick Van Damme (Laboratory of Tropical and Subtropical Agronomy and Ethnobotany, Coupure links 653, B-9000 Gent, Belgium), *Industrial Crops and Products*, 2010, **31**(2), 385-394]

### NPARR 1(3), 2010-0460, **Antiplasmodial activity of *Ajuga bracteosa* against *Plasmodium berghei* infected BALB/c miceS.**

The present work was undertaken to evaluate antiplasmodial activity of ethanolic leaves extract of traditional medicinal plant *Ajuga bracteosa* in *Plasmodium berghei* infected BALB/c mice along with its phytochemical screening and acute toxicity test to support its traditional use as a remedy for malaria. Plant extract (ethanolic) 250, 500, 750mg/kg/day was evaluated in the early and established infection along with repository activity in *P. berghei* infected BALB/c mice through suppressive, curative and preventive test. The phytochemical screening was carried out by employing standard procedures. The acute toxicity was checked through limit test. The ethanolic leaves extract of *A. bracteosa* (250, 500 and 750mg/kg/day) demonstrated a dose-dependent chemosuppression during early and in established infections, along with significant ( $P < 0.05$ ) repository activity. At a concentration of 750mg/kg/day maximum 77.7% chemosuppression during early infection and 68.8% chemosuppression in repository activity were found. This dose enhanced significant mean survival period up to  $27.4 \pm 0.46$  days in established infection. ELEAB was found to be safe up to 5g/kg weight when administrated orally in the female BALB/c mice, which is upper limit for oral administration of the test material to rodents. ED50 of ELEAB was 300mg/kg body weight of mice. ELEAB inhibited parasitaemia and enhanced mean survival time in a dose-dependent manner upto 750 mg/kg/day dose in treated mice. Further studies need to be done to isolate and characterize active constituents of extract and to study their mecha-

nism of action [Chandel and U Bagai (Department of Zoology, Panjab University, Chandigarh, India), *Indian Journal of Medical Research*, 2010, **131**, 440-444].

**NPARR 1(3), 2010-0461, Adulticidal activity of essential oil of *Lantana camara* leaves against mosquitoes**

Development of insect resistance to synthetic pesticides, high operational cost and environmental pollution have created the need for developing alternative approaches to control vector-borne diseases. In the present study the insecticidal activity of essential oil isolated from the leaves of *Lantana camara* against mosquito vectors was investigated. Essential oil was isolated from the leaves of *L. camara* using hydro-distillation method. Bioassay test was carried out by WHO method for determination of adulticidal activity against mosquitoes. Different compounds were identified by gas chromatography-mass spectrometry analysis. LD<sub>50</sub> values of the oil were 0.06, 0.05, 0.05, 0.05 and 0.06 mg/cm<sup>2</sup> while LD<sub>90</sub> values were 0.10, 0.10, 0.09, 0.09 and 0.10 mg/cm<sup>2</sup> against *Ae. aegypti*, *Cx. quinquefasciatus*, *An. culicifacies*, *An. fluviatilis* and *An. stephensi*, respectively. KDT50 of the oil were 20, 18, 15, 12, and 14 min and KDT90 values were 35, 28, 25, 18, 23 min against *Ae. aegypti*, *Cx. quinquefasciatus*, *An. culicifacies*, *An. fluviatilis* and *An. stephensi*, respectively on 0.208 mg/cm<sup>2</sup> impregnated paper. Studies on persistence of essential oil of *L. camara* on impregnated paper revealed that it has more adulticidal activity for longer period at low storage temperature. Gas chromatographic-mass spectrometric analysis of essential oil showed 45 peaks. Caryophyllene (16.37%), eucalyptol (10.75%),  $\alpha$ -humelene (8.22%) and germacrene (7.41%) were present in major amounts and contributed 42.75 per cent of the total constituents.

Thus, essential oil from the leaves of *L. camara* possesses adulticidal activity against different mosquito species that could be utilized for development of oil-based insecticide as supplementary to synthetic insecticides [VK Dua, AC Pandey and AP Dash\* (National Institute of Malaria Research (ICMR), Field Unit, Haridwar and National Institute of Malaria Research New Delhi,

India], *Indian Journal of Medical Research*, 2010, **131**, 434-439]

**NPARR 1(3), 2010-0462, Diatomaceous earth enhances the toxicity of garlic, *Allium sativum*, essential oil against stored-product pests**

Laboratory bioassays were carried out to determine the efficacy of garlic, *Allium sativum* Linn. (Amaryllidaceae), essential oil applied alone or with diatomaceous earth (DE) against adult rice weevils, *Sitophilus oryzae* (Linn.) (Coleoptera: Curculionidae) and red flour beetles, *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae). The results showed that the combination treatment was significantly more effective than either treatment alone. In addition, the results also showed that the simultaneous application of essential oil plus DE significantly reduced the concentration of essential oil alone required for an effective treatment and the application rate of DE can be reduced when combined with essential oil. Moreover, the activity of the combination treatment lasted longer than that of essential oil alone and the survival of eggs or larvae to adult stage was significantly inhibited in the combined treatments against both species, compared with the use of essential oil alone. Thus, the garlic essential oil combined with DE has a strong additive effect and therefore, may have potential as an alternative to synthetic insecticides for the control of insect pests of stored products [Feng-Lian Yang, Guang-Wen Liang, Yi-Juan Xu, Yong-Yue Lu and Ling Zeng\* (Laboratory of Insect Ecology, South China Agriculture University, Guangzhou 510642, Guangdong, PR China), *Journal of Stored Products Research*, 2010, **46**(2), 118-123].

**NPARR 1(3), 2010-0463, Effects of molluscicidal constituents in spices on reproduction in snails**

Sublethal treatment (20 and 60% of 24 hr LC<sub>50</sub>) of young snails (*Lymnaea acuminata*) with the active molluscicidal constituents ferulic acid and umbelliferone from *Ferula asafoetida*, eugenol from *Syzygium aromaticum* (Linn.) Merr. & Perry and limonene from *Carum carvi* Linn. caused a significant reduction in the fecundity, hatchability, and survival of the snails. Treatment with the constituents also increased the length of time to hatching of snails. Withdrawal of the snails from

constituent treatments after 96h with movement to fresh water enabled a significant reproductive recovery in the snail. A 24 hr sublethal treatment with the ferulic acid, umbelliferone, eugenol, and limonene caused a significant ( $p < 0.05$ ) reduction in protein, amino acid, DNA, and RNA levels in the ovotestis of treated snails [Pradeep Kumar, Vinay K Singh, Chandra P.M. Tripathi, Dinesh K. Singh\* (Department of Zoology, DDU Gorakhpur University, Gorakhpur, India), *Journal of Herbs, Spices & Medicinal Plants*, 2010, **16**(1), 24-35].

**NPARR 1(3), 2010-0464, Effect of feeding *Mucuna pruriens* on helminth parasite infestation in lambs**

Thirty-six Dorper  $\times$  Katahdin ram lambs were assigned to three treatments, a cottonseed meal based control diet, a diet in which *Mucuna* replaced cottonseed meal and the control diet with levamisole (7.5mg/kg body weight) administration. All diets were isonitrogenous and isocaloric. The 12 lambs in each treatment were assigned randomly to 4 pens, each containing 3 lambs. Lambs were trickle infected three times per week by gavage with infectious *Haemonchus contortus* larvae (2000 larvae/lamb) for 3 weeks. Levamisole treatment decreased fecal egg counts by 87% and abomasal worm counts by 83%. *Mucuna* intake did not statistically affect fecal egg counts or abomasal worm counts, though numerical ( $P > 0.10$ ) reductions of 7.4% and 18.1%, respectively were evident. Anemia indicators, feed intake, and lamb growth were unaffected by treatment. Levamisole reduced the *Haemonchus* parasite burden in lambs significantly but feeding *Mucuna* reduced the burden by levels unlikely to eliminate the clinical effects of parasitism [C.M. Huisden, A.T. Adesogan\*, J.M. Gaskin, C.H. Courtney, A.M. Raji and T. Kang (Department of Animal Sciences, Institute of Food and Agricultural Science, University of Florida, United States), *Journal of Ethnopharmacology*, 2010, **127**(3), 669-673].

**NPARR 1(3), 2010-0465, Antifungal efficacy of *Aloe vera* in vitro and its use as a preharvest treatment to maintain postharvest table grape quality**

*Aloe vera* gel was added at several concentrations on potato dextrose agar (PDA) to test its efficacy

on inhibiting mycelium growth of two common fungi responsible for fruit decay (*Penicillium digitatum* and *Botrytis cinerea*). For both fungi, the inhibition of mycelium growth rate increased with *Aloe* concentration, although to gain the same inhibition the necessary *A. vera* gel concentration was 3-fold higher for *B. cinerea* than *P. digitatum*. Overall, the dose of 250mLL<sup>-1</sup> led to 4- and 2-log reductions of mycelium growth for *P. digitatum* and *B. cinerea*, respectively. Based on these results, *A. vera* gel at 250 mLL<sup>-1</sup> was applied as a preharvest treatment to table grape vineyards 1 or 1 and 7 days before harvesting. Fruit were cold-stored for 35 days and sampled weekly. Respiration rate and weight loss were significantly reduced in treated samples, while ripening parameters such as colour and fruit firmness were significantly delayed. Both mesophilic aerobics and mould and yeasts counts were significantly lower at harvest in treated samples, the effect being persistent during storage. At the end of the experiment, the percentage of rotted berries was significantly lower in treated than in control fruit. From these results it could be inferred that *A. vera* could be considered as a promising preharvest treatment to maintain table quality during postharvest storage [S. Castillo, D. Navarro, P.J. Zapata, F. Guillén, D. Valero, M. Serrano and D. Martínez-Romero\* (Dept. of Food Technology, EPSO, University Miguel Hernández, Ctra. Beniel km. 3.2, 03312, Orihuela, Alicante, Spain), *Postharvest Biology and Technology*, 2010, **57**(3), 183-188].

**OILS/FATS (incl. Edible oils, Fish oil, Butter etc.)**

**NPARR 1(3), 2010-0466, Environmental and Varietal Influences on the Fatty Acid Composition of Rapeseed, Soybeans and Sunflowers**

The fatty acid (FA) composition of oil crops is of some importance under technological as well as under nutritional aspects. The influence of temperature on this parameter in rapeseed, soybeans and sunflowers was investigated under practical agricultural conditions, whereby varietal variations were taken into account. The analysed plant material originated from variety testing trials located in different climatic zones of Austria. As a measure of the climatic conditions of a location, the mean

temperature of the last 30 days before harvest was calculated. Despite the low temperature differences between the various locations, moderate but significant negative correlations between temperature and the share of linolenic (18:3), respectively, linoleic (18:2) acid on the whole quantity of FAs in rapeseed ( $R^2=0.18-0.42$ ), soybeans ( $R^2=0.11-0.13$ ) and sunflowers ( $R^2=0.15$ ) were found. Furthermore, there was a good negative correlation in the case of sunflower seeds between temperature and oil level ( $R^2=0.45$ ). The environmental influence on the share of polyunsaturated FAs differed between the different species. The results show that quality of vegetable oils is as well a question of environment as of variety [M. Werteker\*, A. Lorenz, H. Johannes, E. Berghofer and C. S. Findlay (Austrian Agency for Health and Food Safety, Variety Testing, Vienna, Austria), *Journal of Agronomy and Crop Science*, 2010, **196**(1), 20–27].

**NPARR 1(3), 2010-0467, Production and utilization of palm fatty acid distillate (PFAD)**

PFAD (palm fatty acid distillate) is a by-product of physical refining of crude palm oil products and is composed of free fatty acids (81.7%), glycerides (14.4%), squalene (0.8%), vitamin E (0.5%), sterols (0.4%) and other substances (2.2%). PFAD is used in the animal feed and laundry soap industries as well as a raw material for the oleochemicals industry. Vitamin E, squalene and phytosterols are value-added products which could be extracted from PFAD and are of potential value for the nutraceutical and cosmetic industries [Ab Gapor Md Top\* (Malaysian Palm Oil Board (MPOB), No. 6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia; *Lipid Technology*, 2010, **22**(1), 11-13].

**NPARR 1(3), 2010-0468, Evolution of some physicochemical parameters of iodine fortified sunflower oil and margarine**

Experimental research were effectuated to establish the modalities of incorporation of the molecular iodine in sunflower oil double refined and deodorised of autochthon production. It was established that the iodisation of sunflower oil may be considered as an admissible method, which allows the incorporation of a

considerable amount of iodine ( $1-100\mu\text{g mL}^{-1}$ ) without modifying the physicochemical properties of the product. It should be noted that iodine value varied a little, even in the sample with a maximum content of iodine ( $1000\mu\text{g mL}^{-1}$ ), its values did not exceed permitted limit. Research of quality indices variation of iodised oil during product storage (3 months), demonstrated that only in the case of maximum concentration of iodine ( $1000\mu\text{g mL}^{-1}$ ) it was manifested a slight overcome of the maximum permitted limit caused by the free iodine presence. Iodised oil was used for the manufacture of iodised margarine in order to fortificate this product with iodine ( $1\mu\text{g iodine g}^{-1}$  margarine). Physicochemical indices (moisture and volatile substances, melting point, free fatty acids content) of iodised margarine did not differ from the characteristics of the product without iodine [Flavia Pop\* (Department of Chemistry-Biology, North University, 76A Victoriei Street, 430122, Baia Mare, Romania), *International Journal of Food Science & Technology*, 2010, **45**(2), 327-333].

**NPARR 1(3), 2010-0469, Refining of high free fatty acid rice bran oil and its quality characteristics**

Commercial rice bran contains 15-20% of oil and also an endogenous lipase which degrades the oil and produces free fatty acids (FFAs). This study was undertaken to examine the quality of refined oil prepared from crude oil after the action of endogenous lipase in bran. The oil which was degraded by lipase to low, medium and high FFAs, upon extraction in the rice bran oil industry were obtained and were refined in the laboratory, and quality of the oils was studied. The crude oils had FFA of 6.5, 36.0 and 87.0%; oryzanol content of 1.52, 1.55 and 1.65%; color of 32.0, 65.0 and 65.0, lovibond units; unsaponifiable matter of 3.2, 4.2 and 4.9%; phytosterol content of 4,600, 4,000 and 1,900 ppm; and sum of tocopherols and tocotrienols of 962, 56 and 96 ppm, respectively. After refining these three crude oils (6.5, 36.0 and 87.0% FFA) were refined; the resultant oils had an FFA content of 0.4, 2.4 and 4.8%; oryzanol content of 1.13, 2.5 and 6.35%; color of 20.0, 55.0 and 50.0 lovibond units; unsaponifiable matter of 3.5, 6.5 and 33.4%, phytosterol content of 4,900, 6,100 and 13,800 ppm, and the sum of tocopherols and tocotrienols of 1,050, 880

and 740ppm, respectively. The refined oils produced from high FFA crude oil had high amounts of unsaponifiable matter, oryzanol, phytosterols and sum of tocopherols and tocotrienols than the permitted level for refined rice bran oil. The refined rice bran oil obtained from fresh rice bran (without lipase action) contained about 90% of triacylglycerols whereas, the refined oil from that of high FFA bran oil showed about 10% triacylglycerols. Hence the latter cannot be used as edible oil, but instead can be used at low levels as a nutraceutical in foods [R.G Raja Rajan and A.G. Gopala Krishna (Department of Lipid Science & Traditional Foods Central Food Technological Research Institute (CSIR), Mysore 570 020, India), *Journal of Food Lipids*, 2009, **16**(4), 589-604].

**NPARR 1(3), 2010-0470, Dietary supplementation of alpha-linolenic acid in an enriched rapeseed oil diet protects from stroke**

Populations of Western countries are severely deficient in omega-3 intake, both in the form of alpha-linolenic acid (ALA) and the Long Chain derivatives (LC-*n*-3), Eicosa-Pentaenoic-Acid and Docosa-Hexaenoic-Acid. Omega-3 insufficiency is a risk factor for cardiovascular and cerebral diseases such as coronary heart disease and stroke. Stroke is a major cause of mortality and morbidity, and induces a significant socioeconomic cost and a marked increase in patient/family burden. To date, preventive treatments and neuroprotective drugs identified in preclinical studies failed in clinical trials, in part because of an inability to tolerate drugs at neuroprotective concentrations. Therefore testing alternative protective strategies, such as functional foods/nutraceuticals, are of considerable interest.

It was previously demonstrated that a single injection of ALA reduced ischemic damage by limiting glutamate-mediated neuronal death, whereas repeated injections displayed additive protective benefits as a result of increased neurogenesis, synaptogenesis and neurotrophin expression. Because intravenous injections are not a suitable long-term strategy in humans, the present study investigated the effect of ALA supplementation by an experimental diet containing rapeseed

oil (RSO, a rich source of ALA) as the only source of lipids for stroke prevention. We tested several experimental diets which included 5, 10, and 20% RSO-enriched diet and feeding paradigms (fresh diet was provided once or twice a week for 4 or 6 weeks). Our results showed that ALA supplemented diets are more sensitive to lipid peroxidation than a regular chow diet. Because the diet affected feeding behavior and animal growth, we defined concrete guidelines to investigate the effect of omega-3 supplementation on neuropathology. Among the different sets of experiments, animals fed with 10% and 20% RSO-enriched diet displayed a reduced mortality rate, infarct size and increased probability of spontaneous reperfusion in the post-ischemic period. In addition, a drastic reduction of lipid peroxidation levels was observed in the ischemic brain of RSO-fed animals. Overall, our findings provide new insights into the potential of employing rapeseed oil as a functional food/nutraceutical aiding in stroke prevention and protection. [C. Nguemini, B. Delplanque, C. Rovère, N. Simon-Rousseau, C. Gandin, G. Agnani, J.L. Nahon, C. Heurteaux and N. Blondeau\* (Institut de Pharmacologie Moléculaires et Cellulaires - UMR6097, C.N.R.S, 06560 Valbonne, France), *Pharmacological Research*, 2010, **61**(3), 226-233].

**NPARR 1(3), 2010-0471, Characterization and utilization of Spanish Broom (*Spartium junceum* L.) seed oil**

Physico-chemical characteristics and fatty acid composition of Spanish Broom seed oil were determined. The percentage yield of the oil was calculated as 4-5%. The saponification value, iodine value, acid value and free fatty acid were determined to assess the quality of the oil. The physico-chemical characterization showed that Spanish Broom seed oil is an unsaturated semi-drying oil, with high saponification and acidic values. The fatty acid composition of Spanish Broom seed oil was determined by Gas Chromatography. The seed oil of Spanish Broom contained linoleic and palmitic acids, the most abundant unsaturated and saturated fatty acids, respectively. It is concluded that Spanish Broom seed oil might be used for making soap, hair shampoo and alkyd resin [T. Cerchiara\*, G. Chidichimo, M.I. Ragusa, E.L. Belsito, A. Liguori and A. Arioli

(Chemistry Department, University of Calabria, Ponte P. Bucci, 87036 Arcavacata di Rende (CS), Italy), *Industrial Crops and Products*, 2010, **31**(2), 423-426].

## PHYTOCHEMICALS

### **NPARR 1(3), 2010-0472, Bioactive lipid constituents of fenugreek**

Neutral and polar lipids of fenugreek were investigated. Triacylglycerol and phosphatidylethanolamine were the major molecular species identified in the neutral and polar lipid fractions, respectively. The fatty acid profile was dominated by unsaturated acids, namely oleic, linoleic and linolenic acids accounting for 16.3, 50 and 24.4%, respectively of the total fatty acids. Besides the major molecular species, N-Acyl phosphatidylethanolamines (NAPE) and fatty acid amides were isolated and identified for the first time in this spice. N-linoleylphosphatidylethanolamine was found to be the major NAPE while oleamide was demonstrated to be the major fatty acid amide in the lipid fraction. The possible role of oleamide, an endogenous sleep-inducing factor, as well as NAPE in contributing to the pharmacological properties of fenugreek is discussed [Suchandra Chatterjee, Prasad S. Variyar\* and Arun Sharma (Food Technology Division, Bhabha Atomic Research Centre, Mumbai 400085, India), *Food Chemistry*, 2010, **119**(1), 349-353].

### **NPARR 1(3), 2010-0473, Clean recovery of antioxidant flavonoids from citrus peel: Optimizing an aqueous ultrasound-assisted extraction method**

One of the main reasons for unsuccessful recovery of flavonoids from citrus by-products is the absence of effective extraction procedures. In this work, flavonoid fractions were obtained from citrus peels (lime, orange and tangerine) growing in South American cultivars using an optimized aqueous ultrasound-assisted extraction method with high yield (40.25±12.09mg of flavonoid fraction/g peel). Total phenolic content in flavonoid fractions obtained from different sources was 74.80±1.90, 66.36±0.75 and 58.68±4.01mg GAE

(gallic acid equivalents)/g, for lime, orange and tangerine, respectively.

The composition of flavonoid fractions was established by using HPLC/MS. Orange peel contained hesperidin, neohesperidin, diosmin, nobiletin and tangeritin, being the most complex source. Tangerine peel was the simplest source and contained only hesperidin and neohesperidin. Using the thiobarbituric acid-reactive substances (TBARS) assay it was demonstrated that all flavonoid fractions were able to inhibit copper (Cu<sup>2+</sup>) or peroxyinitrite (ONOO<sup>-</sup>) induced human low density lipoprotein (LDL) oxidation. Differences in the antioxidant activity of individual components from flavonoid fractions were also observed [Julián Londoño-Londoño\*, Vânia Rodrigues de Lima, Oscar Lara, Andres Gil, Tânia Beatriz Crescynski Pasa, Gabriel Jaime Arango and José R. Ramirez Pineda (Universidad de Antioquia, Grupo de Investigación en Sustancias Bioactivas, Sede de Investigación Universitaria (SIU), A.A 1226 Medellín, Colombia), *Food Chemistry*, 2010, **119**(1), 81-87].

### **NPARR 1(3), 2010-0474, Antibacterial clerodane diterpenes from Goldenrod (*Solidago virgaurea*)**

Nine clerodane diterpenes, solidagoic acids C-I (**1-7**), cleroda-3, 13(14)-dien-16, 15:18,19-diolide (**8**) and cleroda-3,13(14)-dien-15,16:18,19-diolide (**9**) were isolated and characterised from the ethanol-ethyl acetate (1:1) extract of *Solidago virgaurea*. The structures were determined by NMR spectroscopic analysis. Several displayed moderate antibacterial activity against *Staphylococcus aureus*. Nine clerodane diterpenes, solidagoic acids C-I (**1-7**), cleroda-3, 13(14)-dien-16, 15:18, 19-diolide (**8**) and cleroda-3, 13(14)-dien-15, 16:18, 19-diolide (**9**) were isolated and characterised from *Solidago virgaurea*. Of these several displayed moderate antibacterial activity against *Staphylococcus aureus* [Courtney M. Starks\*, Russell B. Williams, Matt G. Goering, Mark O'Neil-Johnson, Vanessa L. Norman, Jin-Feng Hu, Eliane Garo, Grayson W. Hough, Stephanie M. Rice and Gary R. Eldridge (Lead Discovery and Rapid Structure Elucidation Group, Sequoia Sciences Inc., 1912 Innerbelt Busi-

ness Center Drive, St. Louis, MO 63114, United States), *Phytochemistry*, 2010, **71**(1), 104-109].

**NPARR 1(3), 2010-0475, Investigation of various factors for the extraction of peppermint (*Mentha piperita* L.) leaves**

Ingredients from peppermint leaves are widely used in the food industry as food additives and natural flavours. The traditional way to produce mint extracts is via steam distillation or solvent extraction, both long and energy consuming processes. This paper investigated various extraction methods, namely room temperature extraction, reflux temperature extraction, ultrasonic assisted room temperature extraction and microwave-assisted extraction. Extraction of peppermint leaves was studied for extraction times of 5, 10, 30 and 60 min, varying the sample-to-solvent ratio, along with the study of extraction yields for three mint compounds, menthone, menthol and menthofuran. The use of microwave-assisted solvent extraction allows the reduction of process time, the reduction of solvent use, while increasing extraction yields [Jianming Dai, Valerie Orsat\*, G.S. Vijaya Raghavan and Varoujan Yaylayan (Department of Bioresource Engineering, McGill University, 21,111 Lakeshore Road, Ste-Anne-de-Bellevue, QC, Canada H9X 3V9), *Journal of Food Engineering*, 2010, **96**(4), 540-543].

**NPARR 1(3), 2010-0476, Investigation *Eucalyptus globulus* biomass residues from pulping industry as a source of high value triterpenic compounds**

The chemical composition of the lipophilic extracts of *Eucalyptus globulus* harvesting residues and bark generated by the pulp industry was studied by gas chromatography-mass spectrometry. Triterpenoids, mainly triterpenic acids with lupane, ursane and oleanane skeletons (namely, betulonic, betulinic, ursolic, oleanolic, 3-acetylursolic and 3-acetyloleanolic acids) were the major components detected. Triterpenoids contents range from 1.2g/kg to 121.1g/kg in fruits and surface layers of branches bark residues, respectively, being the triterpenic acids highly concentrated in surface layers of *E. globulus* biomass. The results demonstrate that these biomass residues can be considered as prom-

ising sources of valuable bioactive chemicals, opening new strategies to up-grade the pulp industry residues, within an integrated biorefinery context. The exploitation viability of the bark from an industrial pulp mill debarking process was evaluated. The recovery of triterpenoids from bark samples collected along the industrial debarking line decreases substantially, showing that a successful exploitation process of these valuable compounds in an integrated way will require the development of modifications on the debarking systems [R.M.A. Domingues, G.D.A. Sousa, C.S.R. Freire, A.J.D. Silvestre\* and C. Pascoal Neto (CICECO and Department of Chemistry, University of Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal), *Industrial Crops and Products*, 2010, **31**, (1), 65-70].

**NPARR 1(3), 2010-0477, Antioxidant triterpenoids from the stems of *Momordica charantia***

A new multiflorane triterpenoid and two new cucurbitane triterpenoids were isolated from the stems of *Momordica charantia*. The structures of the new compounds were elucidated by spectroscopic methods. These three new compounds, **1**, **2** and **3** displayed ABTS radical cation scavenging activity with IC<sub>50</sub> values of 268.5±7.9, 352.1±11.5 and 458.9±13.0µM, respectively and an inhibitory effect on xanthine oxidase (XO) activity with IC<sub>50</sub> values of 142.3±30.2, 36.8±20.5 and 124.9±8.3µM, respectively. This finding indicated that **1-3** can be used as antioxidants [Chiung-Hui Liu, Ming-Hong Yen, Shih-Fang Tsang, Kim-Hong Gan, Hsue-Yin Hsu and Chun-Nan Lin\* (Faculty of Pharmacy, College of Pharmacy, Kaohsiung Medical University, San Ming Dist., Kaohsiung 807, Taiwan), *Food Chemistry*, 2010, **118**(3), 751-756

**NPARR 1(3), 2010-0478, Antioxidant and antiproliferative activities of phytochemicals from Quince (*Cydonia vulgaris*) peels**

Fifty-nine secondary metabolites have been isolated from *Cydonia vulgaris* peels and characterised on the basis of their spectroscopic features. Among them, five metabolites, 3β-(18-hydroxylinoleoyl)-28-hydroxyurs-12-ene (**12**), 3β-linoleoylurs-12-en-28-oic acid (**15**), 3β-oleoyl-24-hydroxy-24-ethylcholesta-

5,28(29)-diene (**24**), tiglic acid 1-*O*- $\beta$ -D-glucopyranoside (**35**), and 6,9-dihydroxy-megastigmasta-5,7-dien-3-one 9-*O*- $\beta$ -D-gentiobioside (**46**), have been isolated and elucidated for the first time. All of the compounds were tested for their radical-scavenging and antioxidant activities by measuring their capacity to scavenge the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical, and anion superoxide radical and to induce the reduction of Mo (VI) to Mo (V). The antiproliferative activity of all the most abundant compounds by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) bioassay on murine B16-F1 melanoma cells has been also assessed [Daniela Alesiani, Antonella Canini, Brigida D'Abrosca, Marina DellaGreca, Antonio Fiorentino\*, Claudio Mastellone, Pietro Monaco and Severina Pacifico (Dipartimento di Biologia, Università di Roma "Tor Vergata", Via della Ricerca Scientifica 1, I-00133 Rome, Italy), *Food Chemistry*, 2010, **118**(2), 199-207].

**NPARR 1(3), 2010-0479, Determination of isoflavone content and antioxidant activity in *Psoralea corylifolia* Linn. callus cultures**

Relation between isoflavones production and antioxidant activity in *Psoralea corylifolia* cell cultures was studied. High performance liquid chromatography analysis revealed that root-derived callus cultures produced maximum amount of daidzein whereas genistein by leaf-derived callus. Cell cultures grown under continuous illumination ( $40\text{-}\mu\text{mol m}^{-2}\text{s}^{-1}$ ) produced several-fold more isoflavones daidzein (2.28% dry wt) and genistein (0.21% dry wt) than that of field grown plants. The antioxidant activity of extracts was determined using 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay, phosphomolybdenum assay and correlated with the content of total phenolics in the extracts. Calli grown under continuous illumination exhibited strong antioxidant activities compared to dark grown callus cultures and explants materials [Amit N. Shinde, Nutan Malpathak and Devan and P. Fulzele\* (Plant Biotechnology and Secondary Products Section, Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai 400 085, India), *Food Chemistry*, 2010, **118**(1), 128-132].

## PULP/PAPER

**NPARR 1(3), 2010-0480, Feasibility of creating compression-molded biocomposite boards from berry fruit pomaces**

In this study, the feasibility of creating biocomposite boards from berry fruit pomaces on the basis of a crosslinking mechanism was investigated. Blueberry, cranberry, and wine grape pomaces were ground, dried, and mixed with soy flour (SF) or pectin and xanthan gum mixture at a ratio of 1 : 1 and with the addition of 15% glycerol (w/w of pomace and SF). Blueberry pomace (BP) was also blended with NaOH-modified soy flour (MSF) at pomace/MSF ratios of 1 : 1, 4 : 1, and 9 : 1 and with 5, 10, or 15% glycerol. The mixtures were compression-molded at 130-140°C into biocomposite boards to evaluate their mechanical and thermal properties, water absorption and solubility and microstructure. Among the three pomaces, the BP board was the stiffest, whereas the wine grape pomace board was the most flexible. The breaking strength and modulus of elasticity of the BP/MSF boards increased with increasing MSF concentration but decreased with increased glycerol concentration. Mixing the pomace and glycerol into SF shifted the endothermic peaks and initial degradation to lower temperatures compared to that of SF alone. Increasing the glycerol concentration decreased the water absorption but increased the water solubility of the BP/MSF board. The pomace/MSF ratio in the board did not affect ( $P>0.05$ ) the water absorption, but the water solubility increased with increasing pomace concentration. Glycerol addition in the BP/MSF board smoothed the fracture surface, as shown by scanning electron microscopy images. This study may provide an approach to reducing fruit pomace disposal through the development of new value-added biodegradable products for industrial applications, such as nursery pots and egg cartons [Su-Il Park, Yan Jiang, John Simonsen<sup>3</sup> and Yanyun Zhao\* (Department of Food Science and Technology, 100 Wiegand Hall, Oregon State University, Corvallis, Oregon 97331), *Journal of Applied Polymer Science*, 2010, **115** (1), 127-136].

**NPARR 1(3), 2010-0481, Eucalyptus pulp fibres as alternative reinforcement to engineered cement-based composites**

This paper evaluates the advantages of using hardwood short fibre pulp (eucalyptus) as alternative to softwood long fibre pulp (pinus) and polymer fibres, traditionally used in reinforcement of cement-based materials. The effects of cellulose fibre length on microstructure and on mechanical performance of fibre-cement composites were evaluated before and after accelerated ageing cycles. Hardwood pulp fibres were better dispersed in the cement matrix and provided higher number of fibres per unitary weight or volume, in relation to softwood long fibre pulp. The short reinforcing elements lead to an effective crack bridging of the fragile matrix, which contributes to the improvement of the mechanical performance of the composite after ageing. These promising results show the potential of eucalyptus short fibres for reducing costs by both the partial replacement of expensive synthetic fibres in air curing process and the energy savings during pulp refining [G.H.D. Tonoli\*, H. Savastano Jr., E. Fuente, C. Negro, A. Blanco and F.A. Rocco Lahr (Structural Engineering Department, Escola de Engenharia de São Carlos, Universidade de São Paulo, Avenida Trabalhador São Carlense 400, São Carlos/SP 13566-590, Brazil), *Industrial Crops and Products*, 2010, **31**(2), 225-232].

## SPICES/CONDIMENTS

**NPARR 1(3), 2010-0482, Utilization of Fennel biomass (*Foeniculum vulgare*) a medicinal herb for the biosorption of Cd (II) from aqueous phase**

This work presents the biosorption potential of Fennel biomass for the effective removal of Cd (II) ions. The biosorption was maximum (92%) at pH 4.3. Maximum biosorption capacities of Cd (II) at 30, 40 and 50°C temperatures were 21, 24 and 30mg/g, respectively. The biosorption of Cd (II) was concentration dependent and increases from 0.49 to 9.3mg/g with increase in concentration from 5 to 100mg/l. Biosorption follows Freundlich isotherm at 50°C. Mean free energies at different temperatures were in between 7.1 and 11.95kJ/mol indicating chemical nature of biosorption

process. Kinetics studies showed that pseudo-second-order kinetics model was applicable to the data. The process was endothermic and spontaneous, the spontaneity of the process increases with increase in temperature. Regeneration studies showed a decrease in the recovery of Cd(II) from 99.8% to 41.7% in five consecutive cycles. 80% of the Cd(II) in single and multi-metal systems was recovered in 10mL. Breakthrough and exhaustive capacities of Cd(II) in single metal system were 10 and 40mg/g. For multi-metal systems in double distilled water the breakthrough and exhaustive capacities of Cd (II) were 2 and 12mg/g. In saline solution the breakthrough and exhaustive capacities of Cd(II) were 0.8 and 4mg/g [Rifaqat Ali Khan Rao\*, Moonis Ali Khan and Fouzia Rehman (Environmental Research Laboratory, Department of Applied Chemistry, Faculty of Engineering and Technology, Aligarh Muslim University, Aligarh 202002, UP, India), *Chemical Engineering Journal*, 2010, **156**(1), 106-113].

**NPARR 1(3), 2010-0483, Effects of extracts of spices on rumen methanogenesis, enzyme activities and fermentation of feeds *in vitro***

An experiment was conducted to study the effects of boiling water, methanol and ethanol extracts (0, 0.25 and 0.50 mL) of seeds of *Foeniculum vulgare* (fennel), flower buds of *Syzygium aromaticum* (clove), bulbs of *Allium sativum* (garlic), bulbs of *Allium cepa* (onion) and roots of *Zingiber officinalis* (ginger) on rumen methanogenesis, fibrolytic enzyme activities and fermentation characteristics *in vitro*. Ethanol and methanol extracts of fennel, clove and garlic at 0.50 mL and clove at 0.25mL inhibited ( $P < 0.05$ ) methane production. Carboxymethylcellulase activity was reduced ( $P < 0.05$ ) by ethanol and methanol extracts (0.50mL) of fennel and clove (0.25 and 0.50 mL). The extracts of clove reduced (0.25 and 0.50 mL) xylanase and acetylerase activities, and the fennel extract (0.50 mL) reduced ( $P < 0.05$ ) xylanase activity. However, the extracts of garlic (0.50 mL) increased ( $P < 0.05$ ) acetylerase activity. Concentrations of volatile fatty acids were reduced ( $P < 0.05$ ) by the extracts of garlic and onion. The extracts of garlic caused a decrease ( $P < 0.05$ ) in acetate: propionate ratio (A:P) at 0.50 mL, whereas A:P was increased ( $P < 0.05$ ) by the inclusion

of 0.50 mL extracts of clove. Methanol and ethanol extracts of clove decreased ( $P < 0.05$ ) *in vitro* organic matter degradability. Extracts (0.50 mL) of clove decreased ( $P < 0.05$ ) the numbers of total protozoa, small entodiniomorphs and holotrichs, whereas extracts of onion, ginger and garlic enhanced ( $P < 0.05$ ) protozoal numbers (both entodiniomorphs and holotrichs). Ethanol and methanol extracts of fennel and garlic have potential to inhibit rumen methanogenesis without adversely affecting rumen fermentation. [Amlan Kumar Patra\*, Devki Nandan Kamra and Neeta Agarwal (Department of Animal Nutrition, West Bengal University of Animal and Fishery Sciences, 37, K. B. Sarani, Belgachia, Kolkata 700037, India), *Journal of the Science of Food and Agriculture*, 2010, **90**(3), 511-520].

**NPARR 1(3), 2010-0484, Effect of hexane fraction of leaves of *Cinnamomum tamala* Linn on macrophage functions**

The leaves of *Cinnamomum tamala* Linn (Lauraceae), component of Indian spices are associated with hypoglycemic property in Ayurveda; however, no report is available towards its immunomodulation property, which has been explored here. The dried powder of CT leaves was extracted with hexane and solvent free extract (CTH) was given orally to rats for 10 days, in various doses. Its effect was studied on peritoneal macrophage functions, and was compared with ascorbic acid (1,000mg/kg, immune-stimulant) and cyclophosphamide (10mg/kg, immune-suppressant). CTH significantly suppressed phagocytosis activity [EC (50) 2,355 +/-52.45mg/kg], reduced production of superoxide [EC (50) 275.91 +/-10.21 microg/ml] and cellular NADPH [EC(50) 384.959 +/-4.85 microg/ml] content in concentration dependent manner. It also inhibited LPS induced production of nitric oxide [EC (50) 143.75 +/-3.40 microg/ml] and iNOS protein expression [EC(50) 183.132 microg/ml]. Thus, it could be suggested that non-polar hexane fraction of leaves of *C. tamala* possesses immunosuppressive property, which is mediated through modulation of innate immunity [Chaurasia JK, Pandey N and Tripathi YB\* (Department of Medicinal Chemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi,

India), *Inflammopharmacology*, 2010, **18**(3),147-54].

**NPARR 1(3), 2010-0485, Effects of hot spices on energy intake, appetite and sensory specific desires in humans**

This study investigated the effect of hot spices on energy intake and appetite. Forty participants received five meals of fixed portion sizes, served with or without five hot spices followed by a buffet. Spices were used in doses perceived as moderately hot, ensuring that the meals were palatable. Food intake (kJ), appetite and liking (before, during, after the meal and after the buffet), mood (before, after the meal and after the buffet) and desire to eat sweet, sour, fatty, salty, bitter and hot foods (after the meal and after the buffet) were measured on 9-point scales. Hot spices did not affect energy intake ( $p > 0.05$ ). Desire for sweet foods was increased by chili (0.6 point,  $p < 0.05$ ) whereas desire to eat salty foods was decreased by mustard (1 point,  $p < 0.01$ ), suggesting that hot spices can induce changes in sensory specific desires. Liking of the meals tended to increase during the buffet when compared to the relatively constant liking of the fixed starter meals, suggesting that traditional sensory specific satiety does not play a large role in determining eating behaviour with complex meals [Helene Christine Reinbach\*, Torben Martinussen and Per Møller (Faculty of Life Sciences, University of Copenhagen, Rolighedsvej 30, 1958 Frederiksberg C, Denmark), *Food Quality and Preference*, 2010, **21**(6), 655-661].

**NPARR 1(3), 2010-0486, Targeting inflammation-induced obesity and metabolic diseases by curcumin and other nutraceuticals**

Extensive research within the past two decades has revealed that obesity, a major risk factor for type 2 diabetes, atherosclerosis, cancer, and other chronic diseases, is a proinflammatory disease. Several spices have been shown to exhibit activity against obesity through antioxidant and anti-inflammatory mechanisms. Among them, curcumin, a yellow pigment derived from the spice turmeric (an essential component of curry powder), has been investigated most extensively as a treatment for obesity and obesity-related metabolic dis-

eases. Curcumin directly interacts with adipocytes, pancreatic cells, hepatic stellate cells, macrophages, and muscle cells. There, it suppresses the proinflammatory transcription factors nuclear factor-kappa B, signal transducer and activators of transcription-3, and Wnt/beta-catenin, and it activates peroxisome proliferator-activated receptor-gamma and Nrf2 cell-signaling pathways, thus leading to the downregulation of adipokines, including tumor necrosis factor, interleukin-6, resistin, leptin, and monocyte chemoattractant protein-1, and the upregulation of adiponectin and other gene products. These curcumin-induced alterations reverse insulin resistance, hyperglycemia, hyperlipidemia, and other symptoms linked to obesity. Other structurally homologous nutraceuticals, derived from red chili, cinnamon, cloves, black pepper, and ginger, also exhibit effects against obesity and insulin resistance [Aggarwal BB (Cytokine Research Laboratory, Department of Experimental Therapeutics, The University of Texas M. D. Anderson Cancer Center, Houston, Texas 77030, USA), *Annu Rev Nutr*, 2010, **30**, 173-99].

### **SUGARS (incl. Natural sweeteners, Jaggery, Palm sugar, Honey, etc.)**

#### **NPARR 1(3), 2010-0487, Physical, biochemical and antioxidant properties of some Indian honeys**

The study was intended to characterise the physicochemical and antioxidant properties of some commercial brands of Indian honeys. All the samples showed considerable variations with reference to their level of total phenolics, protein, radical scavenging activity, ascorbic acid equivalent antioxidant content (AEAC) and ferric reducing antioxidant potential (FRAP). Comparative studies of Indian honeys indicated the strong correlation between proline content and AEAC as well as 2,2-diphenyl-1-picryl-hydrazyl (DPPH) scavenging activity whereas phenol content was strongly correlated with FRAP values. Thus, overall antioxidant activity seems to be contributed by proline and phenol contents. Besides these major factors, colour pigments ( $ABS_{460}$ ) were also found to contribute significantly to the overall observed antioxidant activity [Sudhanshu Saxena, Satyendra Gautam and Arun

Sharma\*(Food Technology Division, Bhabha Atomic Research Centre, FIPLY, Trombay, Mumbai 400085, Maharashtra, India), *Food Chemistry*, 2010, **118**(2), 391-397].

#### **NPARR 1(3), 2010-0488, Changes in juice quality and sugarcane yield with recurrent selection for sucrose**

Sugarcane (*Saccharum* spp. hybrids) breeding programs in Louisiana have made improving sucrose content a top priority because a short growing season limits cane yield. Using a recurrent selection strategy, the cultivars with the highest sucrose content are crossed, and a new generation of cultivars is selected from the progeny. This study was designed to determine how selection primarily for sucrose content has modified physiological characters, and impacted sucrose content and yield. Five cultivars were randomly selected from each of seven generations of recurrent selection in Louisiana and planted in two experiments. The plant and first stubble crops were harvested late in the harvest season from each experiment. Cane yield and juice quality were determined. Cultivars from the last three generations were superior to cultivars from the first three generations for Brix % cane, sucrose % cane, purity, theoretically recoverable sugar (TRS), cane yield and sugar yield. Fiber % cane was not different among the generations. Selection primarily for sucrose has increased Brix % cane from 14 to 16%, sucrose % cane from 12% to 14%, purity from 82.5 to 87.3%, and TRS from 98 to 122 kgMg<sup>-1</sup>. A plateau in juice quality and sucrose yield in the last three generations may indicate that: (1) Louisiana's short growing season may restrict sucrose accumulation; (2) the genetic potential for late season juice quality has been reached with currently available germplasm; or (3) the inclusion of lower juice quality *Saccharum spontaneum* germplasm into the breeding program in order to increase disease tolerance, cold tolerance, and ratooning ability has diluted the effect of recurrent selection for sucrose [Sarah E. Lingle\*, Richard M. Johnson, Thomas L. Tew and Ryan P. Viator (USDA-ARS, 1100 Robert E. Lee Boulevard, New Orleans, LA 70124, USA), *Field Crops Research*, 2010, **118**(2), 152-157].

**NPARR 1(3), 2010-0489, Detection of adulterants such as sweeteners materials in honey using near-infrared spectroscopy and chemometrics**

Near-infrared (NIR) spectroscopy combined with chemometrics methods has been used to detect adulteration of honey samples. The sample set contained 135 spectra of authentic ( $n=68$ ) and adulterated ( $n=67$ ) honey samples. Spectral data were compressed using wavelet transformation (WT) and principal component analysis (PCA), respectively. In this paper, five classification modeling methods including least square support vector machine (LS-SVM), support vector machine (SVM), back propagation artificial neural network (BP-ANN), linear discriminant analysis (LDA), and  $K$ -nearest neighbors (KNN) were adopted to correctly classify pure and adulterated honey samples. WT proved more effective than PCA, as a means for variables selection. Best classification models were achieved with LS-SVM. A total accuracy of 95.1% and the area under the receiver operating characteristic curves (AUC) of 0.952 for test set were obtained by LS-SVM. The results showed that WT-LS-SVM can be as a rapid screening technique for detection of this type of honey adulteration with good accuracy and better generalization [Xiangrong Zhu, Shuifang Li, Yang Shan\*, Zhuoyong Zhang, Gaoyang Li, Donglin Su and Feng Liu (Hunan Agricultural Product Processing Institute, Hunan Academy of Agricultural Sciences, Changsha 410125, China), *Journal of Food Engineering*, 2010, **101**(1), 92-97].

**NPARR 1(3), 2010-0490, Stevia and saccharin preferences in rats and mice**

Use of natural noncaloric sweeteners in commercial foods and beverages has expanded recently to include compounds from the plant *Stevia rebaudiana*. Little is known about the responses of rodents, the animal models for many studies of taste systems and food intake, to stevia sweeteners. In the present experiments, preferences of female Sprague-Dawley rats and C57BL/6J mice for different stevia products were compared with those for the artificial sweetener saccharin. The stevia component rebaudioside A has the most sweetness and least off-tastes to human raters. In ascending concentration tests (48-h sweetener vs. water), rats and mice preferred a high-rebaudioside, low-

stevioside extract as strongly as saccharin, but the extract stimulated less overdrinking and was much less preferred to saccharin in direct choice tests. Relative to the extract, mice drank more pure rebaudioside A and showed stronger preferences but still less than those for saccharin. Mice also preferred a commercial mixture of rebaudioside A and erythritol (Truvia). Similar tests of sweet receptor T1R3 knockout mice and brief-access licking tests with normal mice suggested that the preferences were based on sweet taste rather than post-oral effects. The preference response of rodents to stevia sweeteners is notable in view of their minimal response to some other noncaloric sweeteners (aspartame and cyclamate) [Sclafani A\*, Bahrani M, Zukerman S and Ackroff K (Department of Psychology, Brooklyn College, Brooklyn, NY 11210, USA), *Chem Senses*, 2010, **35**(5), 433-43].

## THERAPEUTICS

**NPARR 1(3), 2010-0491, Anti-inflammatory and antipyretic effects of *Sonchus oleraceus* in rats**

*Sonchus oleraceus* Linn. has been used to relieve headaches, general pain, hepatitis, infections, inflammation and rheumatism in Brazilian folk medicine. Nevertheless, scientific information regarding this species is scarce; there are no reports related to its possible anti-inflammatory effects. This study was aimed at evaluating the scientific basis for the traditional use of *Sonchus oleraceus* using *in vivo* inflammatory models. Carrageenan-induced paw edema, peritonitis and febrile response induced by lipopolysaccharide tests, as well as fibrovascular tissue growth induced by s.c. cotton pellet implantation were used to investigate the anti-inflammatory activity of *Sonchus oleraceus* hydroethanolic extract (SoHE) in rats. The SoHE at test doses of 100-300mg/kg p.o. clearly demonstrated anti-inflammatory effects by reduced paw edema induced by carragenan, inhibited leukocyte recruitment into the peritoneal cavity and reduced LPS-induced febrile response, and in the model of chronic inflammation using the cotton pellet-induced fibrovascular tissue growth in rats, the SoHE significantly inhibited the formation of granulomatous tissue. The extract administered at 300mg/kg p.o. had a stronger anti-in-

flammatory effect than indomethacin (10mg/kg) or dexamethasone (1mg/kg). The hydroethanolic extract of *Sonchus oleraceus* markedly demonstrated anti-inflammatory action in rats, which supports previous claims of its traditional use. The administration of *Sonchus oleraceus* hydroethanolic extract (SoHE) demonstrated anti-inflammatory effects by reduced inhibited leukocyte recruitment into the peritoneal cavity and febrile response reduced induced by lipopolysaccharide (LPS) from *E. coli* [Fabiana C. Vilela, Andressa D. Bitencourt, Layla D.M. Cabral, Lidiane S. Franqui, Roseli Soncini and Alexandre Giusti-Paiva\* (Department of Biomedical Sciences of Federal University of Alfenas–MG, Alfenas, Brazil), *Journal of Ethnopharmacology*, 2010, **127**(3), 737-741].

**NPARR 1(3), 2010-0492, Gastroprotective activity of *Trichosanthes cucumerina* in rats**

All the experiments were conducted using Wistar strain rats (weight: 200-220g). The food and water given to rats was withdrawn for 36 and 12h respectively, before the commencement of the experiment. These rats were randomly divided into 6 groups ( $n=8$  rats/group; 4 males+4 females) and groups 1-3 were orally administrated with hot water extract (HWE) at a dose of 375, 500 and 750mg/kg, respectively. Group 4 was orally treated with equal volume of distilled water (1mL; control), group 5 was orally treated with a reference drug, cimetidine (100mg/kg) while the group 6 was orally treated with another reference drug, sucralfate (400mg/kg). In the indomethacin experiment, only one dose of HWE (750mg/kg) was tested, as this was found to have the maximum effect in the alcohol model also. Results show that the HWE of *Trichosanthes cucumerina* possesses significant ( $P\leq 0.05$ ) and dose dependent gastroprotective effects in the alcohol model in terms of the length and number of gastric lesions mediated by alcohol, with a maximum effect at 750mg/kg (inhibition of lesion length by 92%; number of gastric lesions by 88%). The same dose also mediated a significant ( $P\leq 0.05$ ) gastroprotective activity in the indomethacin model (inhibition of lesion length by 88%; number of gastric lesions by 84%). In both models, the protective effect demonstrated by the HWE

was comparable with that produced by cimetidine. The HWE significantly ( $P\leq 0.05$ ) increased the amount of mucus produced by the rat gastro mucosa (by 39%) and reduced the gastric acidity (total acidity by 36%; free acidity by 40%). pH of the gastric juice increased from 4.1 to 6.0. However, no change in the volume of gastric juice was observed. Further, HWE showed potent antihistamine activity. It may be concluded that HWE of *Trichosanthes cucumerina* exerts a significant protection against ethanol or indomethacin induced gastric damage. Increasing the protective mucus layer, decreasing the acidity of the gastric juice and antihistamine activity are probable mechanisms by which the HWE of *Trichosanthes cucumerina* mediates its gastroprotective actions [L.D.A.M. Arawwawala\* M.I. Thabrew and L.S.R. Arambewela (Industrial Technology Institute, Baudhaloka Mawatha, Colombo 07, Sri Lanka), *Journal of Ethnopharmacology*, 2010, **127**(3), 750-754].]

**NPARR 1(3), 2010-0493, Aqueous extract of *Carica papaya* leaves exhibits anti-tumor activity and immunomodulatory effects**

Various parts of *Carica papaya* Linn. (CP) have been traditionally used as ethnomedicine for a number of disorders, including cancer. There have been anecdotes of patients with advanced cancers achieving remission following consumption of tea extract made from CP leaves. However, the precise cellular mechanism of action of CP tea extracts remains unclear. The aim of the present study is to examine the effect of aqueous-extracted CP leaf fraction on the growth of various tumor cell lines and on the anti-tumor effect of human lymphocytes. In addition, identification of a functional molecular weight fraction in the CP leaf extract was also attempted. The effect of CP extract on the proliferative responses of tumor cell lines and human peripheral blood mononuclear cells (PBMC), and cytotoxic activities of PBMC were assessed by [ $^3$ H]-thymidine incorporation. Flow cytometric analysis and measurement of caspase-3/7 activities were performed to confirm the induction of apoptosis on tumor cells. Cytokine productions by PBMC were measured by ELISA. Gene profiling of the effect of CP extract treatment was performed by microarray analysis and real-time RT-PCR.

Significant growth inhibitory activity of the CP extract on tumor cell lines was observed. In PBMC, the production of IL-2 and IL-4 was reduced following the addition of CP extract, whereas that of IL-12p40, IL-12p70, IFN- $\gamma$  and TNF- $\alpha$  was enhanced without growth inhibition. In addition, cytotoxicity of activated PBMC against K562 was enhanced by the addition of CP extract. Moreover, microarray analyses showed that the expression of 23 immunomodulatory genes, classified by gene ontology analysis, was enhanced by the addition of CP extract. In this regard, CCL2, CCL7, CCL8 and SERPINB2 were representative of these upregulated genes, and thus may serve as index markers of the immunomodulatory effects of CP extract. Finally, we identified the active components of CP extract, which inhibits tumor cell growth and stimulates anti-tumor effects, to be the fraction with M.W. less than 1000. Since *Carica papaya* leaf extract can mediate a Th1 type shift in human immune system, our results suggest that the CP leaf extract may potentially provide the means for the treatment and prevention of selected human diseases such as cancer, various allergic disorders, and may also serve as immunoadjuvant for vaccine therapy [Noriko Otsuki, Nam H. Dang, Emi Kumagai, Akira Kondo, Satoshi Iwata and Chikao Morimoto\* (Division of Clinical Immunology, Advanced Clinical Research Center, The Institute of Medical Science, The University of Tokyo, Japan), *Journal of Ethnopharmacology*, 2010, **127**(3), 760-767].

**NPARR 1(3), 2010-0494, Hepatoprotective activity of ethanolic extracts of bark of *Zanthoxylum armatum* DC in CCl<sub>4</sub> induced hepatic damage in rats**

*Zanthoxylum armatum* DC is described as a hepatoprotective in Ayurveda, the Indian system of medicine. However, there is no scientific basis or reports in the modern literature regarding its usefulness as a hepatoprotective agent. The present study was carried out to evaluate the hepatoprotective activity of ethanolic extract of bark of *Zanthoxylum armatum* DC in CCl<sub>4</sub> induced hepatotoxicity in male Wistar rats. Ethanolic extracts at doses of 100, 200 and 400mg/kg were administered orally once daily for 7 days. The hepatoprotective activity was assessed using various

biochemical parameters like alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, serum bilirubin, total protein and serum antioxidant enzymes along with histopathological studies of liver tissue. The substantially elevated serum enzymatic levels of serum transaminases, alkaline phosphatase and total bilirubin were significantly restored towards normalization by the extracts. Bark extracts significantly increased the levels of antioxidant enzymes: superoxide dismutase, catalase and glutathione. Phytochemical analysis revealed presence of isoquinoline alkaloid, berberine, as well as flavonoids and phenolic compounds, which have been known for their hepatoprotective activities. *Z. armatum* DC possesses significant protective effect against hepatotoxicity induced by CCl<sub>4</sub> which may be attributed to the individual or combined action of phytoconstituents present in it [Lalitsingh Ranawat, Jigar Bhatt and Jagruti Patel\* (Department of Pharmacology, Institute of Pharmacy, Nirma University of Science and Technology, Sarkhej-Gandhinagar Highway, Ahmedabad 382481, India), *Journal of Ethnopharmacology*, 2010, **127**(3), 777-780].

**NPARR 1(3), 2010-0495, Anti-inflammatory and anti-arthritic activity of total flavonoids of the roots of *Sophora flavescens***

The roots of *Sophora flavescens* have long been used in Chinese medicine for the treatment of fever, inflammatory disorders, ulcers and skin burns. *Sophora flavescens* contains flavonoids and alkaloids. This study was conducted to develop a plant-based anti-inflammatory agent focused on chronic inflammatory disorders. To accomplish this, the alkaloid-free prenylated flavonoid-enriched fraction (PFS) of rhizomes of *Sophora flavescens* was prepared and its *in vitro* and *in vivo* anti-inflammatory activities were then evaluated for the first time. The inhibitory activity of PFS on PGE<sub>2</sub>, NO, IL-6 and TNF- $\alpha$  production of lipopolysaccharide (LPS)-treated RAW 264.7 cells was measured. Additionally, adjuvant-induced arthritis in rats was used as an animal model of chronic inflammation to establish the *in vivo* anti-inflammatory effects of PFS. PFS inhibited cyclooxygenase-2 (COX-2)-catalyzed PGE<sub>2</sub> and inducible nitric oxide synthase (iNOS)-catalyzed NO production by lipopolysaccharide (LPS)-

treated RAW 264.7 cells at 10-50 $\mu$ g/ml, and these effects primarily occurred via COX-2 inhibition and iNOS down-regulation, respectively. PFS also inhibited IL-6 and TNF- $\alpha$  production. When tested against adjuvant-induced arthritis in rats (chronic inflammation), PFS strongly inhibited arthritic inflammation when administered orally at doses of 10-100mg/kg/day. In addition, PFS administered orally potently inhibited acetic acid-induced writhing in mice. The results suggest that PFS inhibits chronic inflammatory response and the inhibition of proinflammatory molecules such as COX-2, iNOS and IL-6 may contribute, at least in part, to the anti-inflammatory activity *in vivo*. Overall, these results indicate that PFS from *Sophora flavescens* may have the potential for treatment of chronic inflammatory disorders such as rheumatoid arthritis [Jeong Ho Jin, Ju Sun Kim, Sam Sik Kang, Kun Ho Son, Hyun Wook Chang and Hyun Pyo Kim\*(College of Pharmacy, Kangwon National University, Chunchon 200-701, Republic of Korea), *Journal of Ethnopharmacology*, 2010, **127**(3), 589-595 ].

**NPARR 1(3), 2010-0496, *Tamarindus indica* Linn. (Fabaceae): Patterns of use in traditional African medicine- Review**

To increase the understanding of the ethnopharmacology of a single species, elaboration of dispersed primary data is required. *Tamarindus indica* Linn. (Fabaceae), or tamarind, is a common tree, especially in West Africa, with a good potential to contribute to affordable local health care based on traditional medicine (TM). For this single species review, more than 60 references with detailed information on the ethnopharmacology of *T. indica* in the African context were selected. It showed that most prominently, the fruits are used as laxative or febrifuge throughout the Sahel and Soudan ecological zones. Tamarind bark and leaves are often involved in the treatment of wounds, especially in central West Africa. While the bark is used to treat diarrhoea in West Africa, the leaves are used for this purpose in East Africa. The findings suggest a difference in the way tamarind is used between East and West Africa and we assess the similarities of its uses within those regions. This review demonstrates the capability of literature research to reveal

knowledge by mining and compiling information from the growing body of primary ethnopharmacologic data, much of which is published in this journal. By creating a specific profile of tamarind in the context of traditional medicine throughout Africa, the authors contribute to the collection of current ethnobotanic species accounts on *T. indica* that tend to be qualitative and more general [Reinout M. Havinga\*, Anna Hartl, Johanna Putscher, Sarah Prehler, Christine Buchmann and Christian R. Vogl (Working Group for Knowledge Systems and Innovations, Institute of Organic Farming, Department for Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences, Vienna, Gregor-Mendel Straße 33, A-1180 Vienna, Austria), *Journal of Ethnopharmacology*, 2010, **127**(3), 573-588].

**NPARR 1(3), 2010-0497, Protective effect of *Calendula officinalis* extract against UVB-induced oxidative stress in skin: Evaluation of reduced glutathione levels and matrix metalloproteinase secretion**

*Calendula officinalis* Linn. flowers have long been employed time in folk therapy and more than 35 properties have been attributed to decoctions and tinctures from the flowers. The main uses are as remedies for burns (including sunburns), bruises and cutaneous and internal inflammatory diseases of several origins. The recommended doses are a function both of the type and severity of the condition to be treated and the individual condition of each patient. Therefore, the present study investigated the potential use of *C. officinalis* extract to prevent UV irradiation-induced oxidative stress in skin.

Firstly, the physico-chemical composition of marigold extract (ME) (hydroalcoholic extract) was assessed and the *in vitro* antioxidant efficacy was determined using different methodologies. Secondly, the cytotoxicity was evaluated in L929 and HepG2 cells with the MTT assay. Finally, the *in vivo* protective effect of ME against UVB-induced oxidative stress in the skin of hairless mice was evaluated by determining reduced glutathione (GSH) levels and monitoring the secretion/activity of metalloproteinases. The polyph-

nol, flavonoid, rutin and narcissin contents found in ME were 28.6mg/g, 18.8mg/g, 1.6mg/g and 12.2mg/g, respectively and evaluation of the *in vitro* antioxidant activity demonstrated a dose-dependent effect of ME against different radicals. Cytotoxicity experiments demonstrated that ME was not cytotoxic for L929 and HepG2 cells at concentrations less than or equal to 15mg/ml. However, concentrations greater than or equal to 30mg/ml, toxic effects were observed. Finally, oral treatment of hairless mice with 150 and 300mg/kg of ME maintained GSH levels close to non-irradiated control mice. In addition, this extract affects the activity/secretion of matrix metalloproteinases 2 and 9 (MMP-2 and -9) stimulated by exposure to UVB irradiation. However, additional studies are required to have a complete understanding of the protective effects of ME for skin [Yris Maria Fonseca, Carolina Dias Catini, Fabiana T.M.C. Vicentini, Auro Nomizo, Raquel Fernanda Gerlach and Maria José Vieira Fonseca\*(Faculdade de Ciências Farmacêuticas de Ribeirão Preto, Universidade de São Paulo, Avenida do Café s/n, 14040-903 Ribeirão Preto, São Paulo, Brazil), *Journal of Ethnopharmacology*, 2010, **127**(3), 596-601].

**NPARR 1(3), 2010-0498, Beneficial effect of the administration of *Hemidesmus indicus* against bromobenzene induced oxidative stress in rat liver mitochondria**

To study the beneficial effect of the prior administration of an aqueous extract of *Hemidesmus indicus* against bromobenzene induced oxidative damage in rat liver mitochondria. Oxidative stress was induced in rats with bromobenzene (10mmol/kg body wt.). The rate of respiration, P/O ratios, lipid peroxides, protein carbonyls and sulphhydryls were studied. When the rats were administered with bromobenzene, the rate of respiration was decreased significantly and the P/O ratio was completely abolished. There was a significant increase on the levels of lipid peroxide and protein carbonyl and a significant decrease on total sulphhydryl groups when compared with control. Administration of rats with an aqueous extract (100mg/kg) prior to bromobenzene administration showed significant beneficial effects like, stimulation in respiration, prevented

the rise in lipid peroxides and protein carbonyls, increased the level of sulphhydryl groups back to control level. Administration of vitamin E could not reverse as effectively as *ra:Hemidesmus indicus*. This study demonstrates a good protective effect of *Hemidesmus indicus* against the bromobenzene induced oxidative stress [S. Gopi and O.H. Setty\* (Department of Biochemistry, School of Life Sciences, University of Hyderabad, Hyderabad 500 046, India), *Journal of Ethnopharmacology*, 2010, **127**(1), 200-203].

**NPARR 1(3), 2010-0499, Effects of *Tribulus terrestris* on endocrine sensitive organs in male and female Wistar rats**

The possible effects of *Tribulus terrestris* (TT) on endocrine sensitive organs in intact and castrated male rats as well as in a post-menopausal rat model using ovariectomized females were investigated. Three different dose levels of TT (11, 42 and 110mg/kg/day) were administered to castrated males for 7 days and to intact males and castrated females for 28 days. In addition to TT treatment, all experiments also included a group of rats treated with dehydroepiandrosterone (DHEA). In experiments using castrated males and females we also used testosterone and 17 $\alpha$ -ethynylestradiol, respectively, as positive controls for androgenicity and estrogenicity. Neither DHEA nor TT was able to stimulate androgen sensitive tissues like the prostate and seminal vesicle in both intact and castrated male rats. In addition, administration of TT to intact male rats for 28 days did not change serum testosterone levels as well as did not produce any quantitative change in the fecal excretion of androgenic metabolites. However, a slight increase in the number of homogenization-resistant spermatids was observed in rats treated with 11mg/kg/day of TT extract. In ovariectomized females, TT did not produce any stimulatory effects in uterine and vaginal epithelia.

*Tribulus terrestris* was not able to stimulate endocrine sensitive tissues such as the prostate, seminal vesicle, uterus and vagina in Wistar rats, indicating lack of androgenic and estrogenic activity *in vivo*. It showed a positive effect of TT administration on rat sperm production, associated with unchanged levels of circulating androgens [Anderson J. Martino-Andrade\*, Rosana

N. Morais, Katherinne M. Spencoski, Stefani C. Rossi, Marina F. Vechi, Munisa Golin, Natália F. Lombardi, Cláudio S. Greca and Paulo R. Dalsenter (Departamento de Fisiologia, Universidade Federal do Paraná, Centro Politécnico, 81531-980 Curitiba, Brazil), *Journal of Ethnopharmacology*, 2010, **127**(1), 165-170].

**NPARR 1(3), 2010-0500, Anti-inflammatory and anti-asthmatic effects of *Viola mandshurica* W. Becker (VM) ethanolic (EtOH) extract on airway inflammation in a mouse model of allergic asthma**

The efficacy of *Viola mandshurica* W. Becker (VM) ethanolic (EtOH) extract in the treatment of bronchial asthma in an ovalbumin (OVA)-induced asthmatic BALB/c mouse model. Female BALB/c mice were sensitized with intraperitoneal (i.p.) ovalbumin (OVA) on days 0 and 14, and were next given intranasal OVA on days 28-30. Randomized treatment groups of sensitized mice received VM EtOH extract, dexamethasone, or placebo, orally, from days 28 to 30. VM EtOH extract significantly inhibited increases in total immunoglobulin E (IgE) and cytokines IL-4 and IL-13 levels in serum and bronchoalveolar lavage fluid (BALF), and also effectively suppressed airway hyperresponsiveness (AHR), eosinophilia, and mucus hypersecretion, in mice with OVA-induced asthma. The results suggest that VM EtOH extract and allied extracts could be useful herbal medicines for asthma treatment, and that VM may also be a valuable lead material for anti-asthma drug development [Mee-Young Lee, Ji-Eun Yuk, Ok-Kyoung Kwon, Hui-Seong Kim, Sei-Ryang Oh, Hyeong-Kyu Lee and Kyung-Seop Ahn\* (Immune Modulator Research Center, Korea Research Institute of Bioscience and Biotechnology, P.O. Box 115, Yuseong, Daejeon 305-600, Republic of Korea), *Journal of Ethnopharmacology*, 2010, **127**(1), 159-164].

**NPARR 1(3), 2010-0501, Value of the ethnomedical information for the discovery of plants with antifungal properties. A survey among seven Latin American countries**

This study reports the antifungal evaluation of 327 plant species (92 families and 251 genera) from seven Latin American countries which were selected on the basis of their reported ethnomedical uses and

compared them with plants selected at random. The main aim of this study was to investigate whether the probability of detecting antifungal plants is higher when plants have reports of ethnopharmacological uses related to fungal infections (PAU group) than when they are selected at random (PNAU group). (b) The second objective was to determine, within the PAU group, whether the probability of obtaining a positive result will be higher when the plants are tested against dermatophytes, than against yeasts or *Aspergillus* spp. (c) The third goal was to investigate, within all MICs  $\leq 1000$  mg/mL, if the MICs displayed by the PAU group are comparatively lower than MIC values of the PNAU group; that is to say, if they can be expected more potent antifungal plants within the group of plants that have a history of traditional use related to fungal infections than when they do not have one. A five-stage process of documentation, evaluation and analysis of results was conducted: (1) selection of words that could describe the ethnopharmacological use related to fungal infections; (2) a survey of specialized literature in each country; (3) collection and preparation of an extract of each plant; (4) antifungal evaluation of the selected plants and (5) statistical analysis of the results. For the antifungal evaluation, the microbroth dilution assay recommended by the Clinical and Laboratory Standards Institute (CLSI, formerly NCCLS) was used against a panel of eleven human opportunistic and pathogenic fungi. For the statistical analysis the Pearson's Chi Square test and the Score's test were used. (a) A significantly higher probability of detecting plants with antifungal activity against at least one fungus was found within the PAU (40.3%) than the PNAU group (21.3%) ( $p < 0.01$ ); (b) A similar higher probability than in (a) (39.6% vs. 20.8%) was found when plants were tested against dermatophytes ( $p < 0.01$ ) but not against yeasts or *Aspergillus* spp. ( $p > 0.05$ ); (c) Within the detected antifungal plants from both groups, plants of the PAU group displayed higher activities (lower MICs) than those of PNAU group against dermatophytes ( $p < 0.05$ ) but not against yeasts or *Aspergillus* spp.

Considering that dermatophytes are the cause of superficial fungal infections, which can be easily detected and followed by traditional healers, our findings

suggest that the ethnopharmacological approach is useful in guiding the detection of antifungal plants in Latin America mainly for infections in which the pathological expression is obvious and, therefore, the cure can be clearly observed [Laura Svetaz, Federico Zuljan, Marcos Derita, Elisa Petenatti, Giselle Tamayo, Armando Cáceres, Valdir Cechinel Filho, Alberto Giménez, Roberto Pinzón, Susana A. Zacchino\* and Mahabir Gupta (Farmacognosia, Facultad de Ciencias Bioquímicas y Farmacéuticas, Universidad Nacional de Rosario, Rosario, Argentina), *Journal of Ethnopharmacology*, 2010, **127**(1), 137-158].

**NPARR 1(3), 2010-0502, *In vivo* antioxidative activity of a quantified *Pueraria lobata* root extract**

Oxidative stress has been associated with many pathological disorders such as atherosclerosis, diabetes and cancer. Supplementation with exogenous antioxidants, including phenolic compounds from plant sources, may help to restore the pro-oxidative/antioxidative balance. To take into account effects of absorption, metabolism, plasma protein binding, distribution, and elimination, antioxidative research should not be limited to *in vitro* assays but be extended to *in vivo* models. In the present work a quantified 50% EtOH root extract of *Pueraria lobata* (Willd.) Ohwi (Fabaceae) was selected to determine its *in vivo* antioxidative activity in a diabetic rat model, where diabetes and the accompanying oxidative stress were induced by intraperitoneal administration of streptozotocin. This root extract was found to contain  $10.42 \pm 0.15\%$  puerarin as the main constituent and smaller amounts of the related isoflavonoids 32-hydroxyruerarin, 32-methoxyruerarin, 63-xylosylruerarin, daidzin, genistin, daidzein and genistein, as determined by a validated HPLC method. This extract was administered orally at a daily dose of 500mg/kg root extract, corresponding to 50mg/kg puerarin, during 3 weeks. In addition the effect on the plasma concentration of some fat-soluble antioxidants (co-enzyme Q<sub>9</sub>,  $\alpha$ - and  $\gamma$ -tocopherol) was evaluated. The level of malondialdehyde (MDA) in plasma, used as a marker of oxidative damage to lipids, was reduced to the same level as in healthy control animals, and as in

the positive control group treated daily with 50mg/kg  $\alpha$ -tocopherol acetate. No obvious signs of toxicity were observed by administration of 10 $\times$  the treatment dose [Lidiya Bebrevska, Kenne Foubert, Nina Hermans, Shyama Chatterjee, Eric Van Marck, Guido De Meyer, Arnold Vlietinck, Luc Pieters\* and Sandra Apers (Laboratory of Pharmacognosy and Pharmaceutical Analysis, Department of Pharmaceutical Sciences, Faculty of Pharmaceutical, Biomedical and Veterinary Sciences, University of Antwerp, Universiteitsplein 1, 2610 Antwerp, Belgium), *Journal of Ethnopharmacology*, 2010, **127**(1), 112-117].

**NPARR 1(3), 2010-0503, Analgesic and anti-inflammatory effects of *Cassia siamea* Lam. stem bark extracts**

The present study was carried out to investigate analgesic and anti-inflammatory activities of *Cassia siamea* Lam stem bark extracts. Cytotoxicity of each extract was also determined. *C. siamea*, a widespread medicinal plant traditionally used in sub-Saharan Africa, was collected in Congo Brazzaville. Stem bark was extracted with petroleum ether (CSE1), chloroform (CSE2), ethanol (CSE3) and water (CSE4). Analgesic, anti-inflammatory and antipyretic activities of these extracts were assessed in rats with hot plate test, paw pressure and carrageenan induced paw oedema. Cytotoxicity was assessed against KB and Vero cells. At the doses used (100, 200, and 400 mg/kg) ethanol and water extracts showed significant and dose-dependent analgesic and anti-inflammatory effects. None of the extracts had cytotoxic activity on KB and Vero cell lines and the most active extracts (CSE3 and CSE4) had no acute toxicity. The study highlighted the analgesic and anti-inflammatory of *C. siamea* stem bark. Four major families of compounds present in the plant may explain these activities: triterpenes (lupeol, oleanolic acid, ursolic acid, friedelin, betulin), flavonoids (apigenin, kaempferol, luteolin), anthraquinones (emodin), phytoosterols (stigmasterol, beta-sitosterol) [G.F. Nsonde Ntandou, J.T. Banzouzi\*, B. Mbatchi, R.D.G. Elion-Itou, A.W. Etou-Ossibi, S. Ramos, F. Benoit-Vical, A.A. Abena and J.M. Ouamba (Centre d'Etude et de Recherche Médecins d'Afrique (CERMA), B.P. 45,

Brazzaville, Congo), *Journal of Ethnopharmacology*, 2010, **127**(1), 108-111].

**NPARR 1(3), 2010-0504, *Leucas cephalotes* regulates carbohydrate and lipid metabolism and improves antioxidant status in IDDM and NIDDM rats**

*Leucas cephalotes* (Roth.) Spreng. (Lamiaceae) is an Ayurvedic traditional medicinal plant used in India, Nepal and Pakistan to treat several ailments including diabetes. The aim of the present study is to investigate the antidiabetic, antihyperlipaemic and antioxidant activities of *Leucas cephalotes* for its purported use in diabetes. The ethanol extract of leaves of *Leucas cephalotes* was administered (150, 300 and 450mgkg<sup>-1</sup>bw) to diabetes induced (IDDM and NIDDM) rats and carbohydrate, lipid, antioxidant, urea and creatinine profiles were assessed. All the three doses of extract decreased plasma glucose and lipid profiles and, improved the antioxidant status of both types of diabetic rats. The extract administration improved hepatic glycogen content and hexokinase activity, decreased glucose-6-phosphatase activity, blood urea, creatinine contents and decreased lipid peroxidation in diabetic rats. Of the three doses used, 450mgkg<sup>-1</sup>bw dose was found to be more potent in its effects comparable to those of glibenclamide and metformin. Thus it can be concluded that *L. cephalotes* regulates both carbohydrate and lipid metabolism and, improves body antioxidant defense systems in both types of diabetes [Jasmin H. Bavarva and A.V.R.L. Narasimhacharya\* (Department of Biosciences, Satellite Campus, Sardar Patel University, Vallabh Vidyanagar 388120, Gujarat, India), *Journal of Ethnopharmacology*, 2010, **127**(1), 98-102].

**NPARR 1(3), 2010-0505, Pharmacological evidence favouring the use of *Nauclea latifolia* in malaria ethnopharmacy: Effects against nociception, inflammation, and pyrexia in rats and mice**

*Nauclea latifolia* Smith is used traditionally in the treatment of uncomplicated malaria and painful conditions among its several other applications. The objective of this study is to investigate the pharmacological activities of the plant relevant to the symptomatic treat-

ment of malaria fever and other painful conditions as an initial step towards developing an effective therapy for the symptomatic management of malaria fever and relief of other painful conditions. Various concentrations of the aqueous extract of the root bark of this plant were evaluated for its anti-nociceptive, anti-inflammatory and anti-pyretic activities in mice and rats. Investigation of the anti-nociceptive activities was performed using the acetic acid-induced abdominal constriction and hot-plate tests in mice and formalin-induced pain test in rats, as models of nociception. The extract was also investigated for its effect against inflammation induced by egg-albumin and pyrexia induced by yeast in rats. Our data showed that the aqueous extract of *Nauclea latifolia* root bark (50-200mg/kg p.o.) significantly ( $P<0.05$ ) attenuated writhing episodes induced by acetic acid and increased the threshold for pain perception in the hot-plate test in mice, dose-dependently. The product also remarkably decreased both the acute and delayed phases of formalin-induced pain in rats and also caused a significant reduction in both yeast-induced pyrexia and egg-albumin-induced oedema in rats. These effects were produced in a dose-dependent manner. The results suggest the presence of biologically active principles in the extract with anti-nociceptive, anti-inflammatory and anti-pyretic activities that justifies its use in malaria ethnopharmacy and subsequent development for clinical application [J. Abbah\* S. Amos, B. Chindo, I. Ngazal, H.O. Vongtau, B. Adzu, T. Farida, A.A. Odutola, C. Wambebe and K.S. Gamaniel (Programme in Neuroscience, Uniformed Services University of the Health Sciences, Bethesda, MD, USA), *Journal of Ethnopharmacology*, 2010, **127**(1), 85-90].

**NPARR 1(3), 2010-0506, Aqueous extracts and polysaccharides from Marshmallow roots (*Althea officinalis* L.): Cellular internalisation and stimulation of cell physiology of human epithelial cells *in vitro***

Aqueous extracts from the roots of *Althea officinalis* Linn. (Malvaceae) are widely used for treatment of irritated mucosa. The clinical proven effects are related to the presence of bioadhesive and mucilaginous polysaccharides from the rhamnogalacturonan type, leading to the physical formation of mucin-like on top

of the irritated tissues. No data are available if the extracts or the polysaccharides from these extract exert an active influence on mucosal or connective tissue cells, in order to initiated changes in cell physiology, useful for better tissue regeneration. *In vitro* investigations of aqueous *A. officinalis* extract AE and raw polysaccharides (RPS) on epithelial KB cells and primary dermal human fibroblasts (pNHF) using WST1 vitality test and BrdU proliferation ELISA. Gene expression analysis by microarray from KB cells. Internalisation studies of polysaccharides were performed by laser scanning microscopy. AE (1, 10µg/mL) had stimulating effect on cell viability and proliferation of epithelial KB cells. RPS (1,10µg/mL) stimulated cell vitality of epithelial cells significantly without triggering the cells into higher proliferation status. Neither AE nor RPS had any effect on fibroblasts. FITC-labeled RPS was shown to be internalised into epithelial cells, but not into fibroblasts. FITC-RPS was shown to form bioadhesive layers on the cell surface of dermal fibroblasts. Microarray analysis indicated an up-regulation of genes related to cell adhesion proteins, growth regulators, extracellular matrix, cytokine release and apoptosis. Aqueous extracts and polysaccharides from the roots of *A. officinalis* are effective stimulators of cell physiology of epithelial cells which can prove the traditional use of Marshmallow preparations for treatment of irritated mucous membranes within tissue regeneration [Alexandra Deters, Janina Zippel, Nils Hellenbrand, Dirk Pappai, Cathleen Possemeyer and Andreas Hensel\* (University of Münster, Institute for Pharmaceutical Biology and Phytochemistry (IPBP), Hittorfstraße 56, D-48149 Münster, Germany), *Journal of Ethnopharmacology*, 2010, **127**(1), 62-69].

**NPARR 1(3), 2010-0507 Cognitive enhancement and neuroprotective effects of *Bacopa monnieri* in Alzheimer's disease model**

*Bacopa monnieri* (Linn.) Wettst., a plant belonging to the family Scrophulariaceae, has been used in the traditional system of Ayurvedic medicine to improve intelligence and memory for a long time. Therefore, the potential of this plant to protect against Alzheimer's disease has been raised but less supported document is available. The present study was conducted

to determine the effect of alcoholic extract of *B. monnieri* on cognitive function and neurodegeneration in animal model of Alzheimer's disease induced by ethylcholine aziridinium ion (AF64A). Male Wistar rats were orally given the alcoholic extract of *B. monnieri* at doses of 20, 40 and 80mg/kg BW via feeding needle for a period of 2 weeks before and 1 week after the intracerebroventricular administration of AF64A bilaterally. Rats were tested for spatial memory using Morris water maze test and the density of neurons and cholinergic neurons was determined using histological techniques 7 days after AF64A administration. *Bacopa monnieri* extract improved the escape latency time ( $p < 0.01$ ) in Morris water maze test. Moreover, the reduction of neurons and cholinergic neuron densities were also mitigated. These findings suggest that *B. monnieri* is a potential cognitive enhancer and neuroprotectant against Alzheimer's disease [Nongnut Uabundit, Jintanaporn Wattanathorn\*, Supaporn Mucimapura and Kornkanok Ingkaninan (Department of Physiology, Faculty of Medicine, Khon Kaen University, Muang, Khon Kaen 40002, Thailand), *Journal of Ethnopharmacology*, 2010, **127**(1), 26-31

**NPARR 1(3), 2010-0508, The antidiabetic plants *Tecoma stans* (L.) Juss. ex Kunth (Bignoniaceae) and *Teucrium cubense* Jacq (Lamiaceae) induce the incorporation of glucose in insulin-sensitive and insulin-resistant murine and human adipocytes**

*Tecoma stans* (Linn.) Juss. ex Kunth. (Bignoniaceae) and *Teucrium cubense* Jacq (Lamiaceae) are plants extensively used for the empirical treatment of diabetes mellitus, but their antidiabetic mechanisms remain to be clarified. In this study, the effect of aqueous extracts of *Tecoma stans* (TSE) and *Teucrium cubense* (TCE) on the glucose uptake in adipose cells was evaluated. Non-toxic concentrations of TSE and TCE were assayed on the adipogenesis and 2-NBDglucose uptake in insulin-sensitive and insulin-resistant murine 3T3-F442A and human subcutaneous adipocytes.

Both extracts stimulated 2-NBDG uptake by insulin-sensitive and insulin-resistant adipocytes in a concentration-dependent manner. In insulin-sensitive cells, TSE 70µg/ml stimulated 2-NBDG uptake by

193% (murine) and by 115% (human), whereas the same concentration of TCE induced the 2-NBDG uptake by 112% (murine) and 54% (human). In insulin-resistant adipocytes, TSE induced the 2-NBDG uptake by 94% (murine) and 70% (human), compared with the incorporation shown by insulin-sensitive adipocytes stimulated by the hormone, whereas TCE induced the incorporation of 2-NBDG by 69% (murine) and 31% (human). On the other hand, TSE and TCE exerted only minimal or null proadipogenic effects on murine and human preadipocytes. *Tecoma stans* and *Teucrium cubense* exert their antidiabetic effects stimulating glucose uptake in both insulin-sensitive and insulin-resistant murine and human adipocytes without significant proadipogenic or antiadipogenic side effects [Angel Josabad Alonso-Castro, Rocio Zapata-Bustos, José Romo-Yañez, Paul Camarillo-Ledesma, Maricela Gómez-Sánchez and Luis A. Salazar-Olivo\* (Instituto Potosino de Investigación Científica y Tecnológica, División de Biología Molecular, San Luis Potosí, SLP, Mexico), *Journal of Ethnopharmacology*, 2010, **127**(1), 1-6

**NPARR 1(3), 2010-0509, Physical and biological properties of yam as a saliva substitute**

The purpose of this study was to investigate the viscosity and wettability of a water-soluble extract of yam and its effects on lysozyme and peroxidase activities. Human whole saliva, yam tuber, hen egg-white lysozyme, and bovine lactoperoxidase were used. Viscosity was measured with a cone-and-plate digital viscometer, while wettability was determined by measuring the contact angle. Lysozyme activity was determined by the turbidimetric method. Peroxidase activity was determined using the NbsSCN assay. Hydroxyapatite beads were used as a solid-phase. The viscosity of the yam solution was proportional to its concentration, with diluted yam solutions at 1:5 and 1:10 in simulated salivary buffer displaying similar viscosity values to unstimulated whole saliva and stimulated whole saliva, respectively. The contact angle of yam solution was not significantly different according to the tested materials or yam concentrations. Contact angles of yam solutions on acrylic resin were higher than those of human saliva.

Yam affected lysozyme and peroxidase activities, and those effects were different on the hydroxyapatite surface versus in solution. Hydroxyapatite-adsorbed yam increased subsequent adsorption of lysozyme and peroxidase. Thus the similarity of the viscoelastic properties of yam and human saliva, suggesting a role for yam in the development of effective saliva substitutes [Moon-Soo Park, Ji-Youn Chang, Yoon-Young Kim, Jeong-Hyun Kang and Hong-Seop Kho\* (Department of Oral Medicine and Oral Diagnosis, School of Dentistry and Dental Research Institute, Seoul National University, Yunkeun-Dong 28, Chongro-Ku Seoul, Republic of Korea), *Archives of Oral Biology*, 2010, **55**(2), 177-183].

**NPARR 1(3), 2010-0510, Potent antibacterial property of APC protein from curry leaves (*Murraya koenigii* Linn.)**

A monomeric protein with molecular mass of 35 kDa, isolated from *Murraya koenigii* Linn. (curry leaves) shows potent antibacterial activity. The protein designated as APC (antioxidant protein from curry leaves) demonstrated potent antibacterial activity against all the human pathogenic strains tested. APC effectively inhibited *Escherichia coli*, *Staphylococcus aureus*, *Vibrio cholerae*, *Klebsiella pneumoniae*, *Salmonella typhi* and *Bacillus subtilis*. The inhibition is comparable to that of commercial antibiotics chloramphenicol, streptomycin and gentamycin. APC inhibited bacterial growth, with MIC values ranging from 13 to 24 µg/ml, which are comparable to MIC values of standard antibiotics. APC is devoid of ribonuclease/deoxyribonuclease and protease activity. APC is non-toxic at tested doses. These results encourage further studies of APC as a potent therapeutic agent [Mylarappa B. Ningappa, B.L. Dhananjaya, R. Dinesha, R. Harsha and Leela Srinivas\* (Adichunchanagiri Biotechnology and Cancer Research Institute, Balagangadharanatha Nagara, Mandya District, Karnataka 571 448, India), *Food Chemistry*, 2010, **118**(3), 747-750].

**NPARR 1(3), 2010-0511, Hepatoprotective effect of the root extract of *Decalepis hamiltonii* against carbon tetrachloride-induced oxidative stress in rats**

*Decalepis hamiltonii*, a climbing shrub, grows in the forests of peninsular India and is consumed for its health promoting properties. The hepatoprotective activity of the aqueous extract of the roots of *D. hamiltonii* with known antioxidant constituents was studied against carbon tetrachloride (CCl<sub>4</sub>)-induced oxidative stress and liver injury in rats. Pretreatment of rats with aqueous extract of the roots of *D. hamiltonii*, single (50, 100 and 200mg/kg b.w.) and multiple doses (50 and 100mg/kg b.w. for 7days) significantly prevented the CCl<sub>4</sub> (1ml/kg b.w.) induced hepatic damage as indicated by the serum marker enzymes (AST, ALT, ALP, and LDH). Parallel to these changes, the root extract also prevented CCl<sub>4</sub>-induced oxidative stress in the rat liver by inhibiting lipid peroxidation and protein carbonylation, and restoring the levels of antioxidant enzymes (SOD, CAT, GPx, GR, and GST) and glutathione. The biochemical changes were consistent with histopathological observations suggesting marked hepatoprotective effect of the root extract in a dose dependent manner. Protective effect of the aqueous extract of the roots of *D. hamiltonii* against CCl<sub>4</sub>-induced acute hepatotoxicity could be attributed to the antioxidant constituents [Anup Srivastava\* and T. Shivanandappa (Department of Pathology, Center for Free Radical Biology, University of Alabama at Birmingham, 901, 19th St. S., Rm #347, Birmingham, AL 35294, USA), *Food Chemistry*, 2010, **118**(2), 411-417].

**NPARR 1(3), 2010-0512, Antioxidant and anticancer activities of 8-hydroxypsoralen isolated from wampee [*Clausena lansium* (Lour.) Skeels] peel**

Fruits of wampee [*Clausena lansium* (Lour.) Skeels] contain a significant amount of coumarins with many health benefits. The activity-guided separation of an ethyl acetate-soluble fraction on a polyamide column followed by silica gel column and high performance liquid chromatography (HPLC) preparation afforded a pure compound, which was identified to be 8-hydroxypsoralen based on the <sup>1</sup>H, <sup>13</sup>C NMR (nuclear magnetic resonance), and ESI-MS (electrospray ionisation mass spectrometric) analysis. This isolate exhibited good scavenging activities against DPPH radical and superoxide anion as well as significant reducing

power. It also showed potent proliferation inhibitory activity against human hepatocellular liver carcinoma cell line (HepG2), human lung adenocarcinoma epithelial cell line (A549) and human cervical carcinoma cell line (HELA). This is the first report on the antioxidant and cytotoxic properties of *C. lansium* fruit extract. The food and pharmaceutical industry could be benefited by the usage of this extract containing this constituent [K. Nagendra Prasad, Haihui Xie, Jing Hao, Bao Yang, Shengxiang Qiu, Xiaoyi Wei, Fang Chen and Yueming Jiang\* (South China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, People's Republic of China), *Food Chemistry*, 2010, **118**(1), 62-66].

**NPARR 1(3), 2010-0513, Analgesic and anti-inflammatory activity of Caryophyllene oxide from *Annona squamosa* L. bark**

Caryophyllene oxide was isolated from an unsaponified petroleum ether extract of the bark of *Annona squamosa* and studied for its analgesic and anti-inflammatory activity. Caryophyllene oxide at the doses of 12.5 and 25mg/kg body wt. and unsaponified petroleum ether extract at a dose of 50mg/kg body wt. showed significant central as well as peripheral analgesic, along with anti-inflammatory activity. These activities of caryophyllene oxide were comparable with the standard drug used in the respective experiments [M.J. Chavan, P.S. Wakte and D.B. Shinde\* (Department of Chemical Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad 431 001, M.S., India), *Phytomedicine*, 2010, **17**(2), 149-151].

**NPARR 1(3), 2010-0514, Rose hip herbal remedy in patients with rheumatoid arthritis – a randomised controlled trial**

The study was done to investigate if standardised powder made from rose-hip (*Rosa canina*) can reduce the symptom score in patients with rheumatoid arthritis. In a double-blind placebo-controlled trial, patients with rheumatoid arthritis (RA) according to ARA/ACR criteria were randomised to treatment with capsulated rose-hip powder 5g daily or matching placebo for 6 months at two outpatient clinics in Berlin and Copenhagen. Primary outcome variable was Health

Assessment Questionnaire (HAQ) at 6 months, secondary outcome included DAS-28, physician's global evaluation of disease activity, RAQoL, SF-12 and concomitant pain medication. In a total of 89 patients (90% female, mean age 56.6±11.3 years, mean disease duration 12.8±9.6 years) HAQ-DI in the rose-hip group improved by 0.105±0.346, whereas in the placebo group it worsened by 0.039±0.253 ( $p$  adjusted=0.032). In the HAQ Patient Pain Scale no significant differences were observed between both groups. In the HAQ Patient Global Scale a trend was seen favouring rose-hip ( $p=0.078$ ). The DAS-28 score yielded improvement in the rose-hip group of 0.89±1.32 and in the placebo group of 0.34±1.27 ( $p=0.056$ ) indicating moderate clinical relevance. The Physicians Global Scale demonstrated more improvement in the rose-hip compared to the placebo group ( $p=0.012$ ). RAQoL and SF-12 physical score improved significantly in the rose-hip group compared to placebo, whereas SF-12 mental score remained unchanged. Intake of pain medication was not different between the groups. Per-protocol analysis confirmed these results. The results indicate that patients with RA may benefit from additional treatment with rose hip powder [S.N. Willich, K. Rossnagel, S. Roll, A. Wagner, O. Mune, J. Erlendson, A. Kharazmi, H. Sørensen and K. Winther\* (Frederiksberg Hospital, Department of Clinical Biochemistry, University of Copenhagen, Denmark), *Phytomedicine*, 2010, **17**(2), 87-93].

**NPARR 1(3), 2010-0515, Effect of green tea extract (catechins) in reducing oxidative stress seen in patients of pulmonary tuberculosis on DOTS Cat I regimen**

The role played by free radicals in pathogenesis of pulmonary tuberculosis and treatment mediated toxicity is well established. Hence, the present study was undertaken to assess the effect of crude green tea catechin in reducing the oxidative stress seen in patients of AFB positive pulmonary tuberculosis. A total of 200 newly diagnosed cases of AFB positive pulmonary tuberculosis, who received CAT I regimen were enrolled consecutively from DOTS center. Out of 200 patients, 100 randomly selected patients received catechin (500µg) with antitubercular treatment (ATT) (cases) and

100 received starch (500µg) with ATT (control). Oxidative stress level in blood samples of cases and controls as compared at the time of enrollment and after one and four months of treatment. Oxidative stress was measured in terms of free radicals (lipid peroxidation, nitric oxide), enzymatic antioxidant (catalase, superoxide dismutase, glutathione peroxidase) and non enzymatic antioxidant (total thiol, reduced glutathione) levels. The results showed significant difference in all the parameters among cases and controls. A significant decrease ( $p\leq 0.001$ ) in LPO level was observed in cases as compare to controls during the follow up while the level of NO was significantly increased ( $p\leq 0.001$ ) in cases as compare to controls. Significant decrease ( $p\leq 0.001$ ) in catalase and GPx level was observed in cases as compare to controls while SOD levels significantly rose ( $p\leq 0.001$ ) in cases as compared to controls. Significant decrease ( $p\leq 0.001$ ) in SH level was observed in cases as compared to controls while the level of GSH was significantly increased ( $p\leq 0.001$ ). These findings suggest that crude catechin extract can play a definite role as adjuvant therapy in management of oxidative stress seen in pulmonary tuberculosis patients. More detailed studies are needed to document use of catechin in reducing the frequency and severity of side effects of treatment [Astha Agarwal, Rajendra Prasad and Amita Jain\* (Department of Microbiology, Chhatrapati Shahuji Maharaj Medical University, Lucknow, UP 226003, India), *Phytomedicine*, 2010, **17**(1), 23-27].

**NPARR 1(3), 2010-0516, Insulin mimetic impact of Catechin isolated from *Cassia fistula* on the glucose oxidation and molecular mechanisms of glucose uptake on Streptozotocin-induced diabetic Wistar rats**

Diabetes mellitus is the most common and serious metabolic disorder among people all over the world. Many plants have successfully been used to overcome this problem. *Cassia fistula*, an ethnomedicinal plant, is widely used in Indian medicine to treat diabetes. Methanol extract of stem of plant, reduced the blood glucose levels in Streptozotocin-induced diabetic rats. Bioassay guided fractionation was followed to isolate Catechin from methanol extract. Catechin was administered

to Streptozotocin (60mg/kg b.w.)-induced diabetic male Wistar rats at different doses (5, 10, 20mg/kg b.w.) for 6 weeks to assess its effect on fasting plasma glucose. The plasma glucose was significantly ( $p < 0.05$ ) reduced when compared to the control. Oral administration of Catechin (20 mg/kg b.w.) markedly increased tissue glycogen, and  $^{14}\text{C}$ -glucose oxidation without any change in plasma insulin and C-peptide. Catechin restored the altered Glucokinase, glucose-6 Phosphatase, Glycogen Synthase and Glycogen Phosphorylase levels to near normal. GLUT4 mRNA and protein expression were enhanced after Catechin treatment. The results of this experimental study indicated that Catechin possesses hypo-glycemic, Glucose oxidizing and insulin mimetic activities and hence it could be used as a drug for treating diabetes [P. Daisy\*, K. Balasubramanian, M. Rajalakshmi, J. Eliza and J. Selvaraj (PG & Research Department of Biotechnology & Bioinformatics, Holy Cross College (Autonomous), Trichy 620002, Tamilnadu, India), *Phytomedicine*, 2010, **17**(1), 28-36].

**NPARR 1(3), 2010-0517, Wound healing potential of methanolic extract of *Trichosanthes dioica* Roxb (fruits) in rats**

The present study provides a scientific evaluation for the wound healing potential of methanolic (MeOH) extract of TDR fruits. Excision and incision wounds were inflicted upon three groups of six rats each. Group I was assigned as control (ointment base), Group II was treated with standard silver sulfadiazine (0.01%) cream. Group III was treated with 5% MeOH extract ointment. The parameters observed were percentage of wound contraction, epithelialization period, hydroxyproline content, tensile strength including histopathological studies. It was noted that the effect produced by the extract ointment showed significant ( $p < 0.01$ ) healing in both the wound models when compared with control group. All parameters such as wound contraction, epithelialization period, hydroxyproline content, tensile strength and histopathological studies showed significant changes when compared to control. The result shows that TDR extract ointment demonstrates wound healing potential in both excision and incision models [Yogesh Shivhare, Pradeep K. Singour, U.K.

Patil and R.S. Pawa\* (Division of Phytochemistry and Pharmacognosy, VNS Institute of Pharmacy, Berkhedha Nathu, Vidya Vihar, Neelbud, Bhopal 462003, M.P., India), *Journal of Ethnopharmacology*, 2010, **127**(3), 614-619].

**NPARR 1(3), 2010-0518, Neuroprotective activity of *Matricaria recutita* Linn against global model of ischemia in rats**

Traditionally, the whole plant is used for various diseases, including neuronal disorders. To evaluate the neuroprotective effect of *Matricaria recutita* Linn. against global cerebral ischemia/reperfusion (I/R) injury-induced oxidative stress in rats. Neuroprotective activity was carried out by global cerebral ischemia on Sprague-Dawley rats by bilateral carotid artery (BCA) occlusion for 30min followed by 60min reperfusion. The antioxidant enzymatic and non-enzymatic levels were estimated along with cerebral infarction area and histopathological studies. The *M. recutita* Linn. methanolic extract showed dose-dependent neuroprotective activity by significant decrease in lipid peroxidation (LPO) and increase in the superoxide dismutase (SOD), catalase (CAT), glutathione (GSH) and total thiol levels in extract treated groups as compared to ischemia/reperfusion group. Cerebral infarction area was significantly reduced in extract treated groups as compared to ischemia/reperfusion group. The methanolic extract of *M. recutita* Linn. showed potent neuroprotective activity against global cerebral ischemia/reperfusion injury-induced oxidative stress in rats [V.M. Chandrashekar\*, V.L. Ranpariya, S. Ganapaty, A. Parashar and A.A. Muchandi (Department of Pharmacology, Hanagal Shri Kumareshawr College of Pharmacy, BVVS campus, Bagalkot-587101, Karnataka, India), *Journal of Ethnopharmacology*, 2010, **127**(3), 645-651].

**NPARR 1(3), 2010-0519, Hepatoprotective activity of ethanolic extracts of bark of *Zanthoxylum armatum* DC. in  $\text{CCl}_4$  induced hepatic damage in rats**

*Zanthoxylum armatum* DC. is described as a hepatoprotective in Ayurveda, the Indian system of medicine. However, there is no scientific basis or reports in the modern literature regarding its usefulness as

a hepatoprotective agent. The present study was carried out to evaluate the hepatoprotective activity of ethanolic extract of bark of *Zanthoxylum armatum* DC. in CCl<sub>4</sub> induced hepatotoxicity in male Wistar rats. Ethanolic extracts at doses of 100, 200, and 400mg/kg were administered orally once daily for 7 days. The hepatoprotective activity was assessed using various biochemical parameters like alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, serum bilirubin, total protein and serum antioxidant enzymes along with histopathological studies of liver tissue. The substantially elevated serum enzymatic levels of serum transaminases, alkaline phosphatase and total bilirubin were significantly restored towards normalization by the extracts. Bark extracts significantly increased the levels of antioxidant enzymes: superoxide dismutase, catalase and glutathione. Phytochemical analysis revealed presence of isoquinoline alkaloid, berberine, as well as flavonoids and phenolic compounds, which have been known for their hepatoprotective activities. *Z. armatum* DC possesses significant protective effect against hepatotoxicity induced by CCl<sub>4</sub> which may be attributed to the individual or combined action of phytoconstituents present in it [Lalitsingh Ranawat, Jigar Bhatt and Jagruti Patel\* (Department of Pharmacology, Institute of Pharmacy, Nirma University of Science and Technology, Sarkhej-Gandhinagar Highway, Ahmedabad 382481, India), *Journal of Ethnopharmacology*, 2010, **127**(3), 777-780]

**NPARR 1(3), 2010-0520, *Cassia occidentalis* Linn.: A review on its ethnobotany, phytochemical and pharmacological profile**

*Cassia occidentalis* Linn. is an annual or perennial Ayurvedic plant which is used in several traditional medicines to cure various diseases. This weed has been known to possess antibacterial, antifungal, antidiabetic, anti-inflammatory, anticancerous, antimutagenic and hepatoprotective activity. A wide range of chemical compounds including achrosin, aloe-emodin, emodin, anthraquinones, anthrones, apigenin, aurantiobtusin, campesterol, cassiollin, chryso-obtusin, chrysophanic acid, chrysarobin, chrysophanol, chrysoeriol etc. have been isolated from this plant. The presented review summarizes the information concerning the botany, ethnopharmacology, phytochemistry, bio-

logical activity and toxicity of the *C. occidentalis* plant [J.P. Yadav\*, Vedpriya Arya, Sanjay Yadav, Manju Panghal, Sandeep Kumar and Seema Dhankhar (Department of Genetics, M. D. University, Rohtak-124001, Haryana, India), *Fitoterapia*, 2010, **81**(4), 223-230].

**NPARR 1(3), 2010-0521, Antidiarrhoeal activity of *Zingiber officinale* Rosc.**

*Zingiber officinale* (ginger) was studied for its antimicrobial profile and effect on virulent features of diarrhoeal pathogens, viz. colonization of epithelial cells and production of enterotoxins. *Z. officinale* showed no antimicrobial activity. Although it inhibited the production of cholera toxin, it had no effect on the action of this toxin. It also had no effect on the production and action of *E. coli* heat labile and heat stable toxins. However the bacterial colonization of HEp-2 cells was reduced. The results indicate that in the absence of antimicrobial action, *Z. officinale* exhibits its antidiarrhoeal activity by affecting bacterial and host cell metabolism. The present study reports a novel mechanism of action by *Z. officinale* in infectious diarrhoea [Poonam G. Daswani, S. Brijesh, Pundarikakshudu Tetali, Noshir H. Antia1, and Tannaz J. Birdi\*(The Foundation for Medical Research, 84A, R.G. Thadani Marg, Worli, Mumbai 400 018, India), *Current Science*, 2010, **98**(2), 222-229].

## VEGETABLES

**NPARR 1(3), 2010-0522, Physico-chemical and pasting properties of starch from stored potato tubers**

Starch was separated from tubers of four potato (*Solanum tuberosum* Linn.) cultivars, viz. 'Kufri Jyoti', 'Kufri Sindhuri', 'Kufri Chipsona-1' and 'Kufri Chipsona-2' before and after 90 days of storage at 4, 8, 12 and 16°C and, morphological, physico-chemical and pasting properties were studied. Scanning electron microscopy showed oval and irregular shaped starch granules with average diameter of 15µm, and the granule diameter increased after storage. Peak viscosity was lower after storage at 8°C and higher at 16°C. Hot paste viscosity decreased while breakdown viscosity and set back viscosity increased after storage, and there

was no significant change in cold paste viscosity. A significant decrease in pasting time and increase in pasting temperature was observed after storage. Phosphorus content showed significant positive correlation with peak viscosity ( $r = 0.452, p < 0.05$ ) and breakdown viscosity ( $r = 0.685, p < 0.01$ ), and a negative correlation with amylose content ( $r = 0.674, p < 0.01$ ). 'Kufri Sindhuri' starch showed significantly ( $p < 0.05$ ) higher peak, hot paste, breakdown and cold paste viscosity. The X-ray diffraction pattern of starch showed a distinctive maximum peak and it was not affected by the cultivar or storage temperature [R.Ezekiel\*, G.Rana, N.Singh and S.Singh (Division of Crop Physiology and Post-harvest Technology, Central Potato Research Institute, Shimla, 171 001, India), *Journal of Food Science and Technology*, 2010, 47(2), 60-64].

**NPARR 1(3), 2010-0523, Effect of scale color on the antioxidant capacity of onions**

The bulb onion (*Allium cepa* Linn.) has been cultivated for thousands of years and used as an important component of human diet. Recent studies suggest that onions can be used to cure, reduce, or prevent some of the health problems such as cancer, cardiovascular diseases, antidiabetic, asthma, antibiosis, and prebiotic effects due to its high antioxidant effect. In this study, the antioxidant capacities of a wide range of onion cultivars; nine commercial cultivars and five advance selections differing in color was determined. The variables tested include bulb size, scale color, total phenolic (TP), total antioxidant activity determined by both "Ferric reducing ability of plasma" (FRAP) and "Trolox equivalent antioxidant capacity" (TEAC). It was found that yellow onion had the greatest TP content (3.7mg GAE/g dw); and, the red group had higher TP mean than the white group (2.2mg GAE/g dw vs. 1.1mg GAE/g dw). For the antioxidant capacity measurements, the red group had the greatest means by both methods (15.4 $\mu$ mol TE/g dw and 9.3 $\mu$ mol TE/g dw for TEAC and FRAP). Yellow onions had higher TEAC (14.7 $\mu$ mol TE/g dw vs. 8.7 $\mu$ mol TE/g dw) and FRAP values (9.8 $\mu$ mol TE/g dw vs. 5.6 $\mu$ mol TE/g dw) than white onions. Among the cultivars tested great differences of TP, TEAC and FRAP was observed. The TP content

of Me-Tan 88 (8.3mg GAE/g dw) was two times higher than the yellow group. Yellow color Dayton had the greatest TEAC (20.5 $\mu$ mol TE/g dw) and FRAP (12.3 $\mu$ mol TE/g dw) means followed by yellow color Me-Tan 88 (19.4 and 11.4 $\mu$ mol TE/g dw). The two antioxidant measurements were found to be highly correlated (0.99) where absolute values of FRAP were about 40% less than those of TEAC. The values of TEAC and FRAP were significantly correlated by TP with similar  $r$ s (0.74 and 0.73, respectively). TP, TEAC and FRAP were significantly and positively correlated to soluble solids (0.41, 0.43, and 0.40, respectively). Our results suggested that the red onions had higher antioxidant activities than yellow and white onions although yellow onions had the richest phenolic contents [Ali Fuat Gökçe\*, Cemal Kaya, Sedat Serçe and Mustafa Özgen (Department of Horticulture, Faculty of Agriculture, University of Uludag, 16059, Gorukle, Bursa, Turkey), *Scientia Horticulturae*, 2010, 123(4), 431-435].

**NPARR 1(3), 2010-0524, 1-Methyl cyclopropene extends postharvest life of spinach leaves**

Senescence of detached spinach leaves either untreated or treated with 0.1 or 1.0 $\mu$ LL<sup>-1</sup> 1-MCP has been investigated. 1-MCP treated leaves had higher chlorophyll content and photosystem II potential quantum yield (Fv/Fm) and lower solute leakage than untreated leaves after storage in darkness at 23°C for 6d, indicating a delay of senescence. Ethylene production was increased in spinach supplemented with 1-MCP after 3d storage and then declined to the rates of untreated leaves. 1-MCP treated spinach had higher ascorbic acid and glutathione concentrations, and a low oxidised/reduced ratio for both antioxidants. Accumulations of ammonium and protein degradation were reduced by 1-MCP. The results presented here indicate that inhibition of ethylene sensitivity can be successfully used to extend the postharvest life of spinach leaves [Gustavo Gergoff Grozoff, María E. Micieli, Facundo Gómez, Laura Fernández, Juan J. Guiamet, Alicia R. Chaves and Carlos G. Bartoli\* (Instituto de Fisiología Vegetal, Universidad Nacional de La Plata-CCT CONICET La Plata, cc327 (1900) La Plata, Argentina), *Postharvest Biology and Technology*, 2010, 55(3), 182-185].

**NPARR 1(3), 2010-0525, Comparison of mineral concentrations in commercially grown organic and conventional crops – Tomatoes (*Lycopersicon esculentum*) and lettuces (*Lactuca sativa*)**

Trace element concentrations and stable nitrogen isotope data ( $\delta^{15}\text{N}\%$ ) from tomatoes (*Lycopersicon esculentum*) and lettuces (*Lactuca sativa*) were subjected to multivariate analysis in an attempt to distinguish between conventional and organic cultivation. This approach improved the correct classification of tomato samples but appears to have had a limited effect on lettuces. Our findings support the growing body of evidence which suggests that systematic differences in the concentrations of certain elements such as manganese, calcium, copper, and zinc may occur between crops cultivated under organic and conventional regimes possibly due to the presence of elevated levels of arbuscular mycorrhizal fungi (AMF) in soils cultivated organically. We assert that such differences in elemental composition may be useful as 'indicators of authenticity'. However, we recognise the limitation that this approach may be restricted to horticultural crops where there are significant differences in agricultural practice such as conventional-hydroponic versus soil-grown organic tomatoes [Simon D. Kelly\* and Alison S. Bateman (School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK), *Food Chemistry*, 2010, **119**(2), 738-745].

**NPARR 1(3), 2010-0526, Characterization and thermal lability of carotenoids and vitamin C of tamarillo fruit (*Solanum betaceum* Cav.)**

The carotenoids from yellow tamarillo were determined by high-performance liquid chromatography-photodiode array detection/mass spectrometry (HPLC-PDA/MS). Xanthophylls were found as esterified with palmitic and myristic acids. *All-trans*- $\beta$ -cryptoxanthin esters and *all-trans*- $\beta$ -carotene were the major carotenoids of tamarillo. Changes in carotenoid and vitamin C contents after thermal pasteurization of degassed and not degassed tomato tree nectars were studied. Zeaxanthin esters appeared to be the less thermo-labile carotenoids. Carotenoids degradation was

not significantly influenced by dissolved oxygen level. However, thermal treatment induced 5, 8-epoxidation and *cis*-isomerization. Retention of ascorbic acid was total under degassed conditions while losses of dehydroascorbic acid were not affected by the initial level of dissolved oxygen [C. Mertz, P. Brat\*, C. Caris-Veyrat and Z. Gunata (Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Département PERSYST, UMR Qualisud, TA B-95/16, 34398 Montpellier Cedex 5, France), *Food Chemistry*, 2010, **119**(2), 653-659].

**NPARR 1(3), 2010-0527, Phenolic content and antioxidant activity of cantaloupe (*Cucumis melo*) methanolic extracts**

The objectives of this study were to determine phenolic content and antioxidant activity of methanolic extracts from different parts of cantaloupe (leaf, stem, skin, seed and flesh). The flesh extract afforded the highest yield ( $89.6\pm 0.3\%$ ) whilst the lowest yield was obtained from the seed ( $13.7\pm 0.5\%$ ) ( $p < 0.05$ ). The leaf extract showed the highest total phenolic content ( $26.4\pm 0.3\text{mg GAE/g extract}$ ) and total flavonoid content ( $69.7\pm 3.37\mu\text{g RE/g extract}$ ) accompanied with best antioxidant activity through all antioxidant assays ( $p < 0.05$ ). In addition, the stem extract also exhibited good antioxidant activity. Thus, these results suggest that methanolic extracts of cantaloupe leaf and stem may serve as a potential source of natural antioxidant for food and nutraceutical application [Hajar Iqbal Ismail, Kim Wei Chan, Abdalbasit Adam Mariod and Maznah Ismail\*(Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia), *Food Chemistry*, 2010, **119**(2), 643-647].

## WOOD

**NPARR 1(3), 2010-0528, Wood properties of juvenile and mature heartwood in *Robinia pseudoacacia* Linn.**

The properties of juvenile and mature heartwood of black locust (*Robinia pseudoacacia* Linn.) was characterised in this study. Content,

composition and the subcellular distribution of heartwood extractives were studied in 14 old-growth trees from forest sites in Germany and Hungary as well as in 16 younger trees of four clone types. Heartwood extractives (methanol and acetone extraction) were analysed by HPLC-chromatography. UV microspectrophotometry was used to topochemically localise the extractives in the cell walls. The natural durability of the juvenile and mature heartwood was analysed according to the European standard EN 350-1. Growth as well as chemical analyses showed that, based on extractives content, the formation of juvenile wood in black locust is restricted to the first 10–20 years of cambial growth. In mature heartwood, high contents of phenolic compounds and flavonoids were present, localised in high concentrations in the cell walls and cell lumen of axial parenchyma and vessels. In juvenile wood, the content of these extractives is significantly lower. Juvenile wood had a correspondingly lower resistance to decay by *Coniophora puteana* (brown rot fungus) and *Coriolus versicolor* (white rot fungus) than mature heartwood [Oliver Dünisch\*, Hans-Georg Richter and Gerald Koch (Master School for Carpentry, Ebern, Gleusdorfer Str. 14, Ebern, 96106, Germany), *Wood Science and Technology*, 2010, **44**(2), 301-313]

**NPARR 1(3), 2010-0529, Lignin Degradation by *Flavodon flavus* (Klotzsch.) Ryv. and *Schizophyllum commune* Fr. on *Mangifera indica* and *Syzygium cumini* Woods**

The lignin degradation by *Flavodon flavus* (Klotzsch) Ryv. and *Schizophyllum commune* Fr. on *Mangifera indica* and *Syzygium cumini* wood, changes in the chemical composition of the degraded wood, and production of extra-cellular lignocellulolytic enzymes were analyzed. White rot fungi *F. flavus* and *S. commune* selectively degraded the lignin of *S. cumini* rather than the holocellulose component, whereas simultaneous degradation of lignin occurred in the case of *M. indica*. After 90 days of pretreatment with *F. flavus*, total weight loss was 29% and loss in lignin content was 25.7% in *M. indica* wood. However, 8% loss of holocellulose was caused by *S. commune* in *S. cumini* wood. Extracellular enzymes from *F. flavus* such as ligninase and cellulase showed higher activity in deg-

radation of *M. indica* wood than in *S. cumini* wood. Weight loss and changes in chemical composition of *M. indica* and *S. cumini* woods showed good correlation with enzyme activity in lignocellulose degradation. Woods of *S. cumini* showed resistance to the white rot fungi could be due to the presence of polyphenols [Ameepadhiar, Susy Albert, Praveen Kumar Nagadesi, Arun Arya\* (Department of Botany, Faculty of Science, The Maharaja Sayajirao University of Baroda, Gujarat, India), *Journal of Wood Chemistry and Technology*, 2010, **30**(2), 129-139].

**NPARR 1(3), 2010-0530, Bonding of spruce wood with wheat flour glue-Effect of press temperature on the adhesive bond strength**

The main objective of this research was to study the potential of renewable polymers based on wheat corn for wood-to-wood bonding and wood composites. Commercial wheat flour containing mainly starch and proteins was used as biobased glue. To evaluate the strength on wood joints under different curing temperatures tensile shear strength of spruce wood specimen was tested according EN 302-1. Thermal properties of the wheat flour glue were studied by means of differential scanning calorimetry (DSC). Pasting profiles of the wheat flour slurry were investigated by using a Micro Visco-Amylograph (MVA). With rising pressing temperature an increase of bond strength was observed up to a temperature of 105°C. Under these conditions excellent bonding strength was reached and mainly wood failure was detected. At higher temperature a slight reduction of bond strength was observed, which can be related to beginning thermal modification of wood, especially changes in character of the wood surface. Best adhesive performance was not reached until the granular order was disrupted and thus starch molecules were separated. Changes in the molecular structure of starch during heating are described by means of analytical methods helping to explain the effects on the bond strength [Stefano D'Amico\*, Marta Hrabalova, Ulrich Müller and Emmerich Berghofer (Competence Center for Wood Composites and Wood Chemistry (Wood K plus), St. Peter Straße 25, A-4021 Linz, Austria), *Industrial Crops and Products*, 2010, **31**(2), 255-260].

## **OTHERS (incl. Cultivation, Distribution, New species, Post harvest Technologies, Packaging Technology, New technologies/Know-how Developed, Book reviews, Forthcoming events)**

### **CULTIVATION**

#### **NPARR 1(3), 2010-0531, Biofortification of lettuce (*Lactuca sativa* Linn.) with iodine: the effect of iodine form and concentration in the nutrient solution on growth, development and iodine uptake of lettuce grown in water culture**

Iodine is an essential trace element for humans. Two billion individuals have insufficient iodine intake. Biofortification of vegetables with iodine offers an excellent opportunity to increase iodine intake by humans. The main aim was to study the effect of iodine form and concentration in the nutrient solution on growth, development and iodine uptake of lettuce, grown in water culture.

In both a winter and summer trial, dose rates of 0, 13, 39, 65, and 90 or 129  $\mu\text{g}$  iodine  $\text{L}^{-1}$ , applied as iodate ( $\text{IO}_3^-$ ) or iodide (I), did not affect plant biomass, produce quality or water uptake. Increases in iodine concentration significantly enhanced iodine content in the plant. Iodine contents in plant tissue were up to five times higher with I than with  $\text{IO}_3^-$ . Iodine was mainly distributed to the outer leaves. The highest iodide dose rates in both trials resulted in 653 and 764  $\mu\text{g}$  iodine  $\text{kg}^{-1}$  total leaf fresh weight. Biofortification of lettuce with iodine is easily applicable in a hydroponic growing system, both with I and  $\text{IO}_3^-$ . I was more effective than  $\text{IO}_3^-$ . Fifty grams of iodine-biofortified lettuce would provide, respectively, 22% and 25% of the recommended daily allowance of iodine for adolescents and adults [Wim Voogt\*, Harmen T Holwerda, Rashied Khodabaks (Wageningen University and Research-Greenhouse Horticulture, Violierenweg 1, 2665 MV Bleiswijk, the Netherlands), *Journal of the Science of Food and Agriculture*, 2010, **90**(5), 906-913].

#### **NPARR 1(3), 2010-0532, Yield, fruit quality and nitrogen uptake of organically and conventionally**

#### **grown muskmelon with different inputs of nitrogen, phosphorus, and potassium**

The effects of varied amounts of fertilization on yield, fruit quality, and nitrogen (N) uptake of muskmelons (*Cucumis melo* Linn. var *reticulatus* Naud) grown under both organic and conventional farming conditions were evaluated. Organic fertilizer (0.0, 0.55, 1.1, and 2.2  $\text{kg m}^{-2}$ ) and mineral fertilizers containing the same amounts of estimated plant available nutrients [N, phosphorus (P) and potassium (K)] were applied to organic and conventional farming plots, respectively, in both the spring and autumn seasons of 2005. In comparison to conventional farming conditions, muskmelons grown under organic farming conditions had the same yield, total soluble solids (TSS) and soluble sugar contents in both growing seasons, and fruit pulp nitrate content was significantly reduced by 12% on average in spring and 16% on average in autumn. At harvest maturity the above ground plant N concentration was significantly higher in the conventional treatments than in the organic treatments. At the vine growth stage, the plant N concentrations were similar in all treatments in both seasons. The ratios of nitrate N to total N amount in aboveground biomass were higher in conventional and high fertilized organic treatments than in low or not fertilized organic treatments under limited N supply from the soil. Muskmelon plants absorbed mainly inorganic N, and the protein N fraction in the xylem sap was larger than the amino acid N fraction. Plants grown in the organic system had a higher proportion of organic N in their xylem sap, especially when manure input was low [Shiwei Song, Philipp Lehne, Jiangang Le, Tida Ge and Danfeng Huang\* (College of Agriculture and Biology, Shanghai Jiao Tong University, Shanghai, China), *Journal of Plant Nutrition*, 2010, **33**(1), 130-141].

#### **NPARR 1(3), 2010-0533, Storage-Dependent changes in dormancy and germination of Himalayan Mayapple (*Podophyllum hexandrum* Royle) seeds and their response to gibberellic acid**

The storage-dependent changes in viability and dormancy/germination status of seeds of a Western population of Himalayan Mayapple (*Podophyllum hexandrum*), an endangered plant species of high medicinal value, have been monitored with particular ref-

erence to the changes in seed responsiveness to GA<sub>3</sub>. Shortly after harvest (3 months), seeds exhibited dormancy that was marginally overcome after storage for 30 months. GA<sub>3</sub> treatment was effective in overcoming the dormancy, particularly when concentrated H<sub>2</sub>SO<sub>4</sub> was used. The responsiveness of the seeds to GA<sub>3</sub>, however, decreased with the storage period. A subset of seeds that failed to germinate under a GA<sub>3</sub>-H<sub>2</sub>SO<sub>4</sub>-GA<sub>3</sub> treatment eventually deteriorated. GA<sub>3</sub>-induced enhancement of the activities of α-amylase and dehydrogenases [2, 3, 5 triphenyltetrazolium chloride (TTC) reduction] corresponded to germination improvement in seeds stored for a short duration, but not in seeds stored for long period of time. Lipid peroxidation in seeds did not change owing to storage or GA<sub>3</sub> treatment, whereas catalase activity tended to decline marginally. Seed phenolic contents were not involved in the seed germination behavior. Possible mechanisms of heterogeneity in responsiveness of seeds to GA<sub>3</sub> are discussed [Rajender K Sharma, Shashi Sharma, and Shanti S Sharma\* (Department of Biosciences, Himachal Pradesh University, Shimla, India), *Journal of Herbs, Spices & Medicinal Plants*, 2010, **16**(1), 69 - 82]

*NPARR* 1(3), 2010-0534, **Influence of Soil Sodicity on the Growth, Alkaloid Yield, and Cation Accumulation of *Catharanthus roseus***

The effects of soil sodicity (exchangeable sodium percentage, or ESP) on the growth, alkaloid yield, and cation accumulation of two cultivars of *Catharanthus roseus* (Nirmal and Dhawal) was studied in a pot experiment. The leaves and stem yield of *C. roseus* significantly increased with an increase in soil ESP from 4.3 (control) to 16.9, but thereafter yield decreased with further increases in soil ESP. The severe leaf injury symptom from soil sodicity was exhibited in both cultivars at 32 weeks after transplanting into soil at ESP levels of 44.9 and above. Root yields of *C. roseus* were also significantly reduced with an increase in soil ESP. Total alkaloid yield in leaves increased with increases in soil at ESP levels of 32.0 and 16.9 for the cultivars Nirmal and Dhawal, respectively, but further increases in soil ESP the total alkaloid yield significantly decreased. The vindoline content in leaves of *C. roseus* significantly decreased with an increase in soil

ESP. In the shoot and root tissues of *C. roseus*, the concentration of sodium significantly increased and that of potassium, and calcium decreased in plants grown in soil with high sodicity (ESP 44.9 and above) as compared with the control [Arun Prasad, Amitabha Chattopadhyay; Sukhmal Chand\*; Raj Kumari and Karuna Shankar (Central Institute of Medicinal and Aromatic Plants, Lucknow, India), *Journal of Herbs, Spices & Medicinal Plants*, 2010, **16**(1), 1-11]

*NPARR* 1(3), 2010-0535, **A simple regeneration protocol from stem explants of *Jatropha curcas*—A biodiesel plant**

A simple, rapid and cost effective protocol has been developed for high frequency regeneration using stem segments of elite genotypes (CSMCRI-I, CSMCRI-II and CSMCRI-III) of *Jatropha curcas*. Shoot bud induction (10-15 buds per explant) was achieved on Murashige and Skoog's (MS) medium supplemented with 1.0 ml<sup>-1</sup> benzylaminopurine (BAP) in combination with 1.0 mg l<sup>-1</sup> 6-furfurylamino purine (KN). Stem explant of CSMCRI-II showed highest response (65.3%) followed by CSMCRI-I and CSMCRI-III. These shoot buds developed into shoots when subcultured on MS medium supplemented with 0.5mg l<sup>-1</sup> BAP and 1.0mg l<sup>-1</sup> IAA (indole-3-acetic acid). Shoots of 4.0-5.0cm length were harvested and cultured on MS medium containing different concentrations of indole-3-butyric acid (IBA) and 40% rooting was achieved in 0.1mg l<sup>-1</sup> IBA after 5 weeks in all the genotypes used. For direct rooting, shoots of 4.0-5.0cm length were used and rooting was achieved by dipping the base of shoots in MS medium supplemented with 0.1mg l<sup>-1</sup> IBA and 3.5% sodium alginate matrix and subsequently dropping in polymerization medium containing 2.0% calcium chloride. Encapsulated shoots were transferred in polybags filled with sterile soil wetted with sterile distilled water containing 0.5% broad-spectrum fungicide (Bavistine). Rooting could be achieved in 62% of shoots within 3 weeks. Rooted plantlets were successfully hardened and transferred to green house with 92% establishment [Aneesha Singh\*, Muppla Parandhami Reddy, Jitendra Chikara and Sweta Singh (Discipline of Wasteland Research, Central Salt & Marine Chemicals Research Institute (Council of

Scientific and Industrial Research), Bhavnagar 364002, Gujarat, India), *Industrial Crops and Products*, 2010, **31**(2), 209-213].

**NPARR 1(3), 2010-0536, Cowpea [*Vigna unguiculata* (Linn.) Walp.] as a green manure to improve the productivity of a menthol mint (*Mentha arvensis* Linn.) intercropping system**

A field experiment was conducted at Central Institute of Medicinal and aromatic Plants (CIMAP), Lucknow, India in a sandy loam soil (entisol) during 2004 and 2005. Cowpea (*Vigna unguiculata*) was intercropped with transplanted menthol mint (*Mentha arvensis* Linn.) for green manuring (GM) and for fodder plus green manuring (F+GM) with four levels of urea N (0, 30, 60, 90 kg N ha<sup>-1</sup>). In GM, cowpea was incorporated in the soil 30 days after sowing (DAS), while in F+GM 50% (alternate) cow pea plants were used for fodder at 30 DAS and 50% were incorporated in soil at 35 DAS. No significant differences were found between GM and F+GM with respect to herb and oil yield of menthol mint and succeeding palmarosa crop and nitrogen economy. Fresh biomass yield of menthol mint increased by 23.4% and essential oil yield by 25.2% by cowpea green manure (mean of GM and F+GM) as compared to without GM across all N levels. The contribution of green manure, as a nitrogen source, was equivalent to 30 kg N ha<sup>-1</sup> when no fertilizer nitrogen was applied in menthol mint. The residual effect of cowpea GM was studied in a succeeding crop of fast growing essential oil yielding palmarosa [*Cymbopogon martinii* (Roxb.) Wats. var *motia* Burk.] over two harvests (July and December). Averaged across N levels green manure resulted in an increase of 18.5% in the fresh biomass and 17.7% in essential oil yield of palmarosa over no green manuring [Man Singh\*, A. Singh, S. Singh, R.S. Tripathi, A.K. Singh and D.D. Patra (Central Institute of Medicinal and Aromatic Plants (CIMAP), PO CIMAP, Lucknow 226015, India) *Industrial Crops and Products*, 2010, **31**(2), 289-293].

## NEW SPECIES

**NPARR 1(3), 2010-0537, *Lindernia ciliata* subsp. *sivarajanii* subsp. nov. (Scrophulariaceae) from India**

A new subspecies of *Lindernia ciliata* (Colsm.) Pennell is described and illustrated. *Lindernia ciliata* (Colsm.) Pennell subsp. *sivarajanii* Dhruvan et Mohanan differs from *L. ciliata* subsp. *ciliata* by its creeping habit, rooting from almost all nodes, distant and sub-aristate leaf serrations, upper lip of corolla almost equal in length to the lower lip and straight staminodes [Dhruvan Tandyekkal and N. Mohanan\* (Tropical Botanic Garden and Research Inst., Palode-695 562 Thiruvananthapuram, Kerala, India), *Nordic Journal of Botany*, 2009, **28**(2), 202-205].

## POSTHARVEST TECHNOLOGIES

**NPARR 1(3), 2010-0538, Effects of heat treatment on atmospheric composition and color of peeled white asparagus in modified atmosphere packaging**

Freshly harvested spears of white asparagus were subjected or not to heat treatment by immersion in a hot water bath at 55°C for 3 min, then left unpeeled or were peeled before wrapping in 16µm stretch film and stored at 3°C for 6 days. During storage, the atmosphere within the packages was sampled for O<sub>2</sub>, CO<sub>2</sub> and C<sub>2</sub>H<sub>4</sub> determination, while spear fresh weight, color and anthocyanin content at the 3cm apical peel segments were determined before and after storage. The results showed that CO<sub>2</sub> concentration in packages of white asparagus spears was not greatly influenced by peeling or heat treatment. On the other hand, a higher package O<sub>2</sub> depletion of treated (peeled or heated) spears was observed. Peeling also resulted in an increase of ethylene peak concentration, indicating wound-induced ethylene production, which was suppressed by heat treatment. The initial color of the whole spear was retained, while the appearance of a violet coloration on the spear tip was prevented by heat treatment in both unpeeled and peeled spears.

Peeled white asparagus has drawn the attention of industry as a novel lightly processed product. The combination of heat treatment with modified atmosphere packaging (MAP) could be used to improve the storage life of this product. Moreover, both peeling and heat treatment cause changes in ethylene production and respiration rate of asparagus spears and this informa-

tion could be useful for development of novel application to MAP design for lightly processed (peeled) white asparagus [Anastasios S. Siomos\*, Dimitrios Gerasopoulos, Pavlos Tsouvaltzis and Athanasios Koukounaras (Department of Horticulture, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece), *Innovative Food Science & Emerging Technologies*, 2010, **11**(1), 118-122].

**NPARR 1(3), 2010-0539, Effects of different nitric oxide application on quality of kiwifruit during 20°C storage**

The effects of fumigating with 0, 10, 20, 30  $\mu\text{LL}^{-1}$  nitric oxide (NO) gas and dipping in 0.5, 1.0 and 2.0  $\mu\text{molL}^{-1}$  NO aqueous solution on quality of kiwifruit (*Actinidia chinensis* Planch cv 'Xuxiang') during storage at 20°C were evaluated. It was found that fumigating with 20  $\mu\text{LL}^{-1}$  NO gas and dipping in 1.0  $\mu\text{molL}^{-1}$  NO aqueous solution delayed firmness lost and increased SSC/TA ratios of kiwifruits. In comparison with the kiwifruits fumigated with 20  $\mu\text{LL}^{-1}$  NO, the kiwifruits dipped in 1.0  $\mu\text{molL}^{-1}$  NO solution had slower ethylene production, lower contents of soluble solids and malondialdehyde (MDA), higher contents of vitamin C and E, but no significant difference existed in chlorophyll contents. The results suggested that dipping kiwifruits in 1.0  $\mu\text{molL}^{-1}$  NO aqueous solution was more effective in maintaining kiwifruits quality during 20°C storage [Shuhua Zhu, Lina Sun and Jie Zhou\* (College of Chemistry and Material Science, Shandong Agricultural University, Taian, 271018, Shandong Province, China), *International Journal of Food Science & Technology*, 2010, **45**(2), 245-251].

**NPARR 1(3), 2010-0540, Effect of different packaging materials on shelf-life and quality of apple during storage**

Studies were conducted to assess the effect of different containers and liners on post-harvest losses and quality parameters of apple during storage at room temperature (22-28°C) and walk-in chambers (5 ± 2°C). For this, apples were packed in CFB boxes, wooden boxes, plastic crates and gunny bags and lined either with polyethylene sheet or newspaper cuttings.

Observation on PLW (%), decay loss (%), fruit firmness (N), juice recovery (%), and quality parameters (TSS, acidity, total sugars and ascorbic acid content) were recorded at different intervals. Our results indicated that PLW and decay loss of apples increased significantly with increase in storage period both at ambient conditions and cold storage, and this increase was much more drastic in control than in different containers. Among different containers, PLW (5.60%) and decay loss (8.0%) were lesser in CFB boxes, followed by wooden boxes. Similarly, containers lined with polyethylene sheet had lesser PLW and higher decay loss than those lined with newspaper cuttings. Fruits remained firmer with higher juice recovery in CFB or wooden containers than other containers or control. Among different quality parameters, total soluble contents, total sugars of apples increased and ascorbic acid content, and acidity decreased with the increase in storage period at ambient conditions up to 30 days, which declined afterwards. Under cold storage conditions, these parameters showed the similar trend up to five months of storage. This increase or decrease in different quality attributes was faster in control fruits than those kept in different containers. Fruits in CFB or wooden boxes had better quality attributes than those in other containers or control. Thus, CFB or wooden boxes were found better in controlling post-harvest losses in apples during storage than other containers. Similarly, fruits lined or wrapped with polyethylene sheet were better in all aspects than those wrapped in newspaper cuttings [Sharma RR\* and Singh Dinesh (Central Institute of Post-harvest Engineering and Technology, Abohar, 152 116, Punjab), *Indian Journal of Horticulture*, 2010, **67**(1), 94-101].

**NPARR 1(3), 2010-0541, Effects of mild temperature conditions during dehydration procedures on saffron quality parameters**

The dehydration procedure is responsible for saffron sensorial properties: colour, taste and aroma. Changes in the compounds responsible for these characteristics have been studied when dehydration processes at high and low temperature are employed. However, the evolution of these changes at mild temperatures is not available in the current bibliography.

In this paper the effect of different mild conditions (18-20°C for 24h, 40-50°C for 75 min and 55°C for 75 min) applied to 45 saffron samples with the same origin was investigated. Crocetin esters, the compounds responsible for saffron colour, increased their content with no significant differences from other processes when high temperatures (55°C) were used, thus producing a noticeable increment in saffron colouring capability. Similar behaviour was obtained for picrocrocin, the compound responsible for saffron taste, with higher average content at the highest temperature (55°C) but without significant differences with the inferior conditions (40-50°C). However, more volatile compounds were generated, especially safranal, at higher temperatures, e.g. 55°C, during the dehydration procedure. The results found support the idea for employing mild to high temperatures during the dehydration process of saffron [C Priscila del Campo, Manuel Carmona · Luana Maggi, Charalabos D Kanakis, Eirini G Anastasaki, Petros A Tarantilis, Moschos G Polissiou and Gonzalo LAlonso\* (Cátedra de Química Agrícola, ETSI Agrónomos de Albacete, Universidad de Castilla-La Mancha, *Journal of the Science of Food and Agriculture*, 2010, **90**(4), 719-725].

**NPARR 1(3), 2010-0542, Effect of drying and storage on the degradation of total carotenoids in orange-fleshed sweetpotato cultivars**

Orange-fleshed sweetpotato (OFSP) can be used to tackle vitamin A deficiency, a major public health problem in most developing countries. In East Africa, common ways of using sweetpotato include drying and subsequent storage. The aim of the study was to investigate the impact of drying and storage on the total carotenoid retention (as an estimate of provitamin A retention) from OFSP. Losses of total carotenoid during drying were generally low (15% or less). Total carotenoid retention in OFSP was not dependent on the type of dryer (solar or sun). Sweetpotato cultivar (Ejumula, Kakamega, SPK004/1, SPK004/1/1, SPK004/6 or SPK004/6/6) had a significant effect on retention in drying ( $P < 0.05$ ). High percentage losses of total carotenoids were, however, correlated with high moisture content and high carotenoid content in fresh sweetpotato

roots. After 4 months' storage at room temperature in Uganda, losses of total carotenoid in dried sweetpotato chips were high (about 70%) and this was not dependent on the use of opaque or transparent packaging. Losses of carotenoids during storage were considered to be more of a nutritional constraint to the utilisation of dried sweetpotato than losses occurring during drying. The relationship between characteristics of the cultivars and losses of carotenoids during drying should be taken into account in selection of cultivars for processing [Aurélié Bechoff\*, Andrew Westby, Constance Owori, Geoffrey Menya, Claudie Dhuique-Mayer, Dominique Dufour and Keith Tomlins (Natural Resources Institute, University of Greenwich, Central Avenue, Chatham Maritime ME4 4TB, UK), *Journal of the Science of Food and Agriculture*, 2010, **90**(4), 622-629].

## NEW TECHNOLOGIES

**NPARR 1(3), 2010-0543, Multiresidue analysis of 50 pesticides in Grape, Pomegranate, and Mango by Gas Chromatography-Ion Trap Mass Spectrometry**

A selective and sensitive multiresidue analysis method is reported for simultaneous determination of 50 pesticides of different chemical classes in three commercially important fruits of different nature viz. grape, pomegranate, and mango. The sample preparation method involves extraction of a 10 g sample with 10 ml of ethyl acetate; cleanup by dispersive solid phase extraction with primary secondary amine (PSA, 25 mg) for grape and PSA + graphitized carbon black (25 + 5 mg) for pomegranate and mango; and determination by gas chromatography-ion trap mass spectrometry through multiple reaction monitoring (MRM). Sample preparation under acidified (pH 4) and cold (<4°C) conditions, use of PTV-large volume injection (20 µl) through multibaffled liner and chromatographic separation on a short 10 m VF-5MS capillary column gave a satisfactory response for all of the analytes including relatively unstable compounds such as captan, captafol, folpet, endrine, and iprodione within 31.8 min. The limit of quantification (LOQ) of most of the compounds was  $\leq 10 \text{ ng g}^{-1}$  except for

captan, captafol, and folpet, where the LOQ was  $\leq 20$  ng g<sup>-1</sup>. For each analyte, the unique and most abundant MRM was selected for quantification, and the next most abundant for confirmation, with their abundance ratio being used for unambiguous identification of any detected pesticide in samples within 20% tolerance range at the LOQ level. Use of matrix-matched standards could minimize the matrix effect, which was lowest in grape, followed by pomegranate and mango. Recoveries ranged within 70-120% at 10, 20, and 50 ng g<sup>-1</sup> in all three matrixes with associated relative standard deviations <20% ( $n=6$ ). The method could be successfully applied to the screening of 100 farm samples for compliance to EU maximum residue limits [Rahul H. Savant, Kaushik Banerjee\*, Sagar C. Utture, Sangram H. Patil, Soma Dasgupta, Manoj S. Ghaste and Pandurang G. Adsule (National Research Centre for Grapes, P.O. Manjri Farm, Pune 412 307, India), *Journal of the Agriculture and Food Chemistry*, 2010, **58**(3), 1447-1454]

**NPARR 1(3), 2010-0544, Determination of benzoylurea insecticides in food by pressurized liquid extraction and LC-MS**

A method based on pressurized liquid extraction and LC-MS/MS has been developed for determining nine benzoylureas (BUs) in fruit, vegetable, cereals, and animal products. Samples (5g) were homogenized with diatomaceous earth and extracted in a 22ml cell with 22ml of ethyl acetate at 80°C and 1500psi. After solvent concentration and exchange to methanol, BUs were analyzed by LC-MS/MS using an IT mass analyzer, which achieved several transitions of precursor ions that increase selectivity providing identification. LOQs were between 0.002 and 0.01 mg/kg, which are equal or lower than maximum residue limits established by the Codex Alimentarius. Excellent linearity was achieved over a range of concentrations from 0.01 to 1 mg/kg with correlation coefficients 0.995-0.999 ( $n=7$ ). Validation of the total method was performed by analyzing in quintuplicate seven different commodities (milk, eggs, meat, rice, lettuce, avocado and lemon) at three concentration levels (0.01, 0.1, and 1 mg/kg). The recoveries ranged from 58 to 97% and the RSDs from 5

to 19% depending on the compound and the commodity. The combination of pressurized liquid extraction with LC-MS/MS provides a sensitive and selective method for the determination of BUs in food [Monia Brutti, Cristina Blasco and Yolanda Picó \*(Laboratori de Nutrició i Bromatologia, Facultat de Farmàcia, Universitat de València, Valencia, Spain), *Journal of Separation Science*, 2010, **33**(1), 1-10].

**NPARR 1(3), 2010-0545, Monitoring of Virgin Coconut Oil (VCO) adulteration with palm oil using fourier transform infrared spectroscopy**

Virgin coconut oil (VCO) may be adulterated with cheaper oils, such as palm oil (PO). Thus, the detection and quantification of VCO adulteration with PO was monitored using Fourier transform infrared (FTIR) spectroscopy, combined with chemometrics of partial least square (PLS) and discriminant analysis at frequency regions of 3,010-3,000, 1,660-1,650 and 1,120-1,105/cm. Attenuated total reflectance (ATR) measurements were made on pure VCO and that adulterated with varying concentrations of PO (0.5-50% w/w in VCO). PLS calibration exhibited a good relationship between actual and FTIR-predicted values with coefficient of determination ( $R^2$ ) of 0.999 and standard error of calibration of 0.533. The cross validation was performed by removing one standard at a time, and the final  $R^2$  value of 0.996 and standard error of prediction of 0.953 were obtained. The discriminant analysis using seven principal components was able to classify pure VCO and that adulterated with PO. The adulteration of virgin coconut oil (VCO) with cheaper oils is a serious matter, not only for food suppliers but also for consumers. Therefore, an analytical technique offering fast and reliable detection of such adulteration must be developed. Fourier transform infrared spectroscopy combined with chemometrics of partial least square for quantitative analysis of adulterant, and discriminant analysis for classification between VCO and that adulterated with palm oil, can be employed for detection of palm oil as an adulterant in VCO for quality assurance purposes [Rohman and Y.B. Che man\* (Halal Products Research Institute Faculty of Pharmacy, Gadjah Mada University, 55281, Yogyakarta, Indonesia), *Journal of Food Lipids*, 2010, **16**(4), 618-628].

**NPARR 1(3), 2010-0546, An Improved Commercial Method for Determination of Nicotine in Tobacco**

A high-pressure thin-layer chromatography (HPTLC) method for quantitative analysis of nicotine in *Nicotiana* sp. was developed using a methanol extract of leaves and stems and TLC plates (silica gel 60 GF<sub>254</sub>) with spot visualization under ultraviolet (UV) light. Scanning at 235 nm in the absorption-reflection mode produced linear calibration curves in the range of 2 to 25 µg, with a correlation coefficient of 0.991. The average recovery rate was 95% (CV % 1.35). From the present study, the lower limit of detection was 0.08 µg spot<sup>-1</sup> for the nicotine. The validity of the method was confirmed by comparing the UV spectra of the tobacco plant samples with standards within the same R<sub>f</sub> window [Md. Wasim Aktar, M. Paramasivam and Dwaipayan Sengupta\* (Department of Agricultural Chemistry and Soil Science, Institute of Agricultural Science, University of Calcutta, Kolkata, India), *Journal of Herbs, Spices & Medicinal Plants*, 2010, **16**(1), 36-40]

**NPARR 1(3), 2010-0547, One-step process for enzymatic desizing and bioscouring of cotton fabrics**

Textile wet processing is one of the most polluting industrial processes. It is a complex process, and its complexity depends on the composition of textile material. From this point of view, new efficient strategies for cotton wet processing are needed, which are cost-effective and reduce the impact on the environment. The goal of this work is to accomplish most aspects of preparatory finishing (desizing, scouring) by means of "green chemistry," or, in other words, non-toxic enzymatic treatments. To achieve this goal, a mixture of  $\alpha$ -amylase (Am) and polygalacturonase (PG) enzymes from *Trichoderma harzianum* induced with orange peel was successfully produced. Partial purification of these enzymes using dialysis and chromatographic techniques was carried out, and the purified enzymes were characterized. Different effects on the enzyme activity, including temperature, pH, and surfactant, were studied. The treatment of cotton fabric in a single bath for desizing with Am or a single bath for scouring with PG was accomplished. The treatment

conditions were optimized by varying the enzyme concentration, pH value, treatment temperature, and duration. Treatment effectiveness on fabric properties was evaluated via weight loss (%), violet scale shades, residual starch in fabric (%), copper number, tensile strength, and water absorbency (wettability). A combined process for desizing and scouring was applied to the raw cotton fabric using a mixture of Am and PG enzymes. The effect of the two enzyme concentrations at different incubation times on the desizing and bioscouring efficiencies was further studied [A. S. Aly, Sh. M. Sayed and M K Zahran\* (Department of Chemistry, Faculty of Science, Helwan University, Ain-Helwan, Cairo, Egypt), *Journal of Natural Fibers*, 2010, **7**(2), 71-92].

**NPARR 1(3), 2010-0548, A new methodology to optimise solar energy extraction under cloudy conditions**

The orientation and tilt position of the solar panel affect the amount of solar radiation that falls on the panel surface over the course of the day and indeed the year. The choice of tilt angle for a solar panel is fundamental to its efficient operation because incorrectly positioning the solar panel leads to an unnecessary loss in potential power. In the past, much work has been done by authors to determine the optimum tilt angle by applying existing models to their locations. This approach has been successful in climates with the most favourable solar potential, where greater than 90% of the solar radiation arrives as direct beam radiation. The accuracy of these models in these locations has been attributed to the low presence of cloud cover and the consequential dominance of the beam radiation portion of the global radiation. Countries located above 45N however, (Northern Europe), require a different approach to optimising the tilt angle as they receive the least amount of direct radiation with approximately half arriving as diffuse radiation, due to frequent, heavy cloud cover. This paper reviews existing methods and describes a means of predicting the solar radiation in a frequently overcast climate and proposes a method for choosing the optimum tilt angle in such a climate. The effect of different load profiles on the optimum tilt angle is also

investigated. The solar radiation model is then used to predict the solar radiation for Cairo, Egypt to show that the model has a global application and is not limited to frequently overcast climates [S. Armstrong and W.G. Hurley (Power Electronics Research Centre, Electrical and Electronic Engineering, National University of Ireland, Galway, Ireland), *Renewable Energy*, 2010, **35**(4), 780-787] .

**NPARR 1(3), 2010-0549, Biotechnological conversions of bio-diesel derived waste glycerol into added-value compounds by higher fungi: production of biomass, single cell oil and oxalic acid**

Waste bio-diesel derived glycerol was used as the sole carbon source by higher fungi; two *Lentinula edodes* strains were flask cultured in carbon-limited conditions and displayed satisfactory growth in media presenting weak agitation, pH 4.0 and temperature 25°C. Maximum biomass of 5.2g/l was produced. Mycelia were synthesized, containing around 0.1g of fat per g of biomass, with linoleic acid being the principal cellular fatty acid produced. Two *Aspergillus niger* strains were grown in nitrogen-limited flask cultures with constant nitrogen and two different initial glycerol concentrations into the medium. In 250-ml flask cultures, large-sized pellets were developed, in contrast with the trials performed in 2-l flasks. Nitrogen limitation led to oxalic acid secretion and intra-cellular lipid accumulation; in any case, sequential production of lipid and oxalic acid was observed. Initially, nitrogen limitation led to lipid accumulation. Thereafter, accumulated lipid was re-consumed and oxalic acid, in significant quantities, was secreted into the medium. In large-sized pellets, higher quantities of intra-cellular total lipid and lower quantities of oxalic acid were produced and vice versa. Maximum quantities of oxalic acid up to 20.5-21.5g/l and lipid up to 3.1-3.5g/l (corresponding to 0.41-0.57g of fat per g of biomass) were produced. Lipid was mainly composed of oleic and linoleic acids. [Axel André, Panagiota Diamantopoulou, Antonios Philippoussis, Dimitris Sarris, Michael Komaitis and Seraphim Papanikolaou\* (Agricultural University of Athens, Department of Food Science and Technology, 75 Iera Odos, 11855 Athens, Greece), *Industrial Crops and Products*, 2010, **31**(2), 407-416].

## S&T Know-how developed

**NPARR 1(3), 2010-0550, Protocols for Stevia farming, quality enhancement and processing of dry Stevia leaf in Mizoram Climate**

Protocols for Stevia (*Stevia rebaudiana* Bertoni) farming and quality enhancement as well as home processing of dry Stevia leaf with usages has been developed by North East Stevia, Lengpui, Aizawl, Mizoram group. For reaping a marketable harvest few techniques developed by this group are given below. It is very easy to adopt them and improve income.

## Agrotechnique

1. Use only the better quality planting material, supplied through DC4TD farmers' group. This variety will have higher sweetness and higher leaf yield. This will give more per acre leaf yield and up to 5-6 harvests per year. Use minimum 30,000 saplings per acre or 10,000 saplings per bigha. Saplings, propagated through tissue culture are disease free and true to type.
2. Transplant the planting material immediately; open the boxes/bags and spread the material under shade for better aeration. Keep the material covered with a wet cloth or gunny bag till transplanting. Use a dibbler to transplant. Add activated water absorbing granules and organic manure (if required) in each hole before placing the sapling.
3. Plant the saplings in rows along the slope. Do not make the rows across as it may create water stagnation and damage the crop. Allow at least 45cm between rows and 30 cm between plants within row. Stevia cannot withstand water stagnation at the root zone. Do Not make terrace as it will restrict natural drainage and may cause water stagnation at the root zone and damage the stevia plants.
4. Care is taken to supply saplings after pinching. Some times only a single tiller grows. After 15-20 days pinch the tiller(s) from the top. This will induce more tillers from the bottom. Repeat the operation till 25-40 tillers / branches per plant are obtained.

5. Keep the field clean and without weeds as weeds restrict sunlight and nutrients for the plant. The weed leaves plucked along with the stevia will cause impurity and reduce value. Do the weeding operation every fortnight initially till stevia plants have grown and covered most of the soil. Thereafter, do weeding as and when required.
6. After each weeding, hoeing add a fistful of organic manure to the root zone.
7. Stevia is a tender crop with very shallow root and requires light irrigation regularly. Under Mizoram conditions the rains/drizzles give a good irrigation for 3-6 days. During the winter, the dew provides a light irrigation. The spring and summer days will require light irrigations every alternate day if there is no intermittent rain/drizzle. It is therefore, advised to add well soaked moisture absorbing granules (@ 1g of dry granules converted into about 500 ml of well soaked granules per plant) in the root zone, at the time of transplanting. These granules will slowly release water to the moisture strained root zone. The jelly will also get recharged whenever excess moisture becomes available from rains/irrigation.
8. When there is severe moisture stress and no water is available for irrigation, harvest the entire shoot just leaving half to one inch above the ground, without any leaf. The root stock of stevia is very hardy to remain dormant for a long time and rejuvenate after rains/irrigation. This can keep most plants, if not all, alive and may minimize losses to a great extent.
10. The entire club of tender leaves can be dried in the shade. As the attached stalk is too tender, the same is not needed to be separated and the leaf will find good market for it. As this will also induce more tillering, this will provide an increase in the annual yields.
11. Do not allow the crop to flower. Flowering reduces sweetness and results in poor marketability. Once they have flowered and the vegetative growth is reduced and plants also naturally tend to die.
12. Stevia crop can be put to continuous harvest. It is a very huge and labourious and space consuming task to harvest the entire crop in one day. Instead sub-divide the plot into 60-90 subplots/rows. Do the operations in one / two sub plots per day. This will ease the work load and help better harvest and small place for drying will be required.
13. Use the harvesting baskets. Hand picking the leaves can give better yield. However, in case of shortage of labour and otherwise difficult conditions, use a pair of scissors to cut the twigs leaving 4-6 inches from the bottom. Do not apply force to damage the roots. In this case remove the leaves from the twigs after drying.

### Drying

9. Right stage of harvesting is the pre budding stage. This can be easily identified as the leaves at the top start becoming small and the buds slowly appear. The leaves are sweetest at this stage. Harvest the apical tender portion. This will also induce more tillers/branches from the lower nodes. Lower leaves can be hand picked after obtaining tillers from the nodes. Stevia is sweetest at this stage.
14. Create net racks with Bamboo, shade net and polythene cover at the top. This will help in drying the leaf with ventilation from top and bottom. This will also protect the leaves from soil, dirt and ground moisture. On an average sunny day the leaves will dry in about 8 hours. Each day's harvest can thus be dried before next days leaves are harvested. The dried leaves will be dirt free and green in colour. Once dried shake them to separate the leaves and the twigs.
15. Pack the dried leaves in the poly lined sacks. Do not store in torn /gunny bags.
16. Soon after harvesting, try to send the leaves to nearest collection centre / factory gate.
17. Leaf is graded according to moisture, sweetness and appearance. Better the grade better the price.

## Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. **Delhi International Renewable Energy Conference, October 27-29, 2010, New Delhi**, Ministry of New and Renewable Energy, Government of India, Website: <http://www.direc2010.gov.in>
2. **Malta Stevia 2010, Malta, Europe, October 28-29, 2010**, Sourabh Agarwal, CEO, India Stevia Association, P-29, South Extension Part 2, New Delhi 110049, India; E-mail: [indiasteviaassociation@gmail.com](mailto:indiasteviaassociation@gmail.com); [steviaglobalforum@gmail.com](mailto:steviaglobalforum@gmail.com); Phone: 9811941088; Website: [www.steviaglobalforum.com](http://www.steviaglobalforum.com); [www.indiasteviaassociation.com](http://www.indiasteviaassociation.com); [www.stevia-site.com](http://www.stevia-site.com)
3. **National Conference on Emerging Trends in Biopharmaceuticals – Relevance to Human health, November, 11-13, 2010**, Dr. Manoj Baranwal, Dept of Biotech and Environmental Sciences Thapar University, Patiala, Punjab, India; Website: <http://www.thapar.edu>
4. **International Forestry and Environment Symposium, Nugegoda, Sri Lanka, November 26-27, 2010**, Symposium Organising Committee, Department of forestry & Environmental Science, University of Sri Jayewardenepura, Nugegoda, Sri Lanka, Phone: +94 11 280 4685; Fax: +94 11 280 2914; Website: <http://www.environmentlanka.com/sympo/>
5. **Value Addition, Cultivation and Marketing of Medicinal Plants, Dehra Dun, December 6-10, 2010**, Head, Extension Division, Forest Research Institute, P.O. New Forest, Dehra Dun- 248 006 (Uttarakhand); Phone: 0135 – 2758606; Fax: 0135 – 2756865; E-mail: [headext@icfre.org](mailto:headext@icfre.org) Website: [www.icfre.org](http://www.icfre.org)
6. **Fourth International Conference on Plants & Environmental Pollution (ICPEP-4), Lucknow, India, 8-11 December 2010**, The Organizing Secretaries (ICPEP-4), International Society of Environmental Botanists, National Botanical Research Institute, Rana Pratap Marg, Lucknow-226001, India; E-mail: [isebnbrilko@sify.com](mailto:isebnbrilko@sify.com)/[isebmail@gmail.com](mailto:isebmail@gmail.com); Phone: +91-522-2297821 (Direct) +91-522-2205831 to 2205835 (PBX), Extn. 821; Fax: +91-522-2205836/2205839 “ICPEP-4”; Website: <http://isebindia.com/icpep-4/icpep-4.html>.
7. **Tissue Culture of Important Forest Trees, Bamboos and Medicinal Plants, Dehra Dun, December 13-17, 2010**, Head, Extension Division, Forest Research Institute, P.O. New Forest Dehra Dun 248 006 (Uttarakhand); Phone: 0135-2758606; Fax: 0135-2756865; E-mail: [headext@icfre.org](mailto:headext@icfre.org); Website: [www.icfre.org](http://www.icfre.org)
8. **62nd Indian Pharmaceutical Congress, December 17-19, 2010**, Prof. N Udupa, Indian Hospital Pharmacists' Association, Manipal, Karnataka, India; Website: <http://www.ipc2010manipal.org>
9. **Summer-training cum project work for M.Sc./M.Tech./B.Sc./B.Tech students on Biotechnology, Fragrance & Flavour Development Centre(Ministry of MSME, Govt. of India)**, Agro-Technology Division, F.F.D.C., G.T. Road, Kannauj (U.P.) -209 726; Phone:05694-234465, 234791; Fax: 05694-235242; E-mail: [ffdcknj@sancharnet.in](mailto:ffdcknj@sancharnet.in); **Dr. AK Sharma/Dr. RK Srivastava**, Mobile:-9336617070/8004641300; E-mail:-[aditya\\_ms@rediffmail.com](mailto:aditya_ms@rediffmail.com); [rks\\_ffdc@rediffmai.com](mailto:rks_ffdc@rediffmai.com)

## Announcements

Original research Papers and Reviews on topics dealt within this repository are invited for publication in peer reviewed, quarterly journal (March, June, September and December), ***Indian Journal of Natural Products and Resources*** (Formerly known as *Natural Product Radiance*). For details visit [nopr@niscair.res.in](mailto:nopr@niscair.res.in). The papers may be sent to Dr (Mrs) Sunita Garg, Editor or to Mrs Parmod Singla, Associate Editor, Periodicals Division, National Institute of Science Communication and Information Resources (NISCAIR), CSIR, Dr K. S. Krishnan Marg (Inside Pusa Campus). New Delhi-110012; Phone: (091)-11-25846001, (091)-11-25846304-07, Ext.258, 255. Fax: (091)-11-2584 7062. E-mail: [sunitag@niscair.res.in](mailto:sunitag@niscair.res.in); [parmod@niscair.res.in](mailto:parmod@niscair.res.in); [npr@niscair.res.in](mailto:npr@niscair.res.in)