

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 Natural Products and Resources)

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

NPARR 2(4), 2011-0366, Iron deficiency enhances bioactive phenolics in lemon juice

This study was designed to describe the phenolic status of lemon juice obtained from fruits of lemon trees differing in iron (Fe) nutritional status. Three types of Fe(III) compound were used in the experiment, namely a synthetic chelate and two complexes derived from natural polymers of humic and lignine nature. All three Fe(III) compounds were able to improve the Fe nutritional status of lemon trees, though to different degrees. This Fe(III) compound effect led to changes in the polyphenol content of lemon juice. Total phenolics were decreased (33% average decrease) and, in particular, flavanones, flavones and flavonols were affected similarly.

Iron-deficient trees showed higher phenolic contents than Fe(III) compound-treated trees, though Fe deficiency had negative effects on the yield and visual quality of fruits. However, from a human nutritional point of view and owing to the health-beneficial properties of their bioavailable phenolic compounds, the nutritional quality of fruits of Fe-deficient lemon trees in terms of phenolics was higher than that of fruits of Fe(III) compound-treated lemon trees. Moreover, diosmetin-6,8-di-C-glucoside in lemon juice can be used as a marker for correction of Fe deficiency in lemon trees [Carmen D Mellisho, Rocío González-Barrio, Federico Ferreres, María F Ortuño, Wenceslao Conejero, Arturo Torrecillas, José M García-Mina, Sonia Medina and Angel Gil-Izquierdo* (Research Group on Quality, Safety and Bioactivity of Plant Foods, Food Science and Technology Department, CEBAS-CSIC, PO Box 164, E-30100 Espinardo (Murcia) Spain.), *Journal of the Science of Food and Agriculture*, 2011, **91**(12), 2132-2139].

NPARR 2(4), 2011-0367, Development of a fermented goats' milk containing *Lactobacillus rhamnosus*: in vivo study of health benefits

Lactobacillus rhamnosus CRL1505, a strain of goats' milk origin, is able to stimulate mucosal immunity and protect immunocompetent mice from intestinal and respiratory infections. In this work authors developed and characterized a fermented goats' milk containing *L. rhamnosus* CRL1505, and demonstrated in a model of immunosuppression in mice that the final dairy product preserves the immunomodulatory properties of the strain. *L. rhamnosus* CRL1505 survived the manufacturing process of fermented milk and maintained a viability of 106 cfu g⁻¹ during storage. The fermented goats' milk was accepted by 90.48% of the panelists and was considered as having an acid taste and pleasant aroma. The developed product, used as a supplement during the repletion of immunocompromised malnourished mice, was effective in accelerating the recovery of clinical parameters altered by malnutrition and to induce increased resistance against intestinal and respiratory infections.

Goats' milk fermented with *L. rhamnosus* CRL1505 could be manufactured as an alternative probiotic dairy product since this new food has the ability to stimulate the common mucosal immune system and to improve defenses against respiratory and intestinal infections [Susana Salva, Martha Nuñez, Julio Villena, Adriana Ramón, Graciela Font and Susana Alvarez*(de Referencia para Lactobacilos (CERELA-CONICET), Chacabuco 145, CP 4000, San Miguel de Tucumán, Tucumán, Argentina), *Journal of the Science of Food and Agriculture*, 2011, **91**(13), 2355-2362].

NPARR 2(4), 2011-0368, Effect of inulin as prebiotic and synbiotic interactions between probiotics to improve fermented milk firmness

Inulin behaved as a prebiotic to improve firmness of skim milk fermented by (a) pure cultures of *Lactobacillus acidophilus* (La), *Lactobacillus rhamnosus* (Lr), *Lactobacillus bulgaricus* (Lb) and *Bifidobacterium lactis* (BI), (b) binary co-cultures of them with *Streptococcus thermophilus* (St), or (c) a cocktail containing all them. Inulin addition to co-cultures and cocktail enhanced products firmness, either after 1 day (D1) or 7 days (D7) of cold storage,

likely due to the increase in microbial growth induced by metabolic interactions among lactic acid bacteria and partial inulin metabolization. Co-culture firmness did in fact range from 0.33 N without inulin (St-Lb) after D1 and 0.55N with inulin (St-Lr) after D7. Also cocktail cultures exhibited high values of firmness, ranging, as an average, from 0.43N (D1) to 0.46N (D7), which suggests that they could have been potentiated by the reciprocal synergistic effects of microorganisms in complex mixture [Ricardo Pinheiro de Souza Oliveira, Patrizia Perego, Maricê Nogueira de Oliveira and Attilio Converti* ((Department of Chemical and Process Engineering, Genoa University, Via Opera Pia 15, I-16145 Genova, Italy), *Journal of Food Engineering*, 2011, **107** (1), 36-40)].

NPARR 2(4), 2011-0369 Preparation and evaluation of antioxidant capacity of Jackfruit (*Artocarpus heterophyllus* Lam.) wine and its protective role against radiation induced DNA damage

Jackfruit is an underutilized edible fruit in the tropics and subtropics. Authors produced wine from jackfruit pulp and evaluated the total phenolic and flavonoid contents and antioxidant properties of the wine. The ability of scavenging free radicals was measured using 2, 2-diphenyl-1-picrylhydrazyl

(DPPH), ferric reducing antioxidant assay (FRAP), N, N-dimethyl-p-phenylendiamine (DMPD) and nitric oxide (NO) scavenging assays. Experimental results indicated that jackfruit wine was effective in DPPH radical scavenging ($69.44 \pm 0.34\%$), FRAP (0.358 optical density value, O.D.), DMPD ($78.45 \pm 0.05\%$) and NO ($62.46 \pm 0.45\%$) capacity. By the analysis of the high performance liquid chromatography coupled to diode array detector (HPLC-DAD), two phenolic compounds namely gallic acid and protocatechuic acid were identified. The jackfruit wine was also able to protect H₂O₂ + UV radiation and radiation (100 Gy) induced DNA damage in pBR322 plasmid DNA. The antioxidant and DNA damage protecting properties of jackfruit wine confirmed health benefits when consumed and could become a valuable source of antioxidant rich nutraceuticals. Additionally, the wine could be a commercially valuable by-product for the jackfruit growers. [Umesh B. Jagtapa, Shailesh R. Waghmareb, Vinayak H. Lokhandec, Penna Suprasannad, Vishwas A. Bapata*(Functional Plant Biology section, Nuclear Agriculture and Biotechnology Division, Bhabha Atomic research centre, Trombay, Mumbai 400 085, (MS) India), *Industrial Crops and Products*, (2011), **34**, 1595-1601].

COSMECEUTICALS

NPARR 2(4), 2011-0370, Phase behavior and formulation of palm oil esters o/w nanoemulsions stabilized by hydrocolloid gums for cosmeceuticals application

Palm oil esters (POEs) are wax esters derived from palm oil and cis-9-octadecen-1-ol. The excellent wetting behaviour of the esters without the oily feel make them have great potentials in the manufacture of cosmeceutical and pharmaceutical products. However, little is known about their phase behaviors in ternary systems. The purpose of this investigation was to construct phase diagram of the POEs and mixed surfactants and to consequently select nanoemulsions composition for further studies. The preparation and characterization of oil-in-water nanoemulsions stabilized by hydrocolloid gums were then studied. Two types of nonionic surfactants were selected, namely Tween 80 (T80) and Span 80 (S80). Ternary phase diagram of POEs: Tocotrienol/T80:S80 (80:20)/water system was constructed at $25.0 \pm 0.5^\circ\text{C}$. The emulsification properties of 2 hydrocolloids gum (xanthan gum, carbopol ultrez 20 copolymer) were investigated. Gum dispersions were prepared in water (0.8%) and emulsified with 30% oil using a Polytron homogenizer. The flow curve of the emulsions always exhibited shear thinning behavior and obeys the power law viscosity. The emulsions with carbopol ultrez 20 copolymer was the most stable emulsions which composed of very small oil droplets ($50\% < 142.43\text{nm}$) with a narrow size distribution [Ng Sook Han, Mahiran Basri, Mohd. Basyaruddin Abd. Rahman, Raja Noor Zaliha Raja Abd. Rahman, Abu Bakar Salleh and Zahariah Ismail* (Sime Darby Research Sdn. Bhd Carey Island, Selangor, Malaysia), *Journal of Dispersion Science and Technology*, 2011, **32**(10), 1428-1433].

NPARR 2(4), 2011-0371, Herbal Cosmeceuticals for Photoprotection from Ultraviolet B Radiation: A Review

Ultraviolet B (UVB) rays vary with time and season and are the major cause of sunburns. Sunburned skin is a leading risk factor for melanoma and non-melanoma skin cancers. Protection against exposure to UVB rays may be achieved by a

combination of various approaches such as use of broad spectrum sunscreen formulations. UV radiations (UVR) absorbed by the skin surface can produce harmful compounds called free radicals or reactive oxygen species (ROS), which can cause skin cancer and premature aging. To reduce ROS generation and damage, researchers recommend using sunscreen to protect the skin from harmful UVR. The realm of possibilities in photoprotection may include the development of sunscreens which remain at the surface of the skin for a longer time and may incorporate antioxidants that can neutralize ROS. By quenching free radicals, antioxidants may aid photoprotection effect. This review focuses on photoprotection from UVB radiation and discusses potential herbal candidates with antioxidant properties that can serve as a strong barrier in cosmeceuticals to protect skin against harmful UVB rays [AK Mishra^{1*}, A Mishra and P Chattopadhyay (Department of Pharmaceutical Sciences, Birla Institute of Technology, Ranchi-835215, India), *Tropical Journal of Pharmaceutical Research*, 2011, **10**(3), 351-360].

NPARR 2(4), 2011-0372, Porcine amniotic fluid as possible antiwrinkle cosmetic agent

Porcine amniotic fluid was investigated for use as a functional cosmetic ingredient. From safety tests by MTT (5-diphenyltetrazolium bromide) assay, cell viability was above 90% for 50-1,000 $\mu\text{g/mL}$ concentration and porcine amniotic fluid was safe for cosmetic ingredient. From stability tests, cream containing 1% porcine amniotic fluid maintained constant physical properties for color, pH and viscosity during 28 days, and porcine amniotic fluid was stable for a cosmetic agent. Efficacy tests were done for antiwrinkle (elastase inhibition and collagenase synthesis inhibition), whitening (tyrosinase inhibition and DOPA (3, 4-Dihydroxy-L-phenyl-alanine) oxidation inhibition) and antioxidation. At 500 $\mu\text{g/mL}$ concentration, elastase inhibition of porcine placenta amniotic fluid was 33%, whereas that of adenosine as reference was 14%. However, porcine amniotic fluid showed relatively insignificant effect on collagenase synthesis inhibition, whitening and antioxidation activity. From this study, porcine amniotic fluid showed potential for a future antiwrinkle cosmetic agent. [Tagon Kim, Sung Kim, WhanYul Kang, Hyun Baek, Hye Young

Jeon, Bo Young Kim, Chun Gyu Kim and Donguk Kim* (Department of Pharmaceutical Engineering, Inje University, Gimhae, Gyongnam 621-749, Korea), *Korean Journal of Chemical Engineering*, 2011, **28**(9), 1839-1843].

NPARR 2(4), 2011-0373, ***Nelumbo nucifera* extracts as whitening and anti-wrinkle cosmetic agent**

Water extract from *Nelumbo nucifera* was tested for possible functional cosmetic agent. Whitening effect was measured by tyrosinase inhibition assay and DOPA-oxidase inhibition assay, and anti-wrinkle effect was checked by elastase inhibition assay. DOPA-oxidase inhibition effect (whitening effect) of leaf, seed and flower extract was 59, 57 and 50%, respectively. Its leaf, seed and flower extract showed

56, 49 and 54% elastase inhibition (anti-wrinkle effect) at 200 µg/ml, while adenosine indicated 26% inhibition. Water cream including root, leaf, flower, stem extract did not cause significant skin irritation. Water cream including 4% extract was stable for 30 days under various temperature conditions. From the study, leaf, flower and seed extracts showed strong possibility for whitening and anti-wrinkle functional cosmetic agent [Tagon Kim, Hee Jin Kim, Sung Ki Cho, Whan Yul Kang, Hyun Baek, Hye Young Jeon,, Boyoung Kim and Donguk Kim* (Department of Pharmaceutical Engineering, Inje University, Gimhae, Gyeongnam 621-749, Korea), *Korean Journal of Chemical Engineering* , 2011, **28**(2), 424-427].

DYES (incl. Food colorants)

NPARR 2(4), 2011-0374, Evaluation of antibacterial, antifungal, and antioxidant properties of some food dyes

Natural dyes find use in the coloring of textiles, drugs, cosmetics, etc. Owing to their nontoxic effects, they are also used for coloring various food products. In the present study antimicrobial properties of 8 food dyes against 10 bacteria and 5 fungal organisms were investigated. It was observed that red dyes showed best antibacterial activity while yellow dyes showed better antifungal activity. Dyes obtained from catechu (*Acacia catechu*) and myrobalan (*Terminalia chebula*) is not sufficiently effective against the tested microorganisms. In addition to antimicrobial analysis, antioxidant activity by 3 different methods was also investigated. In all the methods, red dye was found to have greater antioxidant activity. It suggest that the addition of these dyes in food not only enhances the value addition by making the food more presentable but also shall address the issue of food supplementation with substances that are good antibiotics and antioxidants, subsequently proving to be health benefactors [Ramamoorthy Siva*, Meera George Palackan, Lubaina Maimoon, T. Geetha, Dipita Bhakta, P. Balamurugan and S. Rajanarayanan (School of Bio-Science and Technology, VIT University, Vellore, TN, India), *Food Science and Biotechnology*, 2011, **20**(1), 7-13].

NPARR 2(4), 2011-0375, Detection of pigments and natural colorants from Thai herbal plants for possible use as coloring dyes

Fourteen Thai herbal plants were extracted using methanol, ethanol, and acetone. Comparison of the various extraction methods for pigments and polyphenols (colorants) showed that methanol provided a more complete extraction than ethanol and acetone. Percentage yield ranged from 1.7 to 40.7 and was dependent on the plant extracted and solubility of pigments and polyphenols (colorants) extracted by the various solvents. The absorption spectra of pigments and polyphenols (colorants) in the plant extract were present in the visible region (351 to 665 nm) and the absorption spectra of polyphenols were present in the ultraviolet region (200 to 349 nm). Color of plant

extracts varied and included violet-blue, yellow-green, red, orange-red, gray-purple, blue-green, gray-orange, gray-yellow, and black. High-performance liquid chromatography (HPLC) was used to separate and identify compounds of plant pigments and polyphenols (colorants). Ya-nang had the greatest number of peaks and chlorophyll A and chlorophyll B were found only in Ya-nang. Numerous pigments and polyphenols were detected. Such compounds have the potential to be used as coloring dyes [Panthip Boonsong, Natta Laohakunjit, Orapin Kerdchoechuen and Frank B. Matta* (Department of Plant and Soil Sciences, P.O. Box 9555, Mississippi State University, Mississippi State, MS 39762), *Hort Science* 2011, **46** (2), 265-272].

NPARR 2(4), 2011-0376, A colored avocado seed extract as a potential natural colorant

There is an increasing consumer demand for and scientific interest in new natural colorants. Avocado (*Persea americana*) seed when crushed with water develops an orange color ($\lambda_{\text{max_visible}} = 480 \text{ nm}$) in a time-dependent manner. Heat treatment of the seed prevented color development, whereas the addition of exogenous polyphenol oxidase (PPO), but not peroxidase restored color development. Color development was also inhibited by the addition of tropolone, an inhibitor of PPO. Color formation resulted in a decrease in the concentration of polyphenols indicating utilization for color formation. The orange color intensified as the pH was adjusted from 2.0 to 11.0, and these changes were only partially reversible when pH was adjusted from 7.5 to 11.0 in the presence of oxygen, but completely reversible when the pH was changed in the absence of oxygen. The color was found to be stable in solution at -18°C for 2 mo. These results suggest that the avocado seed may be a potential source of natural colorant, and that color development is PPO-dependent [Deepti Dabas, Ryan J. Elias, Joshua D. Lambert* and Gregory R. Ziegler (Dept. of Food Science, The Pennsylvania State Univ., Univ. Park, PA 16802, U.S.A.), *Journal of Food Science*, 2011, **76**(9), C1335–C1341].

NPARR 2(4), 2011-0377, Black mulberries (*Morus nigra*) as a natural dye for animal tissues staining

Natural dyes produce an extraordinary diversity

of rich and complex colours as well as unexpected results, making them exciting to use. Natural dyes have been used for staining wool, silk, carpet and cotton. Black mulberry (*Morus nigra*) has strong staining activity and a distinct flavor with juicy and acidic characteristics making them attractive for use in the processing industry in products such as fruit juice, ice cream, jelly, and jam. Aim of this study was to investigate a new staining method using black mulberry for whole mount and transverse sections staining of fasciola. Adult liver flukes (*Fasciola* sp.) were collected from the livers of naturally infected cows at slaughterhouse, washed with physiological saline solution. Some adult *Fasciola* were collected, immersed in 10% neutral buffered formalin for fixation, and embedded in paraffin for histological studies. The rest of whole mount of adult worms were

collected, and then stained by the new method (dye extracted from beet root) and Carmine staining method for control. Sections, 7-10 micrometer from adult worms were collected, and then stained by the new method and hematoxyllin & eosin staining method for control. By using the dye extracted from beet root, zoologists and parasitologists can make identification and differentiation between different parasites. By using the dye extracted from black mulberry, zoologists and parasitologists can make identification and differentiation between different parasites. This dye method can be an alternative to cost and time consuming current chemical staining methods [Tousson, Ehab and Al-Behbehani, Bahija* (Science Department, College of Basic Education, PAAET, Kuwait), *Animal Biology*, 2011, **61**(1), 49-56].

ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 2(4), 2011-0378, **Improvement of essential oil yield of oil-bearing (*Rosa damascena* Mill.) due to surfactant and maceration**

The essential oil content of the oil-bearing rose (*Rosa damascena* Mill.) is relatively low, around 0.3-0.4 mL kg⁻¹ in fresh flowers. There is a need to increase essential oil yield of oil-bearing rose. The objective was to examine the effect of Tween 20 (polyoxyethylene sorbitan monolaurate) applied with, or without, maceration of flowers on oil content and composition of oil-bearing rose harvested at beginning of flowering, full bloom, and end of flowering. Addition of Tween 20 at 1000 mL L⁻¹ and 2500 mL L⁻¹ increased essential oil yield by 26% (to 0.44 mL kg⁻¹) and 54% (to 0.54 mL kg⁻¹) respectively relative to the untreated control that gave 0.35 mL kg⁻¹ yield. Maceration, in combination with the addition of Tween 20 at 1000 mL L⁻¹ and Tween 20 at 2500 mL L⁻¹, increased oil yield by 69% (to 0.59 mL kg⁻¹) and 94% (to 0.68 mL kg⁻¹) respectively. Among the three phenological phases of harvest, harvesting at the beginning of flowering gave the highest yield followed by the full bloom and then by the end of flowering phases. Since the interaction effect was not significant, the differences obtained among the treatments were regardless of the phase, and vice versa. Treatments did not significantly alter composition of the essential oil. Postharvest pre-extraction application of Tween 20 in combination with maceration could be used in the rose industry for increasing the essential oil yield [Anna Dobreva, Natasha Kovatcheva, Tess Astatkieb, and Valtcho D. Zheljzkovc* (Research Institute for Roses, Aromatic and Medicinal Crops, Kazanluk, Bulgaria), *Industrial Crops and Products*, 2011, **34**, 1649-1651

NPARR 2(4), 2011-0379, **Chemical composition and biological activities of *Calamintha officinalis* Moench essential Oil**

Calamintha officinalis Moench essential oil is used in cooking as an aromatic herb and also to improve the flavor and fragrance of several pharmaceutical products. The essential oil, obtained by hydrodistillation (5 mL/kg), was analyzed by gas

chromatography-mass spectrometry and gas chromatography-flame ionization detection. Sixty-four components were identified, constituting 99.7% of the total oil. The major component was found to be carvone (38.7%), followed by neo-dihydrocarveol (9.9%), dihydrocarveol acetate (7.6%), dihydrocarveol (6.9%), 1, 8 cineole (6.4%), cis-carvyl acetate (6.1%), and pulegone (4.1%). The essential oil showed antifungal and antimicrobial activity against Gram-positive bacteria. In addition, it presented a very low toxicity both in vivo (50% lethal dose >100 mg/kg) and in vitro in the *Artemia salina* test (50% lethal concentration >500 µL/mL). *C. officinalis* essential oil, in rodents, produces the typical effects in behavior of a nonselective central nervous system-depressant drug; it potentiates the hypnotic effects of sodium pentobarbital, decreasing the induction time and enhancing the sleeping time. Moreover, it produces a decrease in body temperature and a protection against pentylenetetrazole-induced convulsions [Maria Teresa Monforte, Olga Tzakou, Antonia Nostro, Vincenzo Zimbalatti, and Enza Maria Galati* (Pharmaco-Biological Department, School of Pharmacy, University of Messina, Vill. SS. Annunziata, 98168, Messina, Italy), *Journal of Medicinal Food*, 2011, **14**(3): 297-303].

NPARR 2(4), 2011-0380, **Antibacterial activity of essential oils from *Eucalyptus* and of selected components against multidrug-resistant bacterial pathogens**

Eucalyptus globulus Labill (Myrtaceae) is the principal source of eucalyptus oil in the world and has been used as an antiseptic and for relieving symptoms of cough, cold, sore throat and other infections. The oil, well known as 'eucalyptus oil' commercially, has been produced from the leaves. Biological properties of the essential oil of fruits from *E. globulus* have not been investigated much. The present study was performed to examine the antimicrobial activity of the fruit oil of *E. globulus* (EGF) and the leaf oils of *E. globulus* (EGL), *E. radiata* Sieber ex DC (ERL) and *E. citriodora* Hook (ECL) against multidrug-resistant (MDR) bacteria. Furthermore, this study was attempted to characterize the oils as well as to establish a relationship between the chemical composition and the corresponding antimicrobial properties.

The chemical composition of the oils was analyzed by GLC-MS. The oils and isolated major components of the oils were tested against MDR bacteria using the broth microdilution method. EGF exerted the most pronounced activity against methicillin-resistant *Staphylococcus aureus* (MIC ~ 250 µg/ml). EGF mainly consisted of aromadendrene (31.17%), whereas ECL had citronellal (90.07%) and citronellol (4.32%) as the major compounds. 1, 8-cineole was most abundant in EGL (86.51%) and ERL (82.66%).

The activity of the oils can be ranked as EGF > ECL > ERL ~ EGL. However, all the oils and the components were hardly active against MDR Gram-negative bacteria. Aromadendrene was found to be the most active, followed by citronellol, citronellal and 1, 8-cineole. [Sri Mulyaningsih, Frank Sporer, Jürgen Reichling, Michael Wink*(, Institute of Pharmacy and Molecular Biotechnology, Heidelberg University, Im Neuenheimer Feld 364, 69120, Heidelberg, Germany), *Pharmaceutical Biology*, 2011, **49**(9), 893-899].

NPARR 2(4), 2011-0381, Influence of different stabilizing operations and storage time on the composition of essential oil of thyme (*Thymus officinalis* L.) and rosemary (*Rosmarinus officinalis* L.)

The effect of different stabilizing techniques on

the composition of essential oil of rosemary (*Rosmarinus officinalis* L.) and thyme (*Thymus officinalis* L.) during one year of storage is reported. The study was aimed to know what is the stabilizing technique to keep at the best the original essential oil composition. The fresh samples were collected and treated as follows: air-dried in a laboratory scale pilot dryer, frozen in a forced-air freezer and freeze-dried in a laboratory freeze-dryer. The fresh sample served as control. The treated samples were packaged with appropriate packaging material and stored at 20°C or -20°C for 12 months. All the samples were hydrodistilled every three months and the oils composition was obtained by means of gas chromatography/mass spectrometry (GC/MS). Quantification of known compounds was done with the use of an internal standard. Freezing best maintained the composition of rosemary and thyme essential oil. Appropriate packaging of air-dried and freeze-dried herbs resulted in negligible quality loss up to one year of storage. The frozen and stored thyme samples showed the best retention of thymol, the most important compound, as well as of γ -terpinene and carvacrol [Marianna Usai, Mauro Marchetti, Marzia Foddai, Alessandra Del Caro, Roberta Desogus, Iser Sanna and Antonio Piga*(Dipartimento di Scienze Ambientali Agrarie e Biotecnologie Agro-Alimentari, Università degli Studi di Sassari, Viale Italia 39/A, 07100 Sassari, Italy), *LWT-Food Science and Technology*, 2011, **44**(1), 244-249].

FEED/FODDER

NPARR 2(4), 2011-0382, Influence of the diet structure on ruminal biohydrogenation and milk fatty acid composition of cows fed extruded linseed

This experiment studied the influence of the diet structure value (SV) on ruminal biohydrogenation and milk fatty acid (FA) responses in cows fed heterogeneous basal diets equally supplemented with FA. Eight lactating Holstein cows were used in a replicated 4×4 Latin square design with four dietary treatments and four 21-day periods. The iso-fat, iso-18:2 *n*-6 and iso-18:3 *n*-3 diets were formulated to display three different SV, using different sources and proportions of forages, energy and nitrogen concentrates. The four diets contained maize silage as the main forage (SV1.2 diet), grass hay as the main forage (SV2.0 diet), maize silage and grass hay in a 4:1 ratio (SV1.6 M diet) or maize silage and grass hay in a 1:1 ratio (SV1.6H diet). The diets also contained soya bean meal and/or urea as additional sources of nitrogen, sugar beet pulp and barley in a 1:1 ratio as additional source of energy, extruded linseed as supplemental 18:3 *n*-3, a mineral and vitamin mix and a vitamin E preparation. Wheat straw was added to the diets as additional structure source, except for the SV2.0 diet. Soya bean oil was added to the diets as supplemental 18:2 *n*-6 to adjust the diets for this FA, except for the SV1.2 diet. The diets were distributed as a restricted total mixed ration. The various C18 FA expressed as 100g of total C18 FA in milk fat are relevant indicators of ruminal biohydrogenation since duodenal concentrations of C18 FA follow similar changes as those in milk fat, and since these ratios only take into account FA involved in ruminal biohydrogenation. All the various C18 FA to total C18 FA in milk fat differed among diets ($P < 0.05$). Milk 18:2 *n*-6+18:3 *n*-3/total C18 FA and total trans-C18 FA/total C18 FA decreased from SV1.2 to SV2.0 diets, whereas 18:0/total C18 FA increased from SV1.2 to SV2.0 diets. Subsequently, transfer efficiencies of 18:2 *n*-6 and 18:3 *n*-3 from diet to milk were higher for the SV1.2 diet than for the other diets ($P < 0.05$). These results confirm the hypothesis that ruminal biohydrogenation is more complete with higher diet SV, which is consistent with results from other published experiments where

high forage diets or grass silage compared to maize silage-based diets were used. This experiment showed that the concept of diet SV is a valid tool characterizing heterogeneous basal diets differing in sources and proportions of forages and concentrates [Q.C. Dang Van*, M. Focant, E. Mignolet, C. Turu, E. Froidmont and Y. Larondelle (Institut des Sciences de la Vie, Université catholique de Louvain, 2/8 Croix du Sud, B-1348 Louvain-la-Neuve, Belgium), *Animal Feed Science And Technology*, 2011, **169**(1-2), 1-10].

NPARR 2(4), 2011-0383, Growth performance of weanling wistar rats fed on accessions of cooked *Colocasia esculenta*-based diets

The growth performance of weanling albino rats (*Rattus norvegicus*) maintained on different accessions (offspring of a variety that was planted/collected at a specific location and time but differing in certain morphologic characteristics) of cooked *Colocasia esculenta* (cocoyam)-based diets (UFCe1-UFCe7) for 28 days was investigated. Proximate analysis of the formulated diets revealed that UFCe3, UFCe4, UFCe5, UFCe6, and UFCe7 had significantly ($P < 0.05$) higher moisture contents than the corn starch-based diet (control). All the accession-based diets of *C. esculenta* had higher ash contents. Similarly, all the accessions of the *C. esculenta*-based diet had lower crude lipid content, whereas UFCe3-UFCe7 had significantly lower protein content. Although the crude fiber content was significantly higher in UFCe2, UFCe4, and UFCe5, only UFCe3 had significantly higher carbohydrate content among all the accessions of *C. esculenta*-based diets. UFCe1, UFCe2, UFCe4, UFCe5, and UFCe6 increased the average weekly water intake, feed consumption, total body weight, liver-body weight ratio, and kidney-body weight ratio of the animals; UFCe3 and UFCe7 decreased these measures. Overall, UFCe1, UFCe2, UFCe4, UFCe5, and UFCe6 are recommended as diets with promise to enhance growth performance in the animals [Muinat N. Lewu, Toyin M. Yakubu, Patrick O. Adebola, and Anthony J. Afolayan* (Department of Botany, University of Fort Hare, Alice 5700, South Africa) *Journal of Medicinal Food*, 2011, **14**(9), 1046-1051]

FIBRES (incl. Textile and other utility fibres)

NPARR 2(4), 2011-0384, Anhydride modification of cultivated Kenaf bast fibers: morphological, spectroscopic and thermal studies

Kenaf bast fiber was chemically modified by using propionic and succinic anhydrides. Five retention times were compared: 30, 60, 120, 180, and 240 minutes at 100°C. Confirmation of anhydride modification was established by the weight percent gain (WPG) and was further confirmed by Fourier Transform Infra-Red (FT-IR) spectroscopy. Based on WPG, succinylated fibers exhibited higher WPG than propionylated fibers. The results of WPG for both succinylated and propionylated fibers showed that 180 minutes was an optimum time for modification, yielding the highest WPG. The thermal stability of modified fibers was characterized with Thermal Gravimetric Analysis (TGA). Succinylated fibers showed better thermal stability than propionylated fibers. Anhydride modification also enhanced the fiber smoothness, as demonstrated by Scanning Electron Microscopy (SEM) analysis. Succinylated fibers showed a much smoother surface as compared to propionylated fibers and untreated fibers. Anhydride modification significantly decreased the contact angle of kenaf bast fibers, thus imparting good adhesion characteristics to the fibers [H. P. S. Abdul Khalil* and Noorul Linda Suraya (School of Industrial Technology, University of Sains, Malaysia), *BioResources*, 2011, **6**(2), 1122-1135].

NPARR 2(4), 2011-0385, Investigation on the effect of alkaline treatment on mechanical properties of banana fibre polymer composite

Nowadays, use of natural, cellulosic fibres as reinforcing fillers for commodity plastics has received much attention because of a number of advantages over traditional, inorganic ones such as good specific strength, high toughness, and good thermal insulation, less abrasion, minimal dermal and respiratory irritation, biodegradability and natural abundance. For high performance composites bast fibres, extracted from the stems of plants such as jute, kenaf, flax, ramie, and hemp are widely accepted as the best candidates due to their very good mechanical

properties. However, lack of good interfacial adhesion, low melting point and poor resistance to moisture absorption make the use of natural fibre reinforced composites less attractive. Chemical treatment of the fibre can clean the fibre surface, chemically modify the surface, stop the moisture absorption process and increase the surface roughness. In this work, banana bast fibres were modified using NaOH of 6% concentrations. Morphological and structural changes of the fibres were investigated using scanning electron microscopy (SEM). In the present work, banana fibre with different proportion was used as reinforcements to polymer based matrices. The effects of fibres content on mechanical properties of banana fibre composite materials were studied. [A. Alavudeen, M. Thiruchitrambalam, J.T. Winowlin Jappes and A. Athijayamani* (Department of Mechanical Engineering, A. C. College of Engineering and Technology, Karaikudi-630 004, Tamilnadu, India), *International Journal of Computer Aided Engineering and Technology*, 2011, **3**(5-6), 434-442].

NPARR 2(4), 2011-0386, Modification of natural bamboo fibers for textile applications

Natural bamboo fibers have excellent properties suggesting that there is a good potential for them to be used in textiles; however, they have not received the attention that they deserve owing to their coarse and stiff quality. Therefore, a chemical method for extraction and modification of natural bamboo fibers for textile end uses were developed and optimized in this paper. The quality of natural bamboo fibers were characterized by their chemical composition, linear density, and tenacity. Experimental results show that the modified bamboo fibers are finer, with significant lower content of noncellulosic substances. The processing parameters are optimized as: 20 g/l NaOH, 3 g/l Na₅P₃O₁₀, 5 g/l Na₂SO₃, 3 g/l penetrating agent, with a fiber to liquid ratio of 1:10, at 100 oC for 2 h, and the bamboo fiber thus produced has cellulose amount of 73.25 %, fineness of 3.26 tex, average length of 44.5 mm, breaking elongation of 2.8 % and tenacity of 2.41 cN/dtex. The result of this study may offer a possibility of developing natural bamboo fibers into practical applications in textiles [Lifang Liu, Qianli Wang, Longdi Cheng, Jingfang Qian and Jianyong Yu1* (Modern Textile Institute, Donghua University, Shanghai 200051, China),

Fibers and Polymers, 2011, **12**(1), 95-103].

NPARR 2(4), 2011-0387, **Application of natural fiber composites to musical instrument top plates**

A flax-reinforced sandwich structure suitable for replacing wood in the top plates of string musical instruments was developed. The mechanical properties of Sitka spruce, the most widely used wood species for this application, were taken as a benchmark when the new materials were developed. The materials were characterized by static and dynamic methods to determine the dynamic Young's modulus, shear modulus, internal friction, and static

mechanical properties. Based on the material characterization, a hand lay-up process with a two-part closed mold and internal pressure bladder was developed and six prototype ukuleles were manufactured. The results show that the flax-reinforced sandwich structure can successfully act as a top plate and that an efficient manufacturing process can be developed to produce monocoque string musical instruments out of composite materials [Steven Phillips* and Larry Lessard, (Department of Mechanical Engineering, McGill University, Macdonald Engineering Building, Montreal, Quebec, Canada), *Journal of Composite Materials*, 2011, August 3).

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

NPARR 2(4), 2011-0388, Hypolipidaemic effects of dietary whole soybean curd (jeondubu) in rats

The characteristic of whole soybean curd is that it includes the soybean residue that is discarded as waste in the manufacture of usual soybean curd (known as tofu). In this study the effect of dietary whole soybean curd on lipid profiles in rats was compared with that of usual soybean curd. Rats were fed for 4 weeks with diets differing only in the source of protein, namely casein, whole soybean curd or usual soybean curd. There were no significant differences in growth parameters due to diet differences. However, the two groups fed with curds had significantly lower levels of serum cholesterol and triglyceride than the group fed with casein, the greatest reduction in lipid profiles being observed in the group fed with whole soybean curd. The serum high-density lipoprotein cholesterol/total cholesterol ratio was higher in rats fed with whole soybean curd. The results suggest the possibility that whole soybean curd may have more beneficial effects in controlling serum lipid profiles than usual soybean curd that is normally consumed [Keong Hee Lee, Yeon Ho Jeong, Beomgoo Lee, Wisoo Kang and Yong Soon Choi* (Division of Medical Biotechnology, College of Biomedical Science, Kangwon National University, Chuncheon 200-701, South Korea), *Journal of the Science of Food and Agriculture*, 2011, **91**(13), 2329-2332].

NPARR 2(4), 2011-0389, Edible coating and post-frying centrifuge step effect on quality of vacuum-fried banana chips

A high oil content in fried banana chips shortens the shelf life of the product and causes a decrease in product acceptability to consumers. The oil absorption problem associated with fried products might be reduced by using hydrocolloids as edible coatings and modifying the frying process during the oil centrifuge step of vacuum frying. The objective of this study was to determine the effect of edible coating materials and the speed of the oil centrifuge step on the amount of oil absorption and the physical properties of vacuum-fried banana chips. Compared with regular vacuum-

fried products (control samples), banana chips coated with either guar gum or xanthan gum solutions at 1.5% or centrifuged at a higher speed than standard conditions (from 140 to 280rpm) reduced oil absorption by 25.22, 17.22 and 17.31%, respectively. Moreover, the combination of an edible coating and the higher centrifugation speed resulted in a greater reduction of oil absorption (33.71%) compared with control samples. Therefore, banana chips coated with an edible coating and produced using the higher speed during the oil centrifuge step in the vacuum-frying process maintained a good quality with low oil content, representing a healthier snack for consumers [Rungsinee Sothornvit*(Department of Food Engineering, Faculty of Engineering at Kamphaengsaen/Center of Excellence for Agricultural and Food Machinery, Kasetsart University, Kamphaengsaen Campus, Nakhonpathom 73140, Thailand), *Journal of Food Engineering*, 2011, **107**(3-4), 319-325].

NPARR 2(4), 2011-0390, Quick-boiling noodle production by using infrared drying

In this study, infrared treatment at different powers was used at drying stage of noodle production. Drying time was reduced to 3 min 30 s and 50% reduction in cooking time was obtained at the highest power. Lower cooking loss and total organic matter values, higher maximum force values were obtained for noodles dried by using infrared, indicating improved quality. Infrared treatment generally caused an increase in Rapid ViscoAnalyzer viscosity values of the noodles. Starch granules of the noodles dried by using infrared retained their birefringence to a large extent and increase in intensity of some peaks and formation of a new peak at $2\theta = 20$ (V-type diffraction pattern) were observed in X-ray diffraction patterns. Relative intensities of some protein bands in SDS-PAGE patterns decreased, total dietary fiber and enzyme resistant starch contents increased slightly. Starch digestibility (in vitro) values increased gradually as the infrared power applied increased [Arzu Basman*, Seda Yalcin (Hacettepe University, Faculty of Engineering, Food Engineering Department, 06800 Beytepe, Ankara, Turkey), *Journal of Food Engineering*, 2011, **106**(3), 245-252].

NPARR 2(4), 2011-0391, The potential role of milk-derived peptides in cardiovascular disease

Bioactive peptides derived from milk proteins are of particular interest to the food industry due to the potential functional and physiological roles that they demonstrate, particularly in relation to cardiovascular disease (CVD). By 2020 it is estimated that heart disease and stroke will become the leading cause of death and disability worldwide. Acute and chronic cardiovascular events may result from alterations in the activity of the renin-angiotensin aldosterone system and activation of the coagulation cascade and of platelets. Medications that inhibit angiotensin converting enzyme (ACE) are widely prescribed in the treatment and prevention of cardiovascular disease. ACE inhibitory peptides are of particular interest due to the presence of encrypted inhibitory peptide sequences. In particular, Ile-Pro-Pro and Val-Pro-Pro are fore runners in ACE inhibition, and have been incorporated into commercial products. Additionally, studies to identify additional novel peptides with similar bio-activity and the ability to withstand digestion during transit through the gastrointestinal tract are ongoing. The potential sources of such peptides in cheese and other dairy products are discussed. Challenges to the bio-availability of such peptides in the gastro intestinal tract are also reviewed. Activation of platelets and the coagulation cascade play a central role in the progression of cardiovascular disease. Platelets from such patients show spontaneous aggregation and an increased sensitivity to agonists which results in vascular damage and endothelial dysfunction associated with CVD. Peptide sequences exhibiting anti-thrombotic activity have been identified from fermented milk products. Studies on such peptides are reviewed and their effects on platelet function are discussed. Finally the ability of food derived peptides to decrease the formation of blood clots (thrombi) is reviewed. In conclusion, due to the widespread nature of cardiovascular disease, the identification of food derived compounds that exhibit a beneficial effect in such widespread areas of CVD regulation will have strong clinical potential. Due to the perception that food derived products have an acceptable risk profile they have the potential for widespread acceptance by the public. In this review, selected biological effects relating to CVD are discussed with a view to providing essential information to researchers

[Phelan, M. and Kerins, D* (Food for Health Ireland, University College Cork, Western Road, Cork, Ireland), *Food and Function*, 2011, 2(3-4), 153-167].

NPARR 2(4), 2011-0392, Nutritional, microbial and organoleptic qualities of fish patties prepared from carp (*Cyprinus carpio* Linn.) of three weight groups

Fish patty from common carp (*Cyprinus carpio* Linn.) which has low consumer preference due to the presence of intramuscular spines was developed and the effects of fish weight and the type of extender on product quality were determined. Six different types of fish patties were prepared by using the fish belonging to 3 weight groups (250-500 g, 501-750 g, and 751-1,000 g) and using 2 extenders (boiled potato and corn flour). Patties containing potato had higher moisture (70.6-73.3%), protein (31.5-32.7%) and lipid (3.3-4.6%) contents than those with corn flour (60-65.2, 27.8-33.3, 2.6-3.8%, respectively). Cooking decreased protein but increased lipid, soluble sugars, and gross energy contents of patties. Corn flour used patties gave higher cooking yield than those with boiled potato. These also had higher fat retention capacity and gross energy values. The 501-750 g group patties containing boiled potato had significantly higher scores for texture and overall acceptability [Sehgal, H.S.*, Shahi, M., Sehgal, G.K. and Thind, S.S (Department of Zoology, Punjab Agricultural University, Ludhiana 141 004, India), *Journal of Food Science and Technology*, 2011, 48(2), 242-245].

NPARR 2(4), 2011-0393, Controlling *Listeria monocytogenes* in ready-to-eat foods: Working towards global scientific consensus and harmonization - Recommendations for improved prevention and control

An international group of experts from the food industry, academia, and governments met in Amsterdam in May 2009 to discuss approaches for controlling *Listeria monocytogenes* in ready-to-eat (RTE) foods in anticipation of an agreement by Member States on the Codex Guidelines for the pathogen in foods. The workshop was organised by Ewen Todd (Michigan State University) in cooperation with the European Federation of Food Science and Technology and the Global

Harmonization Initiative. The group felt there is a need for a risk-based policy with input from all the stakeholders at local and national levels. An important part of the background is to review the critical factors for control, including the unique growth, survival and virulence characteristics of the pathogen; identifying specific populations at risk; and defining what RTE foods are. They also saw the need for *L. monocytogenes* food-source attribution through review of outbreak data, implementation of case-control studies, expert elicitations, microbial source tracking, and development of risk assessment models. They also indicated that surveillance of both listeriosis and the gastrointestinal non-invasive form of illness caused by the pathogen are important for public health agencies to establish or enhance; this would require coordination of laboratories through better communication and reporting for the analysis of clinical cases, foods and environmental sources. These laboratories should be also accredited, with some being reference laboratories at national or regional levels. There was consensus agreement on the microbiological criteria as specified in the Codex Guidelines, but it was recognized there were challenges for industry to meet these and government agencies to assess compliance, requiring a robust testing regime for both food and food-contact surfaces at all stages in the production system, as well as for environmental monitoring. Other issues are the development, validation, and acceptance of quantitative methods sufficient to detect the pathogen in food at levels <100CFUg⁻¹; determining the food's ability to support the growth of the pathogen or not through challenge studies, and risk assessment models, appropriate labelling of RTE foods, and a standardized approach to tracing and tracking of products throughout the food chain. There is also a need for food worker education and training, and consumer awareness and responsibility. Message mapping is one approach to instill the essential food safety messages regarding listeriosis and the safety of RTE foods for both employees and the public [Luber, P., Crerar, S., Dufour, C., Farber, J., Datta, A., Todd, E.C.D. (Department of Advertising, Public Relations and Retailing, Michigan State University, East Lansing, MI 48823, United States), *Food Control*, 2011, **22**(9),1535-1549].

NPARR 2(4), 2011-0394, **Development and quality**

evaluation of honey based carrot candy

Candy was prepared with 3 different combinations of honey and carrot by using 750 g honey+1,000 g carrot (T1), 1,000 g honey+1,000 g carrot (T2) and 1,250 g honey+1,000 g carrot (T3). To establish the best product, sensory evaluation was done on 9-point Hedonic scale. T1 was found to be most preferred candy. Further the T1 candy was assessed for overall quality during storage at room temperature (25-30 °C) for 6 months. Candy can be preserved safely for 6 months in both glass and LDPE packaging materials [Durrani, A.M.*, Srivastava, P.K., Verma, S. (Department of Home Science, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh 202002, India), *Journal of Food Science and Technology*, 2011, **48**(4), 502-505].

NPARR 2(4), 2011-0395, **Physico-chemical characteristics of defatted rice bran and its utilization in a bakery product**

Defatted rice bran (DRB), a byproduct of rice milling is a rich source of dietary fiber and minerals. In the present study, the physico-chemical characteristics, antioxidant potential of defatted rice bran (Laboratory-LDRB and Commercial -CDRB) and its utilization in preparation of bread were studied. The effect of incorporation of CDRB at varying levels (5, 10 & 15%) on the quality characteristics of bread including physical, rheological and sensory attributes were evaluated and the dietary fiber content and antioxidant activity were determined. The results indicated that LDRB had better nutrient profile, physical and antioxidant properties than CDRB. On the basis of physical characteristics, breads with 5% and 10% CDRB were found to be acceptable as such and those containing 15% were acceptable with addition of bread improvers. The dietary fiber content and total antioxidative activity of bread increased with increasing levels of CDRB, which also improved the shelf life. The results reveal that DRB can be incorporated in breads upto 10% and 15% as such or with bread improvers respectively, as source of fiber and natural antioxidant, as a functional ingredient [Sairam, S.*, Gopala Krishna, A.G., Urooj, A. (Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore 570 006, India) *Journal of Food Science and Technology*, 2011, **48**(4), 478-483].

FRUITS

NPARR 2(4), 2011-0396, Effect of acid concentration and treatment time on acid-alcohol modified jackfruit seed starch properties

The properties of starch extracted from jackfruit (*Artocarpus heterophyllus* Lam.) seeds, collected from west Assam after acid-alcohol modification by short term treatment (ST) for 15-30 min with concentrated hydrochloric acid and long term treatment (LT) for 1-15 days with 1 M hydrochloric acid, were investigated. Granule density, freeze thaw stability, solubility and light transmittance of the treated starches increased. A maximum decrease in the degree of polymerisation occurred in ST of 30 min (2607.6). Jackfruit starch had $27.1 \pm 0.04\%$ amylose content (db), which in ST initially decreased and then increased with the severity of treatment; in LT the effect was irregular. The pasting profile and granule morphology of the treated samples were severely modified. Native starch had the A-type crystalline pattern and crystalline structure increased on treatment. FTIR spectra revealed slight changes in bond stretching and bending. Colour measurement indicated that whiteness increased on treatment. Acid modified jackfruit seed starch can have applications in the food industry [Himjyoti Dutta, Sanjib Kumar Paul, Dipankar Kalita, Charu Lata Mahanta*(Department of Food Processing Technology, School of Engineering, Tezpur University, Assam, India), *Food Chemistry*, 2011, **128**(2), 284-291].

NPARR 2(4), 2011-0397, Strawberry consumption improves plasma antioxidant status and erythrocyte resistance to oxidative haemolysis in humans

Significant increases in the plasma total antioxidant capacity (TAC) have already been reported after acute intake of strawberries. In addition, antihaemolytic effects of strawberry extracts have been recently demonstrated in vitro, revealing that part of the antioxidant properties of strawberry bioactive compounds could lie in their localisation within cell membranes. However, there is a lack of research evidence from in vivo protracted strawberry consumption studies. We carried out a 16-day pilot

study where 12 healthy subjects ingested 500 g of antioxidants-rich strawberries daily, and we evaluated the potential effects of fruit consumption on biomarkers of plasma and cellular antioxidant status. A significant increase in fasting plasma TAC and in serum vitamin C concentrations were progressively observed during the period of strawberry supplementation. An enhanced resistance to haemolysis was also observed in both AAPH-treated and untreated erythrocytes, collected during and after the period of strawberry consumption. The results obtained in this work suggest that regular consumption of antioxidant-rich strawberries may exert an improvement on the plasma antioxidant status and an increase on the antihemolytic defenses of human erythrocytes [Sara Tulipani, Josè M.Alvarez-Suarez, FrancoBusco, Stefano Bompadre, Josè L.Quiles, Bruno Mezzetti, Maurizio Battino* (Department of Biochemistry, Biology & Genetics, Faculty of Medicine, Marche Polytechnic University, Ancona, Italy), *Food Chemistry*, 2011, **128**(1), 180-186].

NPARR 2(4), 2011-0398, Effect of cooking on total vitamin C contents and antioxidant activity of sweet chestnuts (*Castanea sativa* Mill.)

In this work the total vitamin C contents (ascorbic acid + dehydroascorbic acid) and antioxidant activity of raw and cooked chestnuts was evaluated. The vitamin C contents of raw chestnuts varied significantly between the different cultivars (cv) studied and it varied from 400 mg/kg dry weight (cv Lada) to 693 mg/kg dry weight (cv Martaínha). The different cultivars behave differently during the cooking process concerning the loss of vitamin C. A significant decrease in the vitamin C content of the chestnuts was observed, 25-54% for the boiling process and 2-77% for the roasting process. Boiled and roasted chestnuts can be good sources of vitamin C since it may represent 22.4, 16.2, 26.8 and 19.4%, respectively, of the recommended dietary intake for an adult man and woman. The cooking process significantly changed the antioxidant activity of the chestnuts. A difference was observed between the cultivars during the cooking processes, concerning the antioxidant activity. For the raw chestnuts the variation in vitamin C content of the chestnuts explains 99% of the antioxidant activity variation but for the roasted and boiled chestnuts this percentage

significantly decreases to 51 and 88%, respectively. Although a high antioxidant activity is still present in the cooked chestnuts, the cause for this antioxidant activity is less dependent on the vitamin C content of the chestnuts, probably due to the conversion of ascorbic acid to dehydroascorbic acid. The increase in gallic acid during the cooking process, presumably transferred from the peels to the fruit, also contributes to the high antioxidant activity observed for the cooked **chestnuts** [Ana I.R.N.A. Barros*, Fernando M. Nunes, Berta Gonçalves, Richard N. Bennett, Ana Paula Silva (Chemistry Research Centre, Chemistry Department, University of Trás-os-Montes e Alto Douro, 5000-801 Vila Real, Portugal), *Food Chemistry*, 2011, **128**(1), 165-172].

NPARR 2(4), 2011-0399, Rheological, textural and spectral characteristics of sorbitol substituted mango jam

Full replacement of sucrose with sorbitol is feasible in mango jam manufacturing. Dynamic rheological tests characterized mango jam manufactured with sucrose/sorbitol as a weak gel. Mango jam did not follow Cox-Merz or modified Cox-Merz rule. The storage- and loss- moduli increased with sucrose concentration up to 60%, but decreased at higher sucrose concentrations. Gel strength decreased with increasing sorbitol concentration because of weaker junction zones in pectin gel network. FTIR spectra revealed that C-O and C-C stretching vibrations are indicators of the gel strength because pectin polymeric chain network formation in fruit jam is due to hydrogen bonding and hydrophobic interactions [Basu, S*, Shivhare, U.S. , Singh, T.V. and Beniwal, V.S. (University Institute of Chemical Engineering and Technology, Punjab University, Chandigarh 160014, India), *Journal of Food Engineering*, 2011, **105**(3), 503-512].

NPARR 2(4), 2011-0400, Gamma irradiation of sun-dried apricots (*Prunus armeniaca* L.) for quality maintenance and quarantine purposes

The study is aimed at the optimization of gamma irradiation treatment of sun-dried apricots for quality maintenance and quarantine purposes. Sun-dried apricots pre-treated with potassium meta-bisulphite (KMS) at 2.5% w/v were procured from progressive apricot grower of district Kargil, Ladakh region of

Jammu and Kashmir state. The sun-dried apricots were packed in 250 gauge polyethylene packs and gamma irradiated in the dose range 1.0-3.0. kGy. The gamma irradiated fruit including control was stored under ambient (15 ± 2 - 25 ± 2 °C, RH 70-80%) conditions and periodically evaluated for physico-chemical, sensory and microbial quality parameters. Radiation treatment at dose levels of 2.5 and 3.0. kGy proved significantly ($p\leq 0.05$) beneficial in retention of higher levels of B-carotene, ascorbic acid, total sugars and color values without impairing the taste as perceived by the sensory panel analysts. The above optimized doses retained the B-carotene content of sun-dried apricots to the extent of 71.2% and 72.6% compared to 63.9% in control samples after 18 months of storage. Irradiation treatment facilitated the release of residual sulfur dioxide in KMS pre-treated sun-dried apricots significantly ($p\leq 0.05$) below the prescribed limit for dried products. During storage, two-fold decrease in sulfur dioxide content was recorded in irradiated samples (3.0. kGy) as compared to 16.9% in control. The above optimized doses besides maintaining the higher overall acceptability of sun-dried apricots resulted in 5. log reductions in microbial load just after irradiation and 1.0 and 1.3. log reductions in yeast and mold and bacterial count after 18 months of ambient storage [Hussain, P.R. *, Meena, R.S., Dar, M.A. and Wani, A.M. (Astrophysical Science Division, Nuclear Research Laboratory, Bhabha Atomic Research Centre, Zakura, Srinagar, Kashmir-190006, India), *Radiation Physics and Chemistry*, 2011, **80**(7), 817-827].

NPARR 2(4), 2011-0401, Nutritional evaluation of date palm (*Phoenix dactylifera*) seeds and fruit as source of feeds in aquaculture

The present study was conducted to find out the nutritional values of *Phoenix dactylifera* (Date palm) flesh and seeds to be used as components in fish feeds for enhanced feed utilization efficiency. Dried (DD) and Semi-dried (SD) date fruits were purchased from Lafia main market. The samples were separated, milled and analyzed for proximate components and mineral elements using standard methods of the AOAC. Physical assessment of the samples showed that the weight (%) of flesh was found to be higher than weight of seed for both dried (DD) and semidried (SD) dates (90.38 ± 2.58 , 9.62 ± 1.80 and 94.69 ± 2.15 , 5.31 ± 1.60) respectively. Proximate analysis showed

that dry matter contents were higher in flesh of DD and SD (95.90±0.12% and 96.93±0.07% respectively) while their respective seeds yielded 94.82 ±0.4 and 94.22±0.30%. Results further showed that the crude protein and carbohydrate were found to be higher in the flesh of both DD and SD than their seeds (P<0.05) while ash, crude fibre and crude lipids were significantly higher (P<0.05) in the seeds than flesh of the dates. The estimated energy value was significantly higher (p < 0.05) in the seeds {1198.70±2.20 and 1007.58±1.00 (KJ/100g)} than the flesh {1183.45±3.10 and 992.67±2.10 (KJ/100g)} of DD and SD respectively. Mineral analysis indicated that both seeds and flesh of dates contain appreciable concentrations (mg/100g) of Ca; Mg; P; K; Na; Fe; Cu and Zn. However, moisture level affects mostly mineral composition of date and other nutrients. It could be inferred from the present study generally, that date flesh would serve a good source of fish feed additives while its seeds would best be used as a source of energy for improved feed utilization efficiency [Sotolu, A.O.*, Kigbu, A.A., Oshinowo, J.A. (Department of Forestry, Wildlife and Fisheries, Nasarawa State University, Shabu-Lafia campus, Lafia, Nigeria), *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 2011, **10**(5), 2279-2285].

NPARR 2(4), 2011-0402, Shellac and aloe-gel-based surface coatings for maintaining keeping quality of apple slices

Apple slices, ozonised in water (1:2 w/v; 200 mg O₃/h, for 5 min) and then soaked in a solution containing ascorbic acid (200 mg kg⁻¹), citric acid (200 mg kg⁻¹) and sodium benzoate (200 mg kg⁻¹) for 10 min, were coated with edible surface coatings made up of shellac and aloe gel (AG), separately and in combination. Application of coatings was found to significantly (p < 0.05) reduce the respiration and ethylene synthesis rates as well as electrolyte leakage. The AG-coated samples showed reduced polyphenol oxidase (96.1) and peroxidase activity (211.2) followed by the samples coated with combination of shellac + AG, and shellac alone; the uncoated samples being showing maximum values (122.8, 288.5) for these enzymes in terms of units/g/min, respectively. The L, a and b values, firmness, microbiological and keeping quality of the coated slices also showed reduced changes during storage for 30 days at 6 ± 1 °C [Chauhan, O.P. *, Raju, P.S., Singh, A. and Bawa, A.S. (Defence Food

Research Laboratory, Siddarthanagar, Mysore 570011, India), *Food Chemistry*, 2011, **126**(3), 961-966].

NPARR 2(4), 2011-0403, Effect of heat processing on discoloration of custard apple (*Annona squamosa* L.) fruit pulp and changes in quality characteristics during storage

Custard apple (*Annona squamosa* L.) fruit pulp has got many food applications as flavour enhancing ingredient in various desserts because of its delicious taste and flavour. However, the pulp has limited shelf life due to polyphenol oxidase activity which causes discoloration or browning that result in deterioration of commercial quality of pulp. Browning is one of the major constraints responsible of underutilization of this highly valuable dry land fruit. In present investigation, efforts were made to study the heat inactivation profile of polyphenol oxidase in custard apple pulp which was further correlated with changes in sensorial quality (browning and discoloration). Efforts were also made to analyze the effect of ascorbic acid addition on discoloration and organoleptic characteristics of pulp. The heat treatment was given to fruit pulp by steaming, at the range of temperatures with different period of time. The results revealed that steam heating of custard apple pulp facilitated at linearly increasing temperatures exhibit accelerated inhibition of PPO activity leading to 100 % inhibition at 83deg;C temperature for 2 minutes while complete inhibition of PPO activity was also observed at the temperature of 82° for 5 minutes. However, heat treatment resulted in decrease in consumer acceptability of pulp in terms of sensorial characteristics. Addition of 2000 ppm of ascorbic acid without heat treatment showed highest sensorial properties without discoloration compared to heat treated samples. Further, the samples were observed for change in various physico-chemical and microbial properties under frozen storage and refrigerated conditions. It was found that pulp without steaming and antioxidant treatment facilitated more discoloration, elevated microbial load and good overall acceptability while treated samples found to have no browning, lower microbial load but comparatively less overall acceptability [Pawar, V.N., Kardile, W.G., Hashmi, S.I.*(Department of Food Science and Technology, College of Food Technology, M.A.U, Parbhani-431401 (MS), India), *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 2011, **10**(4), 2098-2113].

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

NPARR 2(4), 2011-0404, Pelletised fuel production from palm kernel cake

Biomass is an important source of renewable energy. Worldwide, the palm oil industry generates large amounts of waste materials, such as shells, fibres and palm kernel cake, which can be used for power generation. Processing the palm kernel cake into a uniform fuel through pelletisation will be an attractive option - assessing the suitability of this process was the main objective of this research. Extensive analytical and pelletisation tests were performed to evaluate the physical properties of pellets produced from this material. The variables explored included the pelletisation pressure, temperature, fuel moisture and the effect of binders, which all had significant effects on density and tensile strength. The most favourable conditions for pellet production were a pressure of 9338 psi/64.38 MPa, a temperature of 80-100 °C and a fuel moisture content of 7.9%. These pellets had densities of 1184-1226 kg/m³ and tensile strengths of 930-1007 kPa. Adding small amounts of caustic soda (1.5-2.0wt%) to the palm kernel cake under these conditions increased the tensile strength to 3055 kPa, whereas starch additives were not found to be effective binders. It is estimated that the production of palm kernel cake pellets with 2 wt.% of the caustic soda binder would cost approximately £28-47/tonne [Razuan, R., Finney, K.N.*, Chen, Q., Sharifi, V.N. and Swithenbank, J. (SUWIC, Department of Chemical and Process Engineering, University of Sheffield, Mappin Street, Sheffield, S1 3JD, United Kingdom), *Fuel Processing Technology*, 2011, **92**(3), 609-615].

NPARR 2(4), 2011-0405, The use of Koroch seed oil methyl ester blends as fuel in a diesel engine

An experimental investigation was carried out on a small direct injection (DI) diesel engine, fuelling the engine with 10 (B10), 20 (B20), 30 (B30) and 40% (B40) blending of Koroch seed oil methyl ester (KSOME) with diesel. The performance and combustion characteristics of the engine at various loads are compared and analyzed. The results showed higher brake specific fuel consumption (BSFC) and

lower brake thermal efficiency (BTE) for the KSOME blends. The engine indicated power (IP) was more for the blends up to B30, but found to be reduced for the blend B40 when compared to that of diesel. The engine combustion parameters such as pressure crank angle diagram, peak pressure, time of occurrence of peak pressure, net heat-release rate, cumulative heat release, and ignition delay and combustion duration were computed. The KSOME blends exhibited similar combustion trend with diesel. However, the blends showed an early start of combustion with shorter ignition delay period. The study reveals the suitability of KSOME blends up to B30 as fuel for a diesel engine mainly used in generating sets and the agricultural applications in India without any significant drop in engine performance [Gogoi, T.K* and Baruah, D.C. (Department of Mechanical Engineering, Tezpur University, Napaam, Tezpur, Assam, India) *Applied Energy*, 2011, **88**(8), 2713-2725].

NPARR 2(4), 2011-0406, Identification of adulteration of biofuel by addition of residual oil instead of biodiesel to the diesel by total spectrofluorimetry and principal component analysis

Total spectrofluorimetry associated to Principal Components Analysis (PCA) were used to classify into different groups the samples of diesel oil, biodiesel, vegetal oil and residual oil, as well as, to identify addition of non-transesterified residual vegetable oil, instead of biodiesel, to the diesel oil. Using this method, the samples of diesel oil, mixtures of biodiesel in diesel and mixtures of residual oil in diesel were separated into well-defined groups [Meira, M.*, Quintella, C.M. , Ferrer, T.M. , Gonçalves Da Silva, H.R. , Guimarães, A.K. , Santos, M.A. , Da Costa Neto, P.R. , Pepe, I.M. (Instituto de Química, Universidade Federal da Bahia, Campus de Ondina, 40170-290 Salvador - BA, Brazil), *Quimica Nova*, 2011, **34**(4), 2011, 621-624].

NPARR 2(4), 2011-0407, Biodiesel production from mixed soybean oil and rapeseed oil

The biodiesel (fatty acid methyl esters, FAME) was prepared by transesterification of the mixed oil (soybean oil and rapeseed oil) with sodium hydroxide (NaOH) as catalyst. The effects of mole ratio of

methanol to oil, reaction temperature, catalyst amount and reaction time on the yield were studied. In order to decrease the operational temperature, a co-solvent (hexane) was added into the reactants and the conversion efficiency of the reaction was improved. The optimal reaction conditions were obtained by this experiment: methanol/oil mole ratio 5.0:1, reaction temperature 55 °C, catalyst amount 0.8. wt.% and reaction time 2.0. h. Under the optimum conditions, a 94% yield of methyl esters was reached ~94%. The structure of the biodiesel was characterized by FT-IR spectroscopy. The sulfur content of biodiesel was determined by Inductively Coupled Plasma emission spectrometer (ICP), and the satisfied result was obtained. The properties of obtained biodiesel from mixed oil are close to commercial diesel fuel and is rated as a realistic fuel as an alternative to diesel. Production of biodiesel has positive impact on the utilization of agricultural and forestry products [Qiu, F., Li, Y., Yang, D., Li, X. and Sun, P. (School of Chemistry and Chemical Engineering, Jiangsu University, 212013 Zhenjiang, China), *Applied Energy*, 2011, **88**(6), 2050-2055].

NPARR 2(4), 2011-0408, A facile and feasible method to evaluate and control the quality of *Jatropha curcus* L. seed oil for biodiesel feedstock: Gas chromatographic fingerprint

To establish a facile and feasible method to evaluate and control the quality of *Jatropha curcus* L. seed oil for biodiesel feedstock, Gas chromatographic (GC) fingerprint technology was introduced and employed. Initially, the chromatograms of the 13 oil samples from various plantation zones in Guizhou, China were obtained under optimized GC conditions. Ten common peaks were selected as the characteristic peaks for chemometrics, seven of which were identified and quantified by comparing with the standards. The mean chromatogram of S7 (n= 3) was selected as the reference spectrum for similarity analysis based on the influence of the fatty acid composition of the raw material on the fuel properties of resulting biodiesel. Furthermore, the result of SA was confirmed by hierarchical clustering analysis and principal component analysis. By this method, all samples can be classified into three groups. The similarity value of samples approaching 1.000 compared with sample 7 was indicative of the desired

fuel properties of biodiesel, indicating the potential practical applications in the quality evaluation and control of biodiesel feedstock [Wang, R. , Song, B. , Zhou, W., Zhang, Y. , Hu, D. , Bhadury, P.S. and Yang, S.* (State-Local Joint Laboratory for Comprehensive Utilization of Biomass, State Key Laboratory Breeding Base of Green Pesticide and Agricultural Bioengineering, Center for Research and Development of Fine Chemicals, Guizhou University, Guiyang 550025, China), *Applied Energy* , 2011, **88**(6), 2064-2070].

NPARR 2(4), 2011-0409, A multi-variant approach to optimize process parameters for biodiesel extraction from rubber seed oil

Biodiesel is biodegradable, non-toxic and has the capacity for sustainable development, energy conservation and environmental preservation. Apart from yielding high value latex, the rubber plant supply large amount of rubber seed, which are currently underutilized. Extracting biodiesel from rubber seed is a viable option which demands attention for research to consolidate and optimize the process parameters. Design of experiments (DOE) is a powerful statistical approach which is used for optimizing the process parameters through two stage esterification process, relating acid and alkaline as catalyst. Reducing the acid value is the primary objective for process optimization in acid esterification process, whereas, maximizing the monoester yield is the objective for the alkaline-esterification process. Different saturated and unsaturated monoesters present in the biodiesel were quantified using gas chromatograph in order to determine the yield percentage, which ensures the quality of the biodiesel. The fuel was tested for properties such as viscosity, calorific value and carbon residue using standard test procedures and found to be analogous with diesel, which makes it possible to use this alternate fuel in the existing engine without any modification [Melvin Jose, D.F. , Edwin Raj, R.* , Durga Prasad, B. , Robert Kennedy, Z. , Mohammed Ibrahim, A. (Department of Mechanical Engineering, Jawaharlal Nehru Technological University, Anantapur 515 002, India), *Applied Energy*, 2011, **88**(6), 2056-2063].

NPARR 2(4), 2011-0410, Potential non-edible oil

resources as biodiesel feedstock: An Indian perspective

As the world confronts a reported food shortage and rising fuel prices, scientists around the globe are scrambling to develop biofuel feedstocks that would not divert food crops to energy. It is apparent that the demand for biodiesel is expected to increase in near future and although many edible oils might be the cheapest feedstock for biofuel production. But it may not be sustainable source to meet this increasing demand. This justifies the need to use non-edible oil seeds that can be the reliable sustainable feedstock for biofuel production. Furthermore, most of the non-edible seeds bearing trees have the potentials of reclaiming wasteland and does not compete with food crop for limited growing regions. It thus becomes imperative to search for dedicated non-edible feedstocks and their suitability for biodiesel production. This paper attempts to make an assessment of current energy scenario, potential of non-edible oil over edible oils, selected non-edible oil seeds as biodiesel feedstocks, impact of biofuel on environment and future direction. Experimental analysis by different researchers on these non-edible oils showed their great potential as feedstocks for biodiesel production. This paper also reviews the biology, distribution and chemistry of selected non-edible oil seeds plants [Kumar, A. and Sharma, S. (Centre for Rural Development and Technology, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India), *Renewable and Sustainable Energy Reviews*, 2011, **15**(4), 1791-1800].

NPARR 2(4), 2011-0411, Rice bran, a potential source of biodiesel production in Indonesia

Biodiesel is a biodegradable, renewable, non-toxic and environmentally friendly alternative fuel. The cost of raw materials comprises 60-88% of the production cost in commercial biodiesel (fatty acid methyl esters, FAMES) production. Therefore, the use of low-cost raw material as a substrate and an in situ process for biodiesel production are being preferred. In this case, rice bran, which contains 13.5% oil, was an interesting substrate. In situ esterification of high-acidity rice bran with methanol and sulfuric acid catalyst was investigated. The individual and interaction effects of methanol to rice bran ratio, sulfuric acid catalyst concentration and reaction time on purity and recovery

of biodiesel were discussed. Our results suggest that under the following operation conditions: methanol to rice bran ratio of 5. mL/g, sulfuric acid concentration in methanol of 1.5. vol.%, and reaction time of 60. min, an in situ esterification operated on rice bran could yield FAMES with a high purity and recovery. By applying an in situ esterification with n-hexane/water extractions, Indonesia will be successful in obtaining biodiesel from rice bran up to 96,000. ton per year [Gunawan, S.*, Maulana, S., Anwar, K., Widjaja, T. (Department of Chemical Engineering, Faculty of Industrial Technology, Sepuluh Nopember Institute of Technology, Surabaya 60111, Indonesia), *Industrial Crops and Products*, 2011, **33**(3), 624-628].

NPARR 2(4), 2011-0412, High quality biodiesel from yellow oleander (*Thevetia peruviana*) seed oil

Yellow oleander (*Thevetia peruviana* Schum.) seed oil has been investigated to produce biodiesel. Transesterification of the oil to biodiesel was carried out in methanol by batch reaction using a heterogeneous catalyst derived from the trunk of *Musa balbisiana* Colla (one variety of banana plant). 96 wt. % of the oil is converted to biodiesel at 32°C in 3 h. The wt. % composition of the biodiesel is methyl oleate 43.72, methyl palmitate 23.28, methyl linoleate 19.85, methyl stearate 10.71 and methyl arachidate 2.41. Fuel properties conform to standards set for ASTM D6751, EN 14214, BS II and BS III, and in certain aspects better. The biodiesel is free from sulfur and has exhibited a high cetane number of 61.5 [Deka, D.C.* and Basumatary, S. (Department of Chemistry, Gauhati University, Guwahati 781 014, Assam, India), *Biomass and Bioenergy*, 2011, **35**(5), 1797].

NPARR 2(4), 2011-0413, Algal biofuels from wastewater treatment high rate algal ponds

This paper examines the potential of algae biofuel production in conjunction with wastewater treatment. Current technology for algal wastewater treatment uses facultative ponds, however, these ponds have low productivity (~10 tonnes/ha.y), are not amenable to cultivating single algal species, require chemical flocculation or other expensive processes for algal harvest, and do not provide consistent nutrient removal. Shallow, paddlewheel-mixed high rate algal ponds (HRAPs) have much higher productivities (~30 tonnes/ha.y) and promote bioflocculation settling which may provide low-cost algal harvest. Moreover, HRAP algae are carbon-limited and daytime addition of CO₂

has, under suitable climatic conditions, the potential to double production (to ~60 tonnes/ha.y), improve bioflocculation algal harvest, and enhance wastewater nutrient removal. Algae biofuels (e.g. biogas, ethanol, biodiesel and crude bio-oil), could be produced from the algae harvested from wastewater HRAPs. The wastewater treatment function would cover the capital and operation costs of algal production, with biofuel and recovered nutrient fertilizer being by-products. Greenhouse gas abatement results from both the production of the biofuels and the savings in energy consumption compared to electromechanical treatment processes. However, to achieve these benefits, further research is required, particularly the large-scale demonstration of wastewater treatment HRAP algal production and harvest [Craggs, R.J., Heubeck, S., Lundquist, T.J. and Benemann, J.R.* (Benemann and Associates, Walnut Creek, CA, United States), *Water Science and Technology*, 2011, **63**(4), 660-665]

NPARR 2(4), 2011-0414, Toxicity of water-soluble fractions of biodiesel fuels derived from castor oil, palm oil, and waste cooking oil

Concerns over the sustained availability of fossil fuels and their impact on global warming and pollution have led to the search for fuels from renewable sources to address worldwide rising energy demands. Biodiesel is emerging as one of the possible solutions for the transport sector. It shows comparable engine performance to that of conventional diesel fuel, while reducing greenhouse gas emissions. However, the toxicity of products and effluents from the biodiesel industry has not yet been sufficiently investigated. Brazil has a very high potential as a biodiesel producer, in view of its climatic conditions and vast areas for cropland, with consequent environmental risks because of possible accidental biodiesel spillages into water bodies and runoff to coastal areas. This research determined the toxicity to two marine organisms of the water-soluble fractions (WSF) of three different biodiesel fuels obtained by methanol transesterification of castor oil (CO), palm oil (PO), and waste cooking oil (WCO). Microalgae and sea urchins were used as the test organisms, respectively, for culture-growth-inhibition

and early-life-stage-toxicity tests. The toxicity levels of the analyzed biodiesel WSF showed the highest toxicity for the CO, followed by WCO and the PO. Methanol was the most prominent contaminant; concentrations increased over time in WSF samples stored up to 120 d [Leite, M.B.N.L., de Araújo, M.M.S., Nascimento, I.A.*, da Cruz, A.C.S., Pereira, S.A. and do Nascimento, N.C. (Institute of Biology, Federal University of Bahia, Salvador, Bahia, Brazil), *Environmental Toxicology and Chemistry*, 2011, **30**(4), 893-897].

NPARR 2(4), 2011-0415, Quantitative and qualitative analysis of sesame oil biodiesel

At present, the world faces severe issues of energy crises and environmental deterioration. Fuel is inevitable for industrial development and growth of any country. The fossil fuel resources have always been terrifying. Biofuel energy, a renewable source, seems to be an ideal solution for global energy and environmental concern. The present work focuses on an optimized protocol for the production of biodiesel from a feasible source, i.e., sesame plant oil (*Sesamum indicum* L.) through base catalyzed transesterification. The sesame plant oil is investigated in this study as a potential source of biodiesel based on fuel properties and physico-chemical analysis. The free fatty acid number of crude sesame oil was 0.83 mg/g of KOH (1.66%). Conversion of sesame crude oil (triglyceride) to biodiesel (fatty acid methyl ester) was 75.45% and 72.56% at 1:6 molar ratio (oil:methanol) by using optimum 0.67% KOH and 0.34% NaOH catalyst, respectively, at 60°C for qualitative authentication. Specified analytical techniques are as follows: GC-MS used to clarify the different fatty acid methyl esters; FT-IR to monitor the transesterification reaction; and NMR for the justification of proton and carbon of that compound. Qualitatively, the biodiesel fuel properties were analyzed by the standard method American Society for Testing Material (ASTM) [Ahmad, M. *, Ullah, K., Khan, M.A., Ali, S., Zafar, M., Sultana, S. (Department of Plant Sciences, Quaid-I-Azam University, Islamabad 45320, Pakistan), *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, 2011, **33**(13), 1239-1249]

GUM/RUBBER (incl. Latex, Resin, Pectin, Tannin, Mucilage, Starch, Cellulose, etc.)

NPARR 2(4), 2011-0416, Production, recovery and applications of xanthan gum by *Xanthomonas campestris*

Xanthan gum is a water-soluble exopolysaccharide. It is produced industrially from carbon sources by fermentation using the gram-negative bacterium *Xanthomonas campestris*. There have been various attempts to produce xanthan gum by fermentation method using bacteria and yeast by using various cheap raw materials. This review explains the recent methods of production, recovery and applications of various industries such as food, agriculture, oil, paint and cosmetics [Aarthi Palaniraj* and Vijayakumar Jayaraman(Immunology Laboratory, Dept. of Biotechnology, Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai, Tamilnadu, India), *Journal of Food Engineering*, 2011, **106**, 1-12].

NPARR 2(4), 2011-0417, Extraction and characterization of tamarind seed polysaccharide as a pharmaceutical excipient

The objective of the present work was extraction of polysaccharide from tamarind seed and further characterization as pharmaceutical excipient. Study includes phytochemical screening, micromeritic properties. Work also emphasize to study gelling properties of extracted polysaccharide. Water based extraction procedure was used to extract polysaccharide from tamarind seed. Pharmacopoeial procedures were used to study the micromeritic properties, solubility, organoleptic properties and pH. Different concentration based solution were prepared to evaluate gelling properties of seed polysaccharide. Results obtained from the study showed that used procedure was efficient to extract gum from tamarind seed. Obtained results easily predict the fact that extracted polymer can be used as pharmaceutical excipient in terms of micromeritic properties and flow behavior. It was also found that obtained gum showed gelling behavior at 8% w/v solution of water. It can be concluded from whole study that tamarind seed polysaccharide can be an important pharmaceutical

excipient for solid. Obtained results also showed that extracted seed polysaccharide may be used as natural gelling agents in different pharmaceutical formulations. [Singh, R. *, Malviya, R. and Sharma, P.K. (Department of Pharmaceutical Technology, Meerut Institute of Engineering and Technology Baghpat Crossing, Delhi Roorkee Highway, NH-58, Meerut-250005, U.P., India), *Pharmacognosy Journal*, 2011, **3**(20), 17-19].

NPARR 2(4), 2011-0418, Recent investigations of plant based natural gums, mucilages and resins in novel drug delivery systems

All pharmaceutical dosage forms contain many additives besides the active ingredients to assist manufacturing and to obtain the desired effect of the pharmaceutical active ingredients. The advances in drug delivery have simultaneously urged the discovery of novel excipients which are safe and fulfill specific functions and directly or indirectly influence the rate and extent of release and /or absorption. The plant derived gums and mucilages comply with many requirements of pharmaceutical excipients as they are non-toxic, stable, easily available, associated with less regulatory issues as compared to their synthetic counterpart and inexpensive; also these can be easily modified to meet the specific need. Most of these plant derived gums and mucilages are hydrophilic and gel-forming in nature. Recent trend towards the use of plant based and natural products demands the replacement of synthetic additives with natural ones. Many plant derived natural materials are studied for use in novel drug delivery systems, out of which polysaccharides, resins and tannins are most extensively studied and used. This review discusses about the majority of these plant-derived polymeric compounds, their sources, extraction procedure, chemical constituents, uses and some recent investigations as excipients in novel drug delivery systems [Avachat, A.M. *, Dash, R.R. and Shrotriya, S.N. (Sinhgad College of Pharmacy, 44/1, Vadgaon (Bk.), Pune-411041, Maharashtra, India), *Indian Journal of Pharmaceutical Education and Research*, 2011, **45**(1), 86-99].

NPARR 2(4), 2011-0419, *In vitro* retardation of glucose diffusion with gum extracted from malva

nut seeds produced in Thailand

Mucilage of malva nut fruit has been used as traditional medicine in Thailand. Our laboratory has succeeded in extracting malva nut gum (MNG) from malva nut seeds by using alkaline-extraction method. The extract had higher gelling properties compared to water-extracted MNG. This research was aimed to investigate the effect of MNG on the retardation of glucose diffusion in in vitro dialysis processes. The results showed that alkaline-extracted MNG significantly ($p < 0.05$) reduced glucose content in dialysate compared to control containing no dietary fibre. MNG at 1% (w/w) concentration was more effective than that of 0.5% (w/w) concentration. The mixture of MNG and guar gum significantly ($p < 0.05$) reduced glucose in dialysate by 50-82% compared to that of control. In starch digestion process, the mixture of MNG and guar gum showed greater reduction of glucose (3-7 folds) in dialysate at 15-30 min [Srichamroen, A.* and Chavasit, V. (Department of Agro-Industry, Faculty of Agriculture, Natural Resources and Environment, Naresuan University, 65000, Thailand), *Food Chemistry*, 2011, **127**(2), 455-460].

NPARR 2(4), 2011-0420, Cocoa husk waste mucilage as new flow improver in pipelines

Liquid transportation through pipelines for very long distances is one of the most power consuming sectors in the industry. Synthetic polymers were used as flow improvers for many years to solve the power dissipation problem. These polymers are toxic and expensive. An environmentally friendly and more natural product that can replace the usage of polymers as flow improvers is needed. The present study focused on a new, cheap, natural and environmentally friendly flow improver that was extracted from the cocoa husk wastes. Mucilage was prepared from the cocoa husk waste and tested in aqueous media at concentrations between 100 ppm and 400 ppm using pipes with an internal diameter of 0.0125, 0.0254 and 0.0381 m and five different fluid velocities represented by the corresponding Reynolds Numbers (Re). It was found that the cocoa husk mucilage was an effective drag reducing agent. A maximum drag reduction percentage of 44% could be achieved by adding as little as 400 ppm of mucilage. Drag reduction was found to increase by increasing

Reynolds Numbers, additive concentrations and pipe lengths. It also increased with decreasing pipe diameters [Abdul Bari, H.A., Hamad, K.H. and Mohd Yunus, R.B. *(Faculty of Chemical and Natural Resources Engineering, University Malaysia Pahang, Gambang, Kuantan, Pahang, 26300, Malaysia), *Defect and Diffusion Forum*, 2011, **312-315**, 1063-1067].

NPARR 2(4), 2011-0421, Studies on Vigna mungo mucilage as a pharmaceutical excipient

The present work was aimed to isolate the mucilage using microwave assisted extraction technique and to evaluate its excipient properties. The yield was found to be 22.56g/kg. The drugs and the isolated mucilage powder were found to be compatible as confirmed by the IR spectral studies. The sedimentation rates of the prepared suspensions using a model drug metronidazole were similar to that of the marketed sample and they were easily redispersible and do not form a hard cake. The drug content of all the prepared suspension formulations was found to be in the range of 94.2-96.1%. The isolated mucilage was also studied for its binding nature using ibuprofen as a model drug. The prepared granules were free flowing and the compressed tablets showed good hardness and friability as compared with the starch and marketed product, thereby confirming the mechanical resistance of the tablets. The drug content of all the prepared tablet formulations was found to be between 93.0-99.45%. The rate of drug release from tablet formulations using mucilage as binder was fast when compared to formulations containing starch and marketed product. Formulation F4 (1:2 ratio) of the prepared ibuprofen tablets showed similar release profile in comparison with the marketed product. The drug release mechanism for the formulation F4 was predicted as first order model with the r^2 value of 0.9632 [Sravani, B., Deveswaran, R., Bharath, S., Basavaraj, B.V. and Madhavan, V. *[M. S. Ramaiah College of Pharmacy, Bangalore, India), *Journal of Chemical and Pharmaceutical Research*, 2011, **3**(2), 118-125].

NPARR 2(4), 2011-0422, Influence of isolated flaxseed mucilage as a non-starch polysaccharide on noodle quality

Physicochemical, cooking quality and sensory

characteristics of noodles enriched by extracted flaxseed mucilage were evaluated. Noodles were prepared with replacement wheat flour with different mucilage concentrations and drying at different temperatures. Generally, physicochemical and noodle quality characteristics improved with adding flaxseed mucilage compared to control sample. The correlation between optimum cooking time with mucilage concentrations and drying temperatures established by nonlinear regression. The obtained data of cooking yield, swelling index, cooking loss and nitrogen loss were analysed using the two-dimension response surface method. The mucilage concentration of 3% and drying temperature ranging between 68.2 and 70°C were the best condition to prepare the noodle with high cooking quality compared to the control sample. The received scores from sensory evaluation showed that replacement of wheat flour by flaxseed mucilage improved the texture and overall acceptability of prepared noodle [Kishk, Y.F.M.*, Elsheshetawy, H.E. and Mahmoud, E.A.M. (Department of Food Science, Faculty of Agriculture, Ain Shams University, Cairo, Egypt), *International Journal of Food Science and Technology*, 2011, **46**(3), 661-668].

NPARR 2(4), 2011-0423, **Extraction and**

characterization of mucilage in *Ziziphus mauritiana* Lam.

The aim of this study was to characterize the mucilage from jujube. Extraction conditions of the highest mucilage yield can derive from the following process: incubating jujube for 9 days, mixing jujube pulp with water in ratio of 1:7 at water temperature of 60°C, and precipitating the mucilage solution with ethanol in ratio of 1:3. Functional properties analysis of mucilage powder showed that it had brightness in similar value with xanthan gum but higher than guar gum. Water holding capacity was 11.77 g dry weight. The values of oil absorption were 9 and 6 times higher than guar gum and xanthan gum, respectively. Emulsion capacity was analogous to that of guar gum but less than xanthan gum. Rheological properties of mucilage solution exhibited pseudoplastic as same as guar gum. This research also examined that higher concentration of mucilage solution caused larger values of viscosity, but increasing the pH and temperature led to the decrease of viscosity [Thanatcha, R. and Pranee, A. * (Department of Food Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand), *International Food Research Journal*, 2011, **18**(1), 201-212].

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

NPARR 2(4), 2011-0424, Efficacy of some bio-pesticides for the management of shoot & fruit borer (*Earias vittella* Fabr.) infesting okra

Different bio-insecticides were evaluated under field condition at Regional Research Station Salaru Karnal (Haryana) for the management of the shoot and fruit borer, *Earias vittella* (Fabr.) on okra during Kharif season of 2008 and 2009. Spinosad 45 SC @ 0.1% was the most effective in reducing the pest incidence and realized the maximum yield of 84.78 q/ha followed by *Bacillus thuringiensis* @ 0.1%, Azadirachtin 50000 ppm @ 0.2%, Azadirachtin 10000 ppm @ 0.3%, Azadirachtin 1500 ppm @ 0.7%, Neem Seed Kernel extract @ 0.6% and 0.4% giving fruit yield of 72.55, 67.81, 60.40, 56.40, 52.22 and 50.0q/ha respectively. Highest percent fruit infestation (26.74%) and lowest yield (40.77 q/ha.) were recorded under untreated control. Based on the yield data and the cost of application of six spray of each insecticides the cost benefit ratio was 1:1.80 in Azadirachtin 10000 ppm @ 0.3% followed by 1:1.23 in Bt. @ 2.0gm/lit [Singh, B.K* and Gupta, R.P. (National Horticultural Research and Development Foundation, Chitegaon, Phata, Nasik-422 101, India), *Pestology*, 2011, **35**(5), 30-31].

NPARR 2(4), 2011-0425, Chemical constituents of *Cordia latifolia* and their nematicidal activity

Following nematicidal activity-guided isolation studies on the fruits, bark, and leaves of *Cordia latifolia*, two new constituents, cordinoic acid (=11-oxours-12-ene-23,28-dioic acid; 1) and cordicilin (=2-[[[(E)-3-(3,4-dihydroxyphenyl)prop-2-enoyl]oxy]-3-[4-hydroxy-3-(stearoyloxy)phenyl]propanoic acid; 2) were isolated from the stem and leaves, respectively, together with nine known compounds, namely cordioic and cordifolic acid from the stem bark, latifolicin A-D and rosmarinic acid from the fruits, and cordinol and cordicinol from the leaves. Their structures were determined by means of spectroscopic analyses including 1D- and 2D-NMR techniques. The nematicidal activities of these constituents were determined against the root-knot nematode

Meloidogyne incognita. Hundred percent mortality was caused by all of these after 72h at a 0.125% concentration. Compound 1 and cordioic acid were most active and caused 100% mortality after 24h at a 0.50% concentration. Furthermore, compound 2, the ester of rosmarinic acid, was found to be more active than the free acid [Begum, S., Perwaiz, S., Siddiqui, B.S., Khan, S., Fayyaz, S., Ramzan, M.* (International Center for Chemical and Biological Sciences, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan), *Chemistry and Biodiversity*, 2011, **8**(5), 850-861]

NPARR 2(4), 2011-0426, Efficacy of some bio-pesticides for the management of shoot & fruit borer (*Earias vittella* Fabr.) infesting okra

Different bio-insecticides were evaluated under field condition at Regional Research Station Salaru Karnal (Haryana) for the management of the shoot and fruit borer, *Earias vittella* (Fabr.) on okra during Kharif season of 2008 and 2009. Spinosad 45 SC @ 0.1% was the most effective in reducing the pest incidence and realized the maximum yield of 84.78 q/ha followed by *Bacillus thuringiensis* @ 0.1%, Azadirachtin 50000 ppm @ 0.2%, Azadirachtin 10000 ppm @ 0.3%, Azadirachtin 1500 ppm @ 0.7%, Neem Seed Kernel extract @ 0.6% and 0.4% giving fruit yield of 72.55, 67.81, 60.40, 56.40, 52.22 and 50.0q/ha respectively. Highest percent fruit infestation (26.74%) and lowest yield (40.77 q/ha) were recorded under untreated control. Based on the yield data and the cost of application of six spray of each insecticides the cost benefit ratio was 1:1.80 in Azadirachtin 10000 ppm @ 0.3% followed by 1:1.23 in Bt. @ 2.0gm/lit [Singh, B.K. and Gupta, R.P. (National Horticultural Research and Development Foundation, Chitegaon, Phata, Nasik-422 101, India), *Pestology*, 2011, **35**(5), 30-31].

NPARR 2(4), 2011-0427, Chemical composition and mosquito larvicidal activities of *Salvia* essential oils

Vector control is facing a threat due to the emergence of resistance to synthetic insecticides. In this context, essential oils have received much attention as potentially useful bioactive compounds against insects. Therefore, our present study aimed to evaluate the efficacy of essential oils from the aerial parts of *Salvia elegans* Vahl, *Salvia dorisiana* Standl.,

Salvia splendens Sello ex J.A. Schult Blue Ribbon, and *S. splendens* Sello ex J.A. Schult Scarlet Sage Red (Lamiaceae) against the fourth instar larvae of *Aedes albopictus* Skuse (Diptera: Culicidae). The mosquito larvicidal activities of the essential oils and chemical composition of four taxa of *Salvia* are investigated in this article for the first time. Chemical compositions of essential oils obtained from four taxa of *Salvia* were analyzed by gas chromatography-mass spectrometry (GC-MS), GC-FID, and the effects of essential oils on fourth instar larvae of *A. albopictus* were investigated. The main components identified from each *Salvia* essential oils were as follows: spathulenol (38.73%) and caryophyllene (10.32%) from *S. elegans*; ledol (45.8%) and 4,4'-[(p-phenylene)diisopropylidene]diphenol (17.38%) from *S. dorisiana*; β -cubebene (22.9%), and caryophyllene

(12.99%) from *S. splendens* Blue Ribbon; phytol (41.46%) and cyclooctasulfur (24.88%) from *S. splendens* Scarlet Sage Red. The essential oils of *S. elegans* and *S. splendens* Blue Ribbon had excellent inhibitory larvicidal effect against *A. albopictus* larvae, and their LC₉₀ values in 24 h were 46.4 ppm (LC₉₀=121.8 ppm) and 59.2 ppm (LC₉₀=133.0 ppm), respectively. These findings demonstrate that the essential oils of these *Salvia* species could be considered as the powerful candidates to bring about useful botanicals so as to prevent the resurgence of mosquito vectors [Mathew, J. and Thoppil, J.E. * (Cell and Molecular Biology Division, Department of Botany, University of Calicut, Calicut-673635, Kerala, India), *Pharmaceutical Biology*, 2011, **49**(5), 456-463].

MANURE/FERTILIZERS

NPARR 2(4), 2011-0428, Fresh dairy manure as a substitute for chemical fertilization in growing wheat forage; effects on soil properties, forage yield and composition, weed contamination, and hay intake and digestibility by sheep

Two experiments were conducted in two consecutive years. Exp. 1 (2008) was aimed at examining the effects of fertilizing three 1-ha fields with fresh dairy manure that was either weed contaminated (CM) or non-contaminated (NCM), as compared to chemical fertilization (CF). Five 10-m² subplots in each field treatment were analyzed for yield, composition, and *in vitro* digestibility of forage mass, wheat and weed plants, and changes in soil properties. Higher forage wheat yields were obtained in the CM and NCM treatments (9.45 and 9.41 t dry matter (DM)/ha, respectively) than in the CF treatment (7.56 t DM/ha, $P < 0.05$). None of the field treatments included herbicide application, and all fields were highly contaminated by weed mass (419-580g/kg DM). Weed profile in the three field treatments was similar to that observed in neighboring fields. Sheep intake of diets containing 900 g/kg wheat hay was highest in the NCM treatment, lowest in the CM treatment and intermediate in the CF treatment. Digestibility of dietary DM by the sheep followed an opposite trend, but neutral detergent fiber (aNDFom) digestibility was similar in the three treatments (0.64-0.66). Exp. 2 (2009) measured the cumulative effect of fresh dairy manure fertilization applied at two levels, 60 and 120 m³ NCM/ha (designated 60-NCM and 120-NCM, respectively), with CF as the control treatment. The three fields were sprayed with herbicide to reduce weed contamination (<20 g/kg). Wheat yield was higher in the 120-NCM treatment (14.5 t DM/ha) than in the 60-NCM and CF treatments (12.5 and 12.6 t DM/ha, respectively). Sheep intake of rations based on wheat hay from the three treatments was similar (781 g DM/d). Digestibility by sheep of DM and crude protein were higher in hays from treatments 60-NCM and 120-NCM than from the CF treatment. Pathogenic bacteria, including *Escherichia coli* and *Salmonella*, did not survive in either the soil or the wheat plants during the growing seasons. The increase in wheat yield and digestibility due to dairy

manure fertilization was related to the improvement in soil water retention and nutrient availability following this treatment. Adoption of this technology is expected to increase net profits in the dairy industry [J. Miron*, E. Yosef, M. Nikbachat, A. Zenou, E. Zuckerman, R. Solomon, A. Nadler (Agricultural Research Organization, P.O. Box 6, Bet-Dagan 50250, Israel), *Animal Feed Science and Technology*, 2011, **168**(3-4), 179-187].

NPARR 2(4), 2011-0429, Use of tomato crop residues into soil for control of bacterial wilt caused by *Ralstonia solanacearum*

Tomato debris can be used as the soil amendment to reduce agricultural residue accumulation problems and increase soil fertility. However, pathogens present in the debris may form a risk for subsequent crops. In this study, tomato growth substrate was amended with tomato debris artificially inoculated with *Ralstonia solanacearum* and the effect of heat treatments on the survival of the pathogen was measured. Experiments were carried out in the laboratory and in greenhouses, using peat moss and sand mix in pots as substrates. Pots were enclosed in plastic bags or left open. Then 0, 5, 10 and 15 g of tomato debris were applied to 500g growing medium, with four replicates per treatment. Treatments at 45°C lowered tomato wilt indices in tomato cv. Money-Maker and that the pathogen was not eradicated after pot treatments at 25°C. *R. solanacearum* remained pathogenic on the assayed growing media after a six-week treatment at 25 C, but was eradicated after treatments at 45 °C. The lower infectivity of infected debris tomato plants when buried with high doses of organic matter and at temperatures above 45 C suggests that adverse effects on the soil inoculum would be exerted through increased soil temperatures. This study demonstrates that tomato crop residues, usually considered waste material, could be used as soil amendments to reduce their effect as a source of contamination as they offer additional advantages [M.J. Zanón*, M.I. Font and C. Jordá (Instituto Agroforestal Mediterráneo, Universidad Politécnica de Valencia, Camino de Vera s/n, 46022 Valencia, Spain), *Crop Protection*, 2011, **30**(9), 1138-1143].

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

NPARR 2(4), 2011-0430, **Characteristics of papaya seed oils obtained by extrusion–expelling processes**

In general, about 300 g kg⁻¹ of the weight of papaya fruits appears as waste materials during processing, including a considerable amount of papaya seeds. To make a more efficient use of papaya, it is worth investigating the utilization of the seeds. The aim of this study was to comprehensively assess the lipid characteristics of papaya seed oil obtained by expelling processes. Papaya seed oil was found to have several unique characteristics, including its high oleic content, the relative ratio of saturated/monounsaturated/polyunsaturated fatty acids of 29/68/3, the polyunsaturated fatty acids merely accounting for 3.34% and its triacylglycerol composition being very similar to that of olive oil. Also, this oil was rich in chemopreventive benzyl isothiocyanate, the level ranging from 4.0 to 23.3 g kg⁻¹ dependent on the various processing methods for the pretreatment of papaya seeds. On the basis of these results, papaya seed oil can be considered as a high-oleic oil with a chemoprotective effect, and may be viewed as a healthy alternative in the functional food industry [Wei-Ju Lee, Min-Hsiung Lee,*and Nan-Wei Su (Department of Nutrition and Health Science, Chung Chou Institute of Technology, Changhua County 51003, Taiwan), *Journal of the Science of Food and Agriculture*, 2011, **91**(13), 2348-2354].

NPARR 2(4), 2011-0431, **An initial study on the formation of 3-MCPD esters during oil refining**

Oil refining is essential for ensuring quality and safety of oils and fats. However, during the deodorization step of the refining process, the oil is exposed to high temperatures and changes in the lipid matrix may occur leading to the formation of 3-chloropropane-1,2-diol (3-MCPD) esters and possibly other processing by-products. This study was initiated to address the limited understanding on the formation of 3-MCPD ester in oil refining. The impact of refining conditions, both at pilot-plant and industrial scale, were investigated by subjecting palm and rapeseed oils to different refining treatments. The

experiments showed that 3-MCPD esters and glycidyl esters were formed during the deodorization of palm oil, but not rapeseed oil. The level of 3-MCPD esters in the refined palm oils (3.5–4.9 mg/kg) was independent of the deodorization conditions. No correlation was found between the level of 3-MCPD esters formed and the content of the potential precursors, partial acylglycerols and chlorides. In contrast, the formation of glycidyl esters was affected by the deodorization conditions (both temperature and residence time). Higher levels of glycidyl esters (up to 3.8 mg/kg) were found in palm oil deodorized at temperatures above 230°C [Karel Hrnčirik* and Gerrit van Duijn (Unilever R&D Vlaardingen, Department of Fat Technology, Olivier van Noortlaan 120, 3133 AT Vlaardingen, The Netherlands), *European Journal of Lipid Science and Technology*, 2011, **113**(3), 374-379].

NPARR 2(4), 2011-0432, **Palm olein increases plasma cholesterol moderately compared with olive oil in healthy individuals**

Despite the high content of palmitic acid, palm olein has been shown to have a neutral effect on plasma cholesterol concentrations when compared with olive oil, which is suggested to be attributable to palmitic acid in the *sn*-1 and *sn*-3 position. In contrast, palmitic acid is in the *sn*-2 position in lard.

The objective was to investigate the effects of a diet rich in palm olein, fractionated palm oil, olive oil, and lard on plasma blood lipids, inflammatory markers, glucose, and insulin. A controlled double-blinded, randomized 3 × 3 wk crossover dietary intervention study included 32 healthy men who daily replaced part of their habitual dietary fat intake with 17% of energy from palm olein, olive oil, or lard, respectively. Compared with intake of olive oil, palm olein and lard increased total cholesterol and LDL cholesterol ($P < 0.0001$). Palm olein resulted in a lower plasma triacylglycerol concentration than did olive oil ($P < 0.01$). No difference in effects was observed in plasma HDL-cholesterol, high-sensitivity C-reactive protein, plasminogen activator-1, insulin, and glucose concentrations. The current study did not support the previous finding that the effect of palm olein on total plasma cholesterol and LDL cholesterol in healthy individuals with normal plasma cholesterol concentrations is neutral compared with that of olive

oil. Thus, *sn*-positioning was not confirmed to be important with regard to the effect on plasma cholesterol. The relatively lower plasma triacylglycerol concentration after the palm olein diet than after the olive oil diet was unexpected [Tine Tholstrup*, Julie Hjerpsted, and Marianne Raff (Research Department Human Nutrition, Faculty of Life Sciences, Copenhagen University, Denmark) , *The American Journal of Clinical Nutrition* , 2011, **94**(6), 1426-1432].

NPARR 2(4), 2011-0433, **Chemopreventive effects of dietary canola oil on colon cancer development**

Fatty acid composition of dietary fat plays a vital role in colon tumor development in animal models. Fats containing ω -6 fatty acids (e.g., corn oil) enhanced and ω -3 fatty acids (e.g., flaxseed oil) reduced chemically induced colon tumor development in rats. The objective of the present investigation was to study the effects of dietary canola oil, a source of ω -3 fatty acid on azoxymethane-induced colon cancer development in Fischer rats and compare with dietary corn oil.

Dietary canola oil significantly ($P < 0.05$) decreased colonic tumor incidence and tumor multiplicity as compared to dietary corn oil in rats. Fatty acid analysis showed that corn oil group had higher levels of ω -6 fatty acid levels, whereas the canola oil groups exhibited higher levels of ω -3 fatty acids from the colon and serum samples of rats. For the mechanistic study, COX-2 expression in the colon samples from the canola oil group was significantly lower ($P < 0.05$) as compared to the corn oil group.

Taken together, dietary canola oil may be chemopreventive for colon tumor development in Fischer rats as compared to possibly by increasing ω -3 fatty acid levels and decreasing COX-2 levels [Ekta Bhatia*, Chaitanya Doddivenaka, Xiaoying Zhang, Ajay Bommareddy, Padmanabhan Krishnan, Duane P. Matthees and Chandradhar Dwivedi (Department of Pharmaceutical Sciences, South Dakota State University, Brookings, South, Dakota, USA), *Nutrition and Cancer*, 2011, **63**(2), 242-247]

PHYTOCHEMICALS

NPARR 2(4), 2011-0434, Chemical constituents and in vitro antioxidant activity of Phyllanthus wightianus

The whole plant of *Phyllanthus wightianus* (PW) was investigated for the antioxidant effects of three successive extracts: hexane (PWHE), chloroform (PWCE) and methanol (PWME), using standard in vitro models. The PWME exhibited a strong scavenging effect on 2,2-diphenyl-2-picryl hydrazyl (DPPH) free radicals and nitric oxide radical inhibition activity, due to possessing the highest content of tannins. The free radical scavenging effect of PWME was comparable with that of reference antioxidants. The extracts were subjected to isolation of their compounds: isomeric sterol mixture (1) [stigmasterol (1a), campesterol (1b) and β -sitosterol (1c)], fredilin (2), lupeol (3), gallic acid (4), bergenin (5), geraniin (6), corilagin (7) and ellagic acid (8) were established through the use of column chromatographic methods and spectral data. The percentage of tannins was also determined and estimated using the HPLC method. The data suggest that tannins are the active antioxidant compounds of *P. wightianus*. This study provides proof for the ethnomedical claims and reported biological activities of this plant. The plant therefore has very good therapeutic potential [Olaganathan Siva Priya, Madepalli Byrappa Gowdu Viswanathan, Kediki Balakrishna and Muthappan Venkatesan* (Division of Biodiversity, Drug Discovery and Development, Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam, Sundaranar University, Alwarkurichi 627412, Tamil Nadu, India), *Natural Product Research*, 2011, **25**(10), 949-958].

NPARR 2(4), 2011-0435, Catechin and epicatechin in testa and their association with bioactive compounds in kernels of cashew nut (Anacardium occidentale L.)

Catechins in testa and bioactive compounds in testa-free and testa-containing kernels of cashew nuts were analysed. The cashew nut testa contained (+)-catechin and (-)-epicatechin with concentrations of 5.70 and 4.46 g per kg DM, respectively. Testa-containing kernels revealed significantly higher levels

of β -carotene (218 vs. 89.6 $\mu\text{g/kg DM}$), lutein (525 vs. 292 $\mu\text{g/kg DM}$), and α -tocopherol (10.1 vs. 2.4 mg/kg DM), similar amounts of zeaxanthin (7.0 vs. 7.1 $\mu\text{g/kg DM}$), γ -tocopherol (10.6 vs. 10.1 mg/kg DM), stearic acid (41 vs. 43 g/kg DM), oleic acid (214 vs. 219 g/kg DM) and linoleic acid (69 vs. 62 g/kg DM), but a lower concentration of thiamine (3.0 vs. 10.7 mg/kg DM) in comparison to testa-free samples. The testa-containing kernels provide high amounts of catechins and higher concentrations of β -carotene, lutein and α -tocopherol than do testa-free cashew nut kernels [Jennifer Trox, Vellingiri Vadivel, Walter Vetter, Wolfgang Stuetz, Dietmar R. Kammerer, Reinhold Carle, Veronika Scherbaum, Ute Gola, Donatus Nohr, Hans Konrad Biesalski* (Institute for Food Science and Biotechnology, Chair of Plant Foodstuff Technology, University of Hohenheim, Germany), *Food Chemistry*, 2011, **128**(4), 1094-1099].

NPARR 2(4), 2011-0436, Quantitative studies of phytochemicals of selected green leafy vegetables and their antioxidant potential

Methanolic extracts of *Spinacia oleracea* (Spinach), *Coriandrum sativum* (Coriander), *Mentha sativa* (Mint), *Raphanus sativus* (Radish), *Amaranthus hypochondriacus* (*Amaranthus*) were studied to identify the potential of these green leafy vegetables as antioxidants. In this regard free radical scavenging activity, reducing power and ferrous ion chelating activity of the extracts were determined. The selected vegetables were also analyzed for ascorbic acid, total carotenoid and total polyphenol contents, respective values of these phytochemicals in the vegetables under study ranged between 46.76 to 63.78, 0.006 to 0.074 and 289.69 to 1043.94 mg/100g . The highest free radical scavenging activity was recorded in *Spinacia oleracea* ($13.87 \pm 2.60 \text{ mg/ml}$), whereas it was found lowest in *Amaranthus hypochondriacus* ($89.98 \pm 1.42 \text{ mg/ml}$). *Mentha sativa* was found to have the maximum reducing power ($1.68 \pm 0.08 \text{ ASE/ml}$) and also the maximum hydroxyl radical ($\text{HO}\cdot$) inhibition activity ($78.87 \pm 1.33\%$). *Amaranthus hypochondriacus* was found to have the minimum reducing power ($0.45 \pm 0.26 \text{ ASE/ml}$) and also the minimum $\text{HO}\cdot$ radical inhibition activity. Correlation coefficient indicated that the relationship of total antioxidant activity, free radical scavenging activity, and reducing power with total polyphenol and ascorbic acid was positively correlated [Jha

Alok*, Upadhyay Ashutosh, Rasane Prasad, Singh Harikesh Bahadur (Centre of Food Science and Technology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005, India), *Medicinal Plants - International Journal of Phytomedicines and Related Industries*, 2011, **3**(2), 113-117

NPARR 2(4), 2011-0437, Antioxidant phytochemicals in lettuce grown in high tunnels and open field

Genotype along with growing and management conditions can affect the content and the composition of phytochemicals in plants. Two lettuce (*Lactuca sativa* L.) cultivars, 'Baronet' and 'Red Sails,' were grown in an open field and high tunnels to examine the effect of growing conditions on their phytochemical content. The total phenolic concentration and antioxidant capacity of lettuce increased in response to transplanting from greenhouse to both open field and high tunnels. However, the increase was much greater when seedlings were transplanted to the open field and was more than 4 fold over the pre-transplant stage. The concentrations of two major phenolic compounds, chicoric acid and chlorogenic acid, were about 2.5-5.5

times higher in both cultivars when grown in open field than in high tunnels. Also, growing lettuce in open field resulted in a greater activation of key genes (phenylalanine ammonia-lyase, L-galactose dehydrogenase and γ -tocopherol methyl transferase) involved in the biosynthesis of phenolic compounds, ascorbic acid and α -tocopherol. 'Red Sails' accumulated caffeic acid 4 times as much in open field as it did in high tunnels and overall contained higher amount of phenolic compounds, especially in open field, than did Baronet. Although lettuce plants grown in open field were richer in phytochemicals, a significant reduction in biomass accumulation occurred when the lettuce plants were grown in open field compared to high tunnels regardless of cultivar. These results show that growing conditions, in addition to genotype, can significantly affect the content of many phenolic compounds in lettuce and that growing lettuce under open field can have a positive impact on its health-promoting qualities [Myung-Min Oh, Edward E. Carey and C. B. Rajashekar* (Dep. of Horticulture, Forestry, and Recreational Resources, Kansas State Univ., 2021 Throckmorton Plant Science Center, Manhattan, KS 66506), *Biomedical and Life Sciences Horticulture, Environment, and Biotechnology*, 2011, **52**(2), 133-139].

SPICES/CONDIMENTS

NPARR 2(4), 2011-0438, **Studies on development of ready to eat Amla (*Emblica officinalis*) chutney and its preservation by using class one preservatives**

Amla fruit can range up to 950 mg/100 g which is said to be highest among all fruits next only to Barbados cherry. Being very astringent in taste it can not be consumed as raw by the consumer hence processing became essential. Present study was an effort to develop commercially acceptable ready to eat green Amla chutney. To optimize the quantity of pulps and salts to be added, Response Surface Methodology (RSM) was used. Statistical software Stat-Ease was used for statistical and graphical analysis of the experimental data. To consider all the responses simultaneously for optimization the RSM was used to compromise optimum conditions and it was found that the sensory scores were 7.35, 7.8 and 7.75 for colour, flavour and overall acceptability corresponding to optimum conditions. Chutney having composition Amla pulp-65.59%, salt -8%, green chilli-3.31%, garlic paste-2.11% and coriander leave paste 18.89% was found optimum. Triplicates samples were prepared using the optimum conditions and were evaluated for all the responses, corresponding values for color flavor and overall acceptability were 7.91, 8.08 and 8.08 which were comparatively higher than the predicted value. Therefore, the said formulations were recommended for ready to eat chutney. For the preservation of Amla chutney, salt concentration was varied from 8 to 12% while Brix were varied from 20 to 50°B. REG having 25°B had only 10 days of shelf life while chutney of 35°B could be stored up to twenty days at refrigeration temperature. Chutney having 50°B could be stored up to two months without any significant change in the quality attributes of the chutney [Mishra, P. , Verma, M. , Mishra, V. , Mishra, S. and Rai, G.K.* (Centre of Food Technology, University of Allahabad, Science Faculty Campus, India), *American Journal of Food Technology*, 2011, **6**(3), 244-252].

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NPARR 2(4), 2011-0439, **Antioxidant poten..... vs
Coriandrum sativum L. seed extract**

The seeds of *C. sativum* are used as a traditional

drug for the treatment of diabetes. The antioxidant and free-radical scavenging property of seeds in vitro was studied and also investigated whether the administration of seeds curtails oxidative stress in the kidney of streptozotocin-induced diabetic rats. Incorporation of seed powder in the diet led to marked lowering of blood glucose and a rise in the levels of insulin in diabetic rats. A parallel beneficial effect was observed on oxidant-antioxidant balance in the kidney. Addition of coriander seed powder not only inhibited the process of peroxidative damage but also significantly reactivated the antioxidant enzymes and antioxidant levels in diabetic rats. The total polyphenolic content of the seeds was found to be 12.2 gallic acid equivalents (GAE)/g while total flavonoid content was found to be 12.6 quercetin equivalents/g. The seeds also showed scavenging activity against superoxides and hydroxyl radicals in a concentration -dependent manner. Maximum free radical-scavenging action and free radical reducing power of coriander seed extract was observed at a concentration of 50 µg GAE. Islet histology structures showed degeneration of pancreatic islets in diabetic rats which was also reduced in diabetic rats treated with seed powder. These results show that *C. sativum* seeds not only possess antihyperglycemic properties but antioxidative properties also. Increased dietary intake of coriander seeds decrease the oxidative burden in diabetes mellitus [Deepa, B. and Anuradha, C.V. * (Department of Biochemistry and Biotechnology, Faculty of Science Annamalai University, Annamalainagar 608 002, India), *Indian Journal of Experimental Biology*, 2011, **49**(1), 30-38].

NPARR 2(4), 2011-0440, **Update on the chemopreventive effects of ginger and its phytochemicals**

The rhizomes of *Zingiber officinale* Rosc. (Zingiberaceae), commonly known as ginger, is one of the most widely used spice and condiment. It is also an integral part of many traditional medicines and has been extensively used in Chinese, Ayurvedic, Tibb-Unani, Srilankan, Arabic, and African traditional medicines, since antiquity, for many unrelated human ailments including common colds, fever, sore throats, vomiting, motion sickness, gastrointestinal complications, indigestion, constipation, arthritis, rheumatism, sprains, muscular aches, pains, cramps, hypertension, dementia, fever,

infectious diseases, and helminthiasis. The putative active compounds are nonvolatile pungent principles, namely gingerols, shogaols, paradols, and zingerone. These compounds are some of the extensively studied phytochemicals and account for the antioxidant, anti-inflammatory, antiemetic, and gastroprotective activities. A number of preclinical investigations with a wide variety of assay systems and carcinogens have shown that ginger and its compounds possess chemopreventive and antineoplastic effects. A number of mechanisms have been observed to be involved in the chemopreventive effects of ginger. The cancer preventive activities of ginger are supposed to be mainly due to free radical scavenging, antioxidant pathways, alteration of gene expressions, and induction of apoptosis, all of which contribute towards decrease in tumor initiation, promotion, and progression. This review provides concise information from preclinical studies with both cell culture models and relevant animal studies by focusing on the mechanisms responsible for the chemopreventive action. The conclusion describes directions for future research to establish its activity and utility as a human cancer preventive and therapeutic drug. The above-mentioned mechanisms of ginger seem to be promising for cancer prevention; however, further clinical studies are warranted to assess the efficacy and safety of ginger [Baliga, M.S.* , Haniadka, R. , Pereira, M.M. , D'Souza, J.J. , Pallaty, P.L. , Bhat, H.P. and Popuri, S. (Research and Development, Father Muller Medical College, Father Muller Hospital Road, Kankanady, Mangalore 575002, Karnataka, India), *Critical Reviews in Food Science and Nutrition*, 2011, **51**(6), 499-523].

NPARR 2(4), 2011-0441, *Coriandrum sativum*: A daily use spice with great medicinal effect

Coriandrum sativum Linn. has been credited with many medicinal properties. The green leaves of coriander are known as "asotu" in the Eastern Anatolian region or "cilantro" in the United States and are consumed as fresh herb. The essential oil obtained from its fruits at amounts ranging from approximately

0.5 to 2.5% is used both in flavours and in the manufacture of perfumes and soaps. The plant is grown widely all over the world for seed, as a spice, or for essential oil production. It is one of the earliest spices used by mankind. It has been used as a flavouring agent in food products, perfumes and cosmetics. It is used for various purposes such as for flavouring sweets, beverages, tobacco products and baked goods and as a basic ingredient for curry powder. It has been used as an analgesic, carminative, digestive, anti-rheumatic and antispasmodic agent [Mahendra, P. and Bisht, S. (Department of Pharmacology, School of Pharmacy, Suresh Gyan Vihar University, Jaipur 302004, India), *Pharmacognosy Journal* , 2011, **3**(21), 84-88].

NPARR 2(4), 2011-0442, Evaluation of garlic ecotypes for allicin and other allyl thiosulphinates

An aqueous extraction method coupled with ultra performance liquid chromatography with photo diode array detection was optimised and validated for screening of 93 garlic ecotypes for allicin and other allyl thiosulphinate contents. Variability in allicin, allyl methyl thiosulphinate and allyl trans-1-propenyl thiosulphinate was observed both on fresh and dry weight basis. Bulb to bulb variation for allicin levels was less in clonal selections followed by commercial varieties, exotic line and landraces, respectively. Five ecotypes on fresh weight basis and all the ecotypes on dry weight basis had allicin contents more than the recommended pharmacological values (≥ 4.5 mg g⁻¹). Cluster analysis and principal component analysis results revealed that geographical origin, breeding status and colour did not play any role in ecotype clustering. This study is useful as a base for selection of garlic ecotypes as a dependable raw material source for pharmaceutical and food processing industries [Khar, A.* , Banerjee, K. , Jadhav, M.R. and Lawande, K.E. (Directorate of Onion and Garlic Research (ICAR), Rajgurunagar 410 505, Pune, Maharashtra, India), *Food Chemistry*, 2011, **128** (4), 988-996].

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

NPARR 2(4), 2011-0443, Dielectric properties of honey adulterated with sucrose syrup

Sucrose syrup is a common additive in honey adulteration. To provide information for developing a cheap, simple, convenient and rapid sucrose-adulterated honey detector or sucrose content sensor, the permittivities of pure jujube, yellow-locust and milk-vetch flower honey, pure sucrose syrup and honey-sucrose syrup mixtures with sucrose content from 0% (pure honey) to 80% (pure sucrose syrup) were studied from 10 to 4500MHz with open-ended coaxial-line technology and a network analyzer at room temperature. The correlations between permittivities and sucrose contents were regressed. The results showed that the dielectric constants of all samples decreased with increasing frequency, while the pure honey had higher dielectric constant than pure sucrose syrup. Dielectric relaxation existed in all samples. The maximum loss factor decreased with increasing sucrose content. The relaxation frequency changed very little with sucrose content. Strong negative linear correlation, $R^2 > 0.98$, was found between loss factor around the relaxation frequency and sucrose content [Wenchuan Guo*, Yi Liu, Xinhua Zhu and Shaojin Wang (College of Mechanical and Electronic Engineering, Northwest A&F University, Yangling, Shaanxi 712100, PR China), *Journal of Food Engineering*, 2011, **107**(1), 1-7].

NPARR 2(4), 2011-0444, Honey and microbial infections: A Review supporting the use of honey for microbial control

Honey has been used as a medicine throughout the ages and has recently been reintroduced to modern medical practice. Much of the research to date has addressed honey's antibacterial properties and its effects on wound healing. Laboratory studies and clinical trials have shown that honey is an effective broad-spectrum antibacterial agent. Honey antimicrobial action explains the external and internal uses of honey. Honey has been used to treat adult and neonatal postoperative infection, burns, necrotizing fasciitis, infected and nonhealing wounds and ulcers, boils, pilonidal sinus, venous ulcers, and diabetic foot

ulcers. These effects are ascribed to honey's antibacterial action, which is due to acidity, hydrogen peroxide content, osmotic effect, nutritional and antioxidants content, stimulation of immunity, and to unidentified compounds. When ingested, honey also promotes healing and shows antibacterial action by decreasing prostaglandin levels, elevating nitric oxide levels, and exerting prebiotic effects. These factors play a major role in controlling inflammation and promoting microbial control and healing processes. This article reviews data supporting the effectiveness of natural honey in eradicating human pathogens and discusses the mechanism of actions [Noori S. Al-Waili *, Khelod Salom, Glenn Butler and Ahmad A. Al Ghamdi ((Al-Waili's Charitable Foundation for Sciences and Trading, New York, New York, USA), *Journal of Medicinal Food*, 2011, **14**(10), 1079-1096)].

NPARR 2(4), 2011-0445, Effects of planting date on sugar and ethanol yield of sweet sorghum grown in Arizona

Sweet sorghum [*Sorghum bicolor* (L.) Moench] is an annual crop currently being investigated for biofuel production in the arid southwest United States (U.S.). Sweet sorghum is an ideal candidate because it can be grown under reduced inputs (water, fertilizer) and responds more efficiently to stresses than traditional crops. Many varieties have been bred for high sugar, syrup, and forage production, but much biodiversity still remains to be utilized. Studies performed in 2006 and 2007 found that high biomass and percent juice extracted were the best predictors of potential ethanol yield per area. This investigation was undertaken to determine what effects planting dates have on overall sugar and predicted ethanol yields. Four varieties (Dale, M81E, Theis, and Topper) were planted in April, May, June, and July of 2008. They were harvested at physiological maturity, with dates ranging from August 26 to December 2. Biomass, juice weight, and Brix of the juice were recorded in the field. Samples were analyzed in the laboratory by High Performance Liquid Chromatography (HPLC) for fructose, glucose, and sucrose. Theoretical ethanol yields were calculated based on biomass, juice weight, and percent sugar. These were compared to actual yields obtained from laboratory-scale fermentations of the harvested juice, which ranged from 7.4% to 11.2% (58.1–88.6 g L⁻¹).

Since our predictive model uses the maximum conversion rate of sugar to ethanol and this was not reached in the lab, the predicted yields were always higher than the actual yields. However, the model can be a useful tool for estimating ethanol yield per area. Total sugars and predicted ethanol production were influenced by planting date, but the degree of the effects depended on the cultivar planted. Overall a May planting date at this location is preferable due to consistently higher values for the yield components analyzed, and This is not recommended due to its high susceptibility to heat. Sweet sorghum juice has been successfully fermented into ethanol, which indicates this crop may be able to play a transitory role in the emerging biofuel market [Valerie H. Teetora*, Denise V. Duclosa, Elisabeth T. Wittenberga, Kelly M. Younga, Jeerawan Chawhuaymakc, Mark R. Rileyc, Dennis T. Raya (School of Plant Sciences, Division of Horticultural and Crop Sciences, The University of Arizona, PO Box 210036, Tucson, AZ 85721, USA), *Industrial Crops and Products*, 2011, **34**, 1293- 1300].

NPARR 2(4), 2011-0446, Mineral analysis of mono-floral New Zealand honey

The levels of 18 different minerals in ten locally produced mono-floral honeys (clover, honeydew, kāmahi, mānuka, nodding thistle, rātā, rewarewa, tāwari, thyme and viper's bugloss honey) were determined, as well as moisture content, pH, conductivity and colour. The most abundant minerals were potassium, phosphorus and calcium, ranging between 34.8-3640, 29.5-255 and 7.21-94.3 mg/kg, respectively. Potassium made up 73% of the total mineral content. There was a large range of mean total mineral contents, with honeydew honey having the highest level (4060 mg/kg) and viper's bugloss honey the lowest (126 mg/kg). Honeydew had more than twice the mean total mineral contents than kāmahi, the next highest. The heavy metal contents (Cd, Pb and Zn) of the mono-floral honey types investigated were very low. A strong positive relationship between mean conductivity and total mineral content ($r^2 = 0.973$), and pH and total mineral content ($r^2 = 0.776$) was observed in this study [Leo P. Vanhanen*, Andrea Emmertz, Geoffrey P. Savage (Food Group, Faculty of Agriculture and Life Sciences, Lincoln University, Canterbury, New Zealand), *Food Chemistry*, 2011, **128**(1), 236-240].

THERAPEUTICS

NPARR 2(4), 2011-0447, **Determination of Antimicrobial Activity of Sorrel (*Hibiscus sabdariffa*) on *Escherichia coli* O157:H7 Isolated from Food, Veterinary, and Clinical Samples**

The use of medicinal plants as natural antimicrobial agents is gaining popularity. Sorrel (*Hibiscus sabdariffa*) is widely used for the treatment of diseases. The objective of this study was to investigate the antimicrobial activity of sorrel on *Escherichia coli* O157:H7 isolates from food, veterinary, and clinical samples. Phenolics of the calyces were extracted from 10 g of ground, freeze-dried samples using 100 mL of 80% aqueous methanol. Concentrations of 10%, 5%, and 2.5% methanol extract of sorrel were investigated for its antimicrobial activity. Inhibition zones were indicated by a lack of microbial growth due to inhibitory concentrations of sorrel diffused into semisolid culture medium beneath the sorrel-impregnated disk. The results of this experiment showed that the most potent sorrel concentration was 10%, then 5%, and finally 2.5%. The overall mean zone of inhibition for the sorrel extract was 12.66 mm for 10%, 10.75 mm for 5%, and 8.9 mm for 2.5%. The highest inhibition zones (11.16 mm) were observed in veterinary samples, and the lowest (10.57 mm) in the food samples. There were significant ($P < .05$) differences among mean zones of inhibition found in the food, veterinary, and clinical sources. Based on the source of samples and concentration of sorrel extract, the lowest mean inhibition was 7.00 ± 0.04 mm from clinical samples, and the highest was 15.37 ± 0.61 mm from a food source. These findings indicated that sorrel was effective at all levels in inhibiting *E. coli* O157:H7; thus it possesses antimicrobial activity and hold great promise as an antimicrobial agent [Marjorie Fullerton, Janak Khatiwada, Jacqueline U. Johnson, Shurrita Davis and Leonard L. Williams* (Center for Excellence in Post-Harvest Technologies, North Carolina A&T State University, 500 Laureate Way, Suite 422,2 Kannapolis, NC 28081-4332, USA), *Journal of Medicinal Food*, 2011, 14(9), 950-956].

NPARR 2(4), 2011-0448, **Antioxidant and anticarcinogenic effects of methanolic extract and**

volatile oil of fennel seeds (*Foeniculum vulgare*)

The present study evaluated the efficacy of fennel seed methanolic extract (FSME) for its antioxidant, cytotoxic, and antitumor activities and for its capacity to serve as a nontoxic radioprotector in Swiss albino mice. The natural antioxidant compounds of FSME for use in industrial application was also assessed. Cytotoxic activity of FSME was evaluated in a mouse model of Ehrlich ascites carcinoma (EAC) and on different types of human cell lines in vitro. The safety and optimum dose of FSME were determined. FSME, 100 mg/kg, was injected intraperitoneally into mice bearing EAC before the mice were exposed to three 2-Gy doses of gamma irradiation. After 30 days, mice were fasted for 18 h and then sacrificed to observe the lifespan of EAC-bearing hosts. Malondialdehyde (MDA), catalase activity, glutathione content, and total protein in serum, liver tissue, and ascitic fluid were determined. Iron, total iron-binding capacity, transferrin, and ferritin were also evaluated in serum. The data showed the presence of different types of compounds in FSME, such as flavonoids, terpenoids, alkaloids, phenols, and sterols; estragole (71.099%) was the predominant alcohol, gallic acid was the phenolic compound (18.895%), and L-limonene was the most prevalent monoterpene hydrocarbon (11.967%). The mean \pm standard deviation 50% inhibitory concentrations were 50 ± 0.03 μ g/mL for the MCF7 breast cancer cell line and 48 ± 0.22 μ g/mL for the Hepg-2 liver cancer cell line. The significant increase in MDA levels and the significant decrease in catalase activity and glutathione content in liver and tumor tissue in mice bearing EAC were ameliorated after FSME administration. In contrast, total protein content was increased in ascitic fluid. Serum iron was inversely proportional to the levels of ferritin and transferrin and total iron-binding capacity. Administration of FSME before irradiation exerted a cytoprotective effect against gamma irradiation, as manifested by a restoration of the MDA level, catalase activity, and GSH content to near-normal levels. In conclusion, FSME may have remarkable anticancer potential against a breast cancer cell line (MCF7) and liver cancer cell line (Hepg-2). It also showed strong free radical-scavenging activity (100%). Thus, FSME may reduce oxidative stress and protect mouse cells from damage caused by reactive oxygen species. In addition, it could be used as a safe,

effective, and easily accessible source of natural antioxidants to improve the oxidative stability of fatty foods during storage. FSME also exhibited an antitumor effect by modulating lipid peroxidation and augmenting the antioxidant defense system in EAC-bearing mice with or without exposure to radiation [Ragaa Hosny Mohamad*, Amal Mohamad El-Bastawesy, Mohamad Gamil Abdel-Monem, Assmaa Mahmoud Noor, Hussain Abdel Rahman Al-Mehdar, Sabry Mohamad Sharawy and Mahmuod Mohamad El-Merzabani), (National Cancer Institute, Cancer Biology, Fom Al-Khalig-Al-Kaser Al-Aini Street, Cairo 11234, Egypt), *Journal of Medicinal Food*, 2011, **14**(9), 986-1001].

NPARR 2(4), 2011-0449, **Garlic allicin as a potential agent for controlling oral pathogens**

Garlic has been used medicinally throughout human history. Allicin is considered the most therapeutic constituent of garlic. This study tested the antimicrobial activity of garlic allicin on oral pathogens associated with dental caries and periodontitis. Allicin was found effective against all the tested bacteria. The broth dilution method revealed that planktonic growth of the cariogenic, gram-positive species *Streptococcus mutans*, *S. sobrinus*, and *Actinomyces oris* was inhibited by an allicin concentration of 600 $\mu\text{g/mL}$ or higher. Planktonic growth of the tested gram-negative periopathogenic species *Aggregatibacter actinomycetemcomitans* and *Fusobacterium nucleatum* was inhibited by a minimum allicin concentration of 300 $\mu\text{g/mL}$. *Porphyromonas gingivalis*, an anaerobic, gram-negative pathogen and the bacterium most associated with chronic periodontitis, demonstrated the lowest sensitivity to allicin (2,400 $\mu\text{g/mL}$). Gel zymography and the synthetic chromogenic substrate *N* α -benzoyl-L-arginine 4-nitroanilide hydrochloride demonstrated that allicin inhibits the proteases of *P. gingivalis*, including the arginine and lysine gingipains known as major virulence factors of this organism. A gingipain-inactivated mutant demonstrated high sensitivity to allicin (<300 $\mu\text{g/mL}$), revealing that gingipains confer resistance to allicin. Live/dead staining followed by analysis with confocal laser scanning microscopy revealed that allicin was bactericidal to *S. mutans* grown in mature biofilms. However, this bactericidal effect was reduced as biofilm depth increased. In

conclusion, these results support the traditional medicinal use of garlic and suggest the use of allicin for alleviating dental diseases Gilad Bachrach*, Areen Jamil, Ronit Naor, Golan Tal, Zvi Ludmer and Doron Steinberg (Institute of Dental Sciences, The Hebrew University-Hadassah School of Dental Medicine, The Hebrew University of Jerusalem, P.O.B. 12272, Jerusalem 91120, Israel), *Journal of Medicinal Food*, 2011, **14**(11), 1338-1343.]

NPARR 2(4), 2011-0450, **Anti-Hyperglycemia properties of tea (*Camellia sinensis*) bioactives using in vitro assay models and influence of extraction time**

Tea (*Camellia sinensis*) has well-known health benefits, which are attributed to its polyphenolic metabolites. This research explored the potential of regular tea consumption and influence of extraction time typically used in daily consumption of tea, as a therapeutic dietary support for potential management of early stage type 2 diabetes using in vitro assay models. Extraction times of 2 and 5 minutes were compared. The 5-minute extraction time had significantly higher total phenolic content compared with the 2-minute extraction time. Choice Darjeeling 5-minute extraction yielded the highest amount of total phenolics (299.6 \pm 5.9 $\mu\text{g/g}$), followed by Tazo Black 5-minute extraction (240 \pm 9.7 $\mu\text{g/g}$), whereas Bigelow Green 2-minute extraction had the lowest total phenolic content (53 \pm 8.2 $\mu\text{g/g}$). 1, 1-Diphenyl-2-picrylhydrazyl scavenging-linked antioxidant activity was high (81–91%) for all types evaluated, and for most samples it was influenced by the extraction time. Similarly, high in vitro α -glucosidase inhibition was observed in almost all the samples assayed, and for most samples the 5-minute extraction had significantly higher inhibition compared with the 2-minute extraction time. The most fermented teas showed highest α -amylase inhibition: Choice Darjeeling 5-minute extraction had the highest inhibition (84.1%), followed by Tazo Black 5-minute extraction (71.6%). Angiotensin converting enzyme inhibition was not observed in any sample. Overall, the 5-minute extraction time was found to have more relevance for potential benefits for managing hyperglycemia than the 2-minute procedure. This research suggests that tea offers an attractive potential strategy to regulate postprandial hyperglycemia toward an overall dietary support for type 2 diabetes

management [Chandrakant Ankolekar, Trisha Terry, Kevin Johnson, David Johnson, Ana Christina Lopez Barbosa, and Kalidas Shetty*(Laboratory of Food Biotechnology, (Department of Food Science, Chenoweth Laboratory, University of Massachusetts, Amherst, MA 01003, USA), *Journal of Medicinal Food*, 2011, **14**(10): 1190-1197].

NPARR 2(4), 2011-0451, *Morinda citrifolia* Linn. leaf extract possesses antioxidant activities and reduces nociceptive behavior and leukocyte migration

Herbal drugs have been used since ancient times to treat a wide range of diseases. *Morinda citrifolia* Linn (popularly known as “Noni”) has been used in folk medicine by Polynesians for over 2,000 years. It is reported to have a broad range of therapeutic effects, including effects against headache, fever, arthritis, gingivitis, respiratory disorders, infections, tuberculosis, and diabetes. The aim of this study was to investigate the antioxidant, anti-inflammatory, antinociceptive, and antibacterial properties of the aqueous extract from *M. citrifolia* leaves (AEMC). Antioxidant activity was observed against lipid peroxidation, nitric oxide, and hydroxyl radicals. The antinociceptive effect of AEMC was observed in the acetic acid–induced writhing test at the higher dose. Moreover, AEMC significantly reduced the leukocyte migration in doses of 200 and 400 mg/kg and showed mild antibacterial activity. Together, the results suggest that properties of *M. citrifolia* leaf extract should be explored further in order to achieve newer tools for managing painful and inflammation conditions, including those related to oxidant states, Mairim Russo Serafini, Rodrigo Correia Santos, Adriana Gibara Guimarães, João Paulo Almeida dos Santos, Alan Diego da Conceição Santos, Izabel Almeida Alves, Daniel Pens Gelain, Paulo Cesar de Lima Nogueira, Lucindo José Quintans-Júnior, Leonardo Rigoldi Bonjardim, and Adriano Antunes de Souza Araújo* (Departamento de Fisiologia, Curso de Farmácia - UFS Adress, Av. Marechal Rondon SN, CEP 49100-000, São Cristóvão - SE, Brazil), *Journal of Medicinal Food*, 2011, **14**(10), 1159-1166].

NPARR 2(4), 2011-0452, High potential of agro-industrial by-products of pomegranate (*Punica granatum* L.) as the powerful antifungal and antioxidant substances

Microorganisms such as fungi are one of the most important factors that cause oxidative processes during postharvest stage and consequently deterioration of agriculture products would not be unexpected. On the other hand, high antioxidant properties of industrial by-products of pomegranate propose them as powerful antioxidant and antifungal substances. So to investigate the antioxidant and antifungal properties of pomegranate, two independent factorial experiments based on randomized design with 5 replications were conducted. In the first experiment the effect of 3 different parts of pomegranate (peel, seed and leaf) and 2 different kinds of extracts (aqueous and methanolic) with 4 concentrations (0, 500, 1000 and 1500 ppm) were investigated on 3 postharvest fungi (*Penicillium italicum*, *Rhizopus stolonifer* and *Botrytis cinerea*). In the second experiment antioxidant capacity and phenolic content were measured for two different extracts from different parts. Based on the results the methanolic extract showed the highest inhibitory effects on the mycelia growth (IMG) and spore germination (ISG) with 49.82 and 41.25% respectively. On the other hand, peel and seed extracts had more inhibitory effect (IMG and ISG) than leaf extract. The phenolic content of peel extract were also measured 2.8 fold higher than pomegranate leaf extract and antioxidant capacity of peel, seed and leaf extracts of pomegranate were 55.3%, 35.7% and 16.4% respectively. Therefore, it seems that the high percentage of phenolic content in the peel and seed of pomegranate could cause the high antifungal and antioxidant activity of their extracts [Ali Tehranifara* Yahya Selahvarzia, Mahdiyeh Kharrazia and Vahid Jahan Bakhshb (Center of Pomegranate Research, Department of Horticultural Science, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran), *Industrial Crops and Products*, 2011, **34** (2011) 1523-1527].

VEGETABLES

NPARR 2(4), 2011-0453, Storage stability of cauliflower soup powder: The effect of lipid oxidation and protein degradation reactions

Soups based on cauliflower soup powders, prepared by dry mixing of ingredients and rapeseed oil, showed a decrease in quality, as evaluated by a sensory panel, during the storage of the soup powder in the dark for up to 12 weeks under mildly accelerated conditions of 40 °C and 75% relative humidity. Antioxidant, shown to be effective in protecting the rapeseed bulk oil, used for the powder preparation, had no effect on storage stability of the soup powder. The freshly prepared soup powder had a relatively high concentration of free radicals, as measured by electron spin resonance spectroscopy, which decreased during storage, and most remarkably during the first two weeks of storage, with only marginal increase in lipid hydroperoxides as primary lipid oxidation products, and without any increase in secondary lipid oxidation products. Analyses of volatiles by SPME-GC-MS revealed a significant increase in concentrations of 2-methyl- and 3-methyl butanals, related to Maillard reactions, together with an increase in 2-acetylpyrrole concentration. The soup powders became more brown during storage, as indicated by a decreasing Hunter L-value, in accord with non-enzymatic browning reactions. A significant increase in the concentrations of dimethyl disulfide in soup powder headspace indicated free radical-initiated protein oxidation. Protein degradation, including Maillard reactions and protein oxidation, is concluded to be more important than lipid oxidation in determining the shelf-life of dry cauliflower soup powder [Riikka Raitio, Vibeke Orlieen and Leif H. Skibsted* (University of Copenhagen, Department of Food Science, Faculty of Life Sciences, Rolighedsvej 30, DK-1930 Frederiksberg C, Denmark), *Food Chemistry*, 2011, **128**(2), 371-379].

NPARR 2(4), 2011-0454, Changes in carotenoids during processing and storage of pumpkin puree

Changes in the contents of carotenoids and their true retentions (% TR) during the production of puree of *Cucurbita moschata* 'Menina Brasileira' and of *Cucurbita maxima* 'Exposição' pumpkins and the

stability of such compounds during 180 days of storage were monitored by liquid chromatography coupled with a photodiode array detector. Cooking caused higher losses than commercial sterilisation. High losses of xanthophylls such as lutein and violaxanthin were noted during processing and storage of pumpkin puree. Such losses show the low stability of these compounds. The major carotenoids, pro-vitamin A carotenes, namely, α -carotene and all-trans- β -carotene for *C. moschata* 'Menina Brasileira' and all-trans- β -carotene for *C. maxima* 'Exposição' obtained high retentions (>75%) after processing. A slight degree of isomerisation of β -carotene was noted in the puree samples, but with low concentrations of cis-isomers. Storage for 180 days did not significantly affect ($P < 0.05$) the concentrations of these carotenoids [João Gustavo Provesi, Carolinne Odebrecht Dias and Edna Regina Amante*(Federal University of Santa Catarina, Department of Food Science and Technology, Laboratory of Fruits and Vegetables, Rodovia Admar Gonzaga 1.346, 88034-001 Florianopolis, SC, Brazil), *Food Chemistry*, 2011, **128**(1), 195-202].

NPARR 2(4), 2011-0455, Nutritional and medicinal potential of *Lagenaria siceraria*

Dietary prebiotics and phytomedicine have made available novel therapeutic possibilities to manage human health and diseases. Sitotherapy, the therapeutic use of diet and nutrition, strives to adapt the chemistry of food and nutrition in order to improve human health. Gastrointestinal crypt stem cells and enteric microflora are believed to be affected by diet, which can result in improved health. *Lagenaria siceraria* (Molina) Standl. is a vegetable food also used as a traditional medicine. It is reported to have immunomodulatory, hepatoprotective, cardioprotective, antioxidant, anti-stress and adaptogenic, antihyperlipidemic, analgesic, and anti-inflammatory properties. A novel protein, Lagenin (20 kDa), isolated from seeds is reported to have antitumor, antiviral, antiproliferative, and anti-HIV activities. The consumption of bottle gourd can be considered to improve human health, but additional research is required [Ahmad, I., Irshad, M and Rizvi, M.M.A. * (Department of Biosciences, Jamia Millia Islamia (Central University), Jamia Nagar, New Delhi 110025, India), *International Journal of Vegetable Science*, 2011, **17**(2), 157-170].

NPARR 2(4), 2011-0456, Comparison of wines from grape and a mix of beetroot and carrot

Wine is one of the oldest forms of alcoholic beverages and can impart benefits to human beings. Beetroot (*Beta vulgaris* L) and carrot (*Daucus carota* L) are rich in betalain and carotene. These vegetables have medicinal and nutritive properties. Yeast (*Saccharomyces cerevisiae* INVSc1) was used to prepare wine from beetroot and carrot and its quality was compared to grape wine. The vegetable wine was reddish-brown in color, slightly acidic (titratable acidity = 1.0 ± 0.02 g tartaric acid/100 mL), sweet (3.1 ± 0.07 g of reducing sugar/100 mL), and with an alcohol content of $10.6 \pm 0.8\%$. No major differences in biochemical aspects of the wine were found. Organoleptic analysis indicated that the vegetable wine was preferred over the grape wine for taste and color/appearance. The taste was a significant criteria ($\chi^2 = 36.46$; $P < 0.01$) in selection of the vegetable wine as the superior product [Kempuraj, V.* and Dasgupta, D. (Department of Biochemistry, The Institute of Science, #15, Madame Cama Road, Mumbai 400 032, India), *International Journal of Vegetable Science*, 2011, **17**(2), 171-176].

NPARR 2(4), 2011-0457, Nutritional and sensory quality of micronutrient-rich traditional products incorporated with green leafy vegetables

The study was aimed to formulate micronutrient rich products with dried greens. 'Keerae' (*Amaranthus paniculatus*) and 'shepu' (*Peucedanum graveolens*) greens were steam blanched after chemical pretreatment and dried in hot air oven. Dried greens were analyzed for proximate constituents, vitamins, minerals, antinutrients and dialyzable minerals. Dehydrated greens were incorporated into 'Mathri'-a wheat flour based deep fried product and 'Thalipeeth'-a mixed cereal based shallow fried product at 4, 8 and 12 % levels. The products were evaluated for sensory quality in comparison to control (without greens) by an untrained panel numbering 80. Analysis of chemical composition showed no significant losses in proximate, mineral and antinutrient contents of dehydrated greens. Results of sensory analysis revealed that products incorporated with 4% dehydrated greens were similar to control in texture, taste and overall quality. However, acceptability scores reduced with increasing concentration of

greens. Addition of dehydrated greens increased nutrient density of all products [Gupta, S.* and Prakash, J. (Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore-570 006, India), *International Food Research Journal*, 2011, **18**(2)].

NPARR 2(4), 2011-0458, Provitamin-A and xanthophyll carotenoids in vegetables and food grains of nutritional and medicinal importance

This study reports carotenoid composition of vegetables (n = 56), cereals (n = 12), pulses and legumes (n = 12), analysed by HPLC. It was hypothesised that food grains, like vegetables may be good sources of carotenoids. Amongst vegetables, higher level (mg/100 g dry weight) of lutein (210-419) was detected in green/red/capsicum and yellow zucchini, whilst zeaxanthin was dominant in kenaf (4.59). β -Carotene (mg/100 g dry weight) was higher in green capsicum and kenaf (48,159) whilst carrot, ivy gourd and green capsicum contain α -carotene (22-110). Amongst food grains, chickpea, split red gram and flaxseed contain higher levels (μ g/100 g dry weight) of lutein (185-200) whilst zeaxanthin level was highest in puffed chickpea (1.8). Red unpolished parboiled rice was richest (μ g/100 g dry weight) in β -carotene (67.6) whilst whole black gram contained higher levels of α -carotene (52.7). Thus, results indicate that chickpea and red unpolished parboiled rice are good sources of carotenoids. These carotenoid-rich vegetables and grains may be exploited to meet the lutein and β -carotene requirement [Mamatha, B.S., Sangeetha, R.K. and Baskaran, V.* (Department of Biochemistry and Nutrition, Central Food Technological Research Institute, CSIR, Mysore 570 020, Karnataka, India), *International Journal of Food Science and Technology*, 2011, **46**(2), 315-323].

NPARR 2(4), 2011-0459, Vegetable and fruit peels as a novel source of antioxidants

Consumers are currently demanding less use of chemicals or minimally processed fruits and vegetables, so more attention had been paid to search for naturally occurring substances. This is particularly true for plant materials that act as alternative antioxidant sources. From this point of view, the present study was designed to evaluate the antioxidant

potential of seven fruit and vegetable peels from India. Extraction was done individually by cold percolation method using various organic solvents (hexane, chloroform, acetone and methanol). Quantitative phytochemical analysis was done for total phenol and flavonoid content. Antioxidant testing assays were 2,2-diphenyl-1-picryl-hydrazyl (DPPH) free radical scavenging assay, hydroxyl radical scavenging assay, superoxide anion radical scavenging assay and reducing capacity assessment. Amongst the seven plant peels, the acetone extract of *Mangifera indica* was the most potent and in some

cases even better than the standard. The results obtained indicate that *M. indica* peel may become important as a cheap and noticeable natural source of compounds with health protective potential, which can be used in pharmaceutical, nutraceutical and food preparation [Kalpna, R., Mital, K., Sumitra, C*.(Phytochemical, Pharmacological and Microbiological Laboratory, Department of Biosciences, Saurashtra University, Rajkot-360 005, Gujarat, India), *Journal of Medicinal Plant Research*, 2011, **5**(1), 63-71].

WOOD

NPARR 2(4), 2011-0460, A study of the antioxidant capacity of oak wood used in wine ageing and the correlation with polyphenol composition

The antioxidant capacity of oak wood used in the ageing of wine was studied by four different methods: measurement of scavenging capacity against a given radical (ABTS, DPPH), oxygen radical absorbance capacity (ORAC) and the ferric reducing antioxidant power (FRAP). Although the four methods tested gave comparable results for the antioxidant capacity measured in oak wood extracts, the ORAC method gave results with some differences compared to the other methods. Non-toasted oak wood samples displayed more antioxidant power than toasted ones due to differences in the polyphenol composition. A correlation analysis revealed that ellagitannins were the compounds mainly responsible for the antioxidant capacity of oak wood. Some phenolic acids, mainly gallic acid, also showed a significant correlation with antioxidant capacity [M.E.Alañón*, L.Castro-Vázquez, M.C.Díaz-Maroto, M.H.Gordon and M.S.Pérez-Coello (Área de Tecnología de los Alimentos, Facultad de Ciencias Químicas, Universidad de Castilla-La Mancha, Av. Camilo José Cela 10, 13071 Ciudad Real, Spain) *Food Chemistry*, 2011, **128**(4), 997-1002].

NPARR 2(4), 2011-0461, Effect of neem seed oil fumigation on wood-destroying insect

As the deadline for phasing out the use of conventional synthetic chemicals as fumigant approaches, alternative fumigants are being evaluated. Fumigants from plant origins could have greater potential in future on the basis of their efficacy, economic value and use in large scale storage. Several aromatic plants are being investigated for their antifeedant and insecticidal activity including their fumigation action. In the present study, neem seed oil (Nso) was extracted and used at different concentrations. Wooden blocks of hard and soft woods were fumigated with six concentrations of Nso and exposed to *Lyctus africanus* Lesne larvae. Nso has emerged as promising alternative of synthetic fumigants. The present study showed that Nso is an effective fumigant for the control of *Lyctus* larvae at

all concentrations tested. The lowest concentration showed 48% mean mortality, while 1.6% caused >85% mortality of *Lyctus* larvae. On the basis of probit analysis, it was observed that the LC50 of Nso for *L. africanus* is 0.048–0.05% in both woods [Pant, H and Tripathi, S (Forest Products Division Forest Research Institute Dehradun, Uttarakhand PIN-248006), *International Wood Products Journal*, 2011, **2**(2), 95-100].

NPARR 2(4), 2011-0462, Protein extraction from secondary sludge of paper mill wastewater and its utilization as a wood adhesive

In this study, secondary sludge (SS) from a kraft paper mill was used as a source of biomass to recover protein and investigate its potential use as a wood adhesive. The process of protein recovery involved disruption of the floc structure in alkaline medium to disintegrate and release intercellular contents into the aqueous phase followed by separation of soluble protein. Finally, the soluble protein was subjected to low pH precipitation and the pelletized sludge protein, referred to as recovered sludge protein (RSP) was tested for crude protein, moisture, and other contents. A significant process yield of 90% in terms of precipitation of soluble protein from disintegrated sludge was estimated through calorimetric studies, whereas an overall material balance confirmed a RSP yield of up to 23% based on total suspended solids of raw sludge. The RSP containing 30% crude protein was used as a wood adhesive and its adhesion performance was compared with soy protein isolate (SPI) and phenol formaldehyde (PF) resin. The testing of plywood lap joints has shown up to 41% shear strength level of RSP adhesive compared to PF. This work demonstrates the technical feasibility and potential of SS as a biomass resource to develop eco-friendly adhesives for wood composite applications. Effect of oxalic acid pretreatment of wood chips on manufacturing medium-density fiberboard [Muhammad Pervaiz and Mohini Sain*(Centre for Biocomposites and Biomaterials Processing University of Toronto, Ontario, Canada), *BioResources*, 2011, **6**(2), 961-970].

NPARR 2(4), 2011-0463, Condensed tannins extraction from grape pomace: Characterization and utilization as wood adhesives for wood particle board

The extraction of condensed tannins from grape pomace was examined using water medium in the

presence of NaOH, Na₂CO₃, NaHCO₃ eventually in the presence of Na₂SO₃. The tannin fractions reactivity towards formaldehyde was studied by gel time analysis and thermomechanical analysis in bending and it was demonstrated that despite of their lower phenolic contents, some of these extracts displayed promising properties for adhesive applications. A resin formulation in which the total

content of tannin is 75% of the total resin solids content gave good results and was employed for the elaboration of the first grape pomace based-wood particleboard which passed relevant international standard specifications for interior-grade panels. [Lan Pinga,b, Antonio Pizzi b, Zhou Ding Guoa, Nicolas Brosseb*(Laboratoire d'Etude et de Recherche sur le MAteriau Bois, Faculté des Sciences et Techniques, Nancy-Université, Bld des Aiguillettes, F-54500 Vandoeuvre-lès-Nancy, France), *Industrial Crops and Products*, 2011, **34**(1), 907-914].

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

CULTIVATION

NPARR 2(4), 2011-0464, Micropropagation of *Arnebia hispidissima* (Lehm). DC. and production of alkannin from callus and cell suspension culture

Alkannin, a red-purple dye and bioactive compound found in the roots of *Arnebia hispidissima* has antibiotic and anti-inflammatory properties and is also used in cosmetic and textile industries at a large-scale. In the present communication, we demonstrate the establishment of callus and cell suspension culture of *A. hispidissima* with the aim of optimizing the production of alkannin. Highest alkannin content was recorded in cell suspension and callus culture established on M-9 medium. Production of alkannin was influenced by the different culture medium. Evaluation of alkannin content of roots of field-grown plants and in vitro grown cell, tissue and organ showed that alkannin production was higher in all in vitro grown culture systems (cell suspension, callus and roots) than the roots of field-grown plants. The present investigation may be applicable in designing systems for the large-scale cultivation of *A. hispidissima* cell suspensions for the production of alkannin [Shekhawat, M.S.* and Shekhawat, N.S. (Department of Botany, Biotechnology Centre, Jai Narain Vyas University, Jodhpur 342 033, India), *Acta Physiologiae Plantarum*, 2011, **33**(4), 1445-1450].

NPARR 2(4), 2011-0465, Enhanced plumbagin production in elicited *Plumbago indica* hairy root cultures

Elicitation of *Plumbago indica* hairy roots with yeast carbohydrate fraction, chitosan, manganese chloride, copper chloride and methyl jasmonate exhibited significant elevation (~1.2 to 2 fold) of plumbagin production in shake flask culture as

compared with control. Chitosan and methyl jasmonate elicitation also caused simultaneous plumbagin leaching into culture media. Three days' exposure of chitosan (200mg/l) and methyl jasmonate (80 μ M) together synergized total plumbagin yield to its maximum 11.96 \pm 0.76mg/g DW in shake flask culture. In bioreactor cultivation, a significant raise in fresh root biomass was recorded on day 20 as compared with control shake flask culture. Three days' exposure of chitosan (200mg/l) and methyl jasmonate (80 μ M) with 20days old bioreactor-culture significantly improved total plumbagin production to 13.16 \pm 1.72mg/g DW with simultaneous plumbagin leaching into bioreactor media [Gangopadhyay, M.*, Dewanjee, S. and Bhattacharya, S. (Medicinal Plant Laboratory, Department of Botany, Bose Institute, 93/1 APC Road, Kolkata 700009, India), *Journal of Bioscience and Bioengineering*, 2011, **111**(6), 706-710].

NPARR 2(4), 2011-0466, Micropropagation of *Nyctanthes arbor-tristis*: A medicinal plant

Nyctanthes arbor-tristis Linn. is a valuable medicinal plant which belongs to the family Oleaceae. The *N. arbor-tristis* L. demonstrate diverse pharmacological and biological activities like anti-inflammatory, anti-pyretic, anti-allergic, anti-malarial, analgesic along with ulcerogenic activities. Due to unrestricted large-scale use of the natural resource and less cultivation the plant becomes gradually depleted so In vitro culture is an alternative method for conservation and propagation of this species. Nodes and leaves were collected and cultured in MS medium variously supplemented with cytokinins and combination of cytokinins and auxins. The highest frequency of shoot formation was observed from nodal explants on the MS medium fortified with 3.0mg/l BA and 0.5 mg/l NAA. Leaf explants responded for callus initiation only in MS medium fortified with 3.0 mg/l BA and 0.5 mg/l NAA. Elongated shoots were excised and placed in a 100 mg/l and appropriate Incubation can be done. However optimal rooting and growth of micro shoot were observed in 100mg/l IBA conc. when incubation can be done for 8hr. After four weeks, acclimatization of the rooted plantlets can be done and then transfer to earthen pots at the natural agro-climatic condition. This study might provide new opportunities for clonal propagation and germplasm conservation of

Nyctanthes arbor-tristis [Kumar, P.S.*, Lopa, P., Rayagada, Odisha, India), *International Journal of Research in Pharmaceutical Sciences*, 2011, **2**(2), 291-295].
Biswajit, M.S., Raghunath, S. (Department of Biotechnology, MITS Engineering College,

DISTRIBUTION

NPARR 2(4), 2011-0467, *Solanum cordatum*
(*Solanaceae*) - **A new record to Southern India**

While preparing an inventory of flowering plants of the Kolli hills, Namakkal district, Tamil Nadu, Southern India, some specimens of *Solanum* L. were collected and identified as *S. cordatum* Forssk.

On scrutiny of literature, it is revealed that this species is known only from Gujarat in India and forms a new record to Southern India. Hence, a detailed description, phenology and illustration are provided to facilitate easy identification of the species [Ramachandran, A. and Viswanathan, M.B.*(Centre for Climate Change and Adaptation Research, Anna University, Chennai-600 025, Tamil Nadu, India), *Rheedea* , 2010, **20**(1), 56-58]

ANALYTICAL METHODS

NPARR 2(4), 2011-0468, Effective natural dye extraction from different plant materials using ultrasound

Dyes derived from natural sources have emerged as an important alternative to synthetic dyes. Therefore, there is a need for developing better solid-liquid extraction techniques for leaching natural colorants from plant materials for applications in plant research, food as well as dyeing industries. The influence of ultrasound on natural colorant extraction from different potential dye yielding plant materials has been studied in comparison with magnetic stirring process as control. The color yielding plant materials used in the present study include Green wattle bark, Marigold flowers, Pomegranate rinds, 4'o clock plant flowers and Cocks Comb flowers. Analytical studies such as UV-VIS spectrophotometry and gravimetric analysis were performed on the extract. The results indicate there is a significant 13-100% improvement in the extraction efficiency of the colorant obtained from different plant materials due to the use of ultrasound. Therefore, this methodology could be employed for extracting coloring materials from plant materials in a faster and effective manner [Sivakumar, V. *, Vijaeswarri, J. and Anna, J.L. (Chemical Engineering Division, Central Leather Research Institute (CLRI), Council of Scientific and Industrial Research (CSIR), Adyar, Chennai 600 020, India), *Industrial Crops and Products*, 2011, **33**(1), 116-122].

NPARR 2(4), 2011-0469, Antioxidant dye and pigment extraction using a homemade pressurized solvent extraction system

Increases in reports of health hazards and toxicity of synthetic colorants are driving the food industry towards applying natural colorants to an increasing number of processed food products. The attention that natural dyes and pigments are getting is due to the functional properties attributed to some of these colorants. Although synthetic dyes and/or pigments have lower production costs and greater stability, the number of synthetic additives permitted in developed countries is decreasing every year; this increases the usage of antioxidant colorants, such as

carotenoids and anthocyanins by the food processing industries. Commonly, conventional extraction methods are used to extract these compounds from natural sources. Nevertheless, these methods are, in general, time- and solvent-consuming and may promote the degradation of these compounds. To overcome these drawbacks, conditions of short extraction times using environmentally friendly pressurized solvents, such as supercritical CO₂ and pressurized ethanol, have been successfully used to obtain antioxidant dyes and pigment-rich extracts. The objective of this work was to validate a homemade pressurized solvent extraction system that can be independently used for supercritical fluid extraction (SFE) and pressurized liquid extraction (PLE) processes. Functional colorant sources, such as annatto seeds and jabuticaba skins, were used as model plant materials. Our SFE results were compared to those obtained using commercial SFE unit with the same processing conditions to validate the new system. To establish the statistically significant differences or similarities between the SFE yield values, a Tukey's test was utilized. A confidence coefficient of 95% was used to compare the means. The anthocyanin content of the Jabuticaba skin extract obtained by the PLE method was determined using the pH differential method. The supercritical extracts from Jabuticaba skins obtained in a previous study in our laboratory study with pressurized ethanol were fractionated by thin-layer chromatography (TLC) [Diego T. Santos, Carolina L. C. Albuquerque, Maria Angela A. Meireles*(Laboratory of Supercritical Technology: Extraction, Fractionation, and Identification of vegetable extracts FEA - School of Food Engineering. UNICAMP - University of Campinas. Rua Monteiro Lobato, 80 13083-862 Campinas, SP - Brasil), *Procedia Food Science*, 2011, **1**, 1581-1588].

NPARR 2(4), 2011-0470, Development and validation of analytical methods for ethyl carbamate in various fermented foods

The aim of this work was to develop and validate analytical methods for ethyl carbamate (EC) in various food matrices. Column chromatography was used for the analysis of EC in kimchi, a fermented soybean paste (doenjang), a fermented fish product (jeotgal), yoghurt, bread, and cheese. To remove the fat in the bread and cheese, a Florisil

cartridge was selected. The volume of dichloromethane in the chromatography column was optimised to 60 mL for the kimchi, cheese, and fermented soybean paste. For the bread, jeotgal, and yoghurt, the best recovery rate was found by using 100 mL of dichloromethane. For the accurate analysis of EC in the vinegar, 150 mL of dichloromethane and a neutralisation process (pH = 8.0) were required. In the standard curve of EC, satisfactory linearity ($R^2 = 0.998$) was shown. The limit of quantification (LOQ) was 10 ng/mL and the recovery rates ranged from 76.9% to 118.1%. Intra- and inter-assay precision ranged from 3.5% to 34.2% and 3.8% to 41.9%, respectively [Hyo-Shin Lim and Kwang-Geun Lee* (Department of Food Science and Biotechnology, Dongguk University-Seoul, South Korea), *Food Chemistry*, 2011, **126**(3), 1373-1379].

NPARR 2(4), 2011-0471, Evaluation of a simple and promising method for extraction of antioxidants from sea buckthorn (*Hippophaë rhamnoides* L.) berries: Pressurised solvent-free microwave assisted extraction

The pressurised solvent-free microwave assisted extraction (PSFME) technique has been developed and optimised for extraction of antioxidants from

Hippophaë rhamnoides L. berries using a two-level full factorial design. The effects of factors (extraction time, irradiation power, number of cycles) and their first order interactions were evaluated from antioxidant activity of extracts using the 2,2'-diphenyl-1-picrylhydrazil (DPPH) free radical scavenging method, the ferric reducing ability of plasma (FRAP) assay, and the estimation of total phenolic content using the Folin-Ciocalteu method. The best extraction conditions were obtained, in a laboratory scale extractor of 50 mL filled with 4 g fresh berries, using a 1000 W microwave power applied during 50 s and repeated five cycles. PSFME was then compared to other common extraction techniques such as pressing, maceration and pressurised liquid extraction. It is appeared that PSFME leads to the most active and richest extract in phenolic content including molecules such as quercetin and isorhamnetin not extracted with other techniques. Furthermore PSFME respect green chemistry, it is rapid, cheap and does not need sample preparation and/or evaporation step [Thomas Michel, Emilie Destandau* and Claire Elfakir [Institut de Chimie Organique et Analytique, Université d'Orléans-CNRS UMR 6005, BP 67059, 45067 Orléans Cedex 2, France) *Food Chemistry*, 2011, **126**(3), 1380-1386].

POSTHARVEST TECHNOLOGIES

NPARR 2(4), 2011-0472, Kinetics of quality changes of pumpkin (*Curcubita maxima* L.) stored under isothermal and non-isothermal frozen conditions

The effects of freezing process and frozen storage at isothermal (−7, −15 and −25 °C) and non-isothermal (accelerated life testing with step-stress methodology; temperature range from −30 to −5 °C) conditions on pumpkin quality were investigated. Storage temperature conditions were selected to embrace the limits practiced in the cold chain. Quality changes, such as texture, colour CIE *Lab* and vitamin C (ascorbic acid) content, were evaluated for both frozen storage regimes. The freezing process (that included a pre-blanching step) and subsequent frozen storage had significant impacts on all quality parameters analysed. A fractional conversion kinetic model was adequate in colour, texture and vitamin C data fits. The storage temperature effect was successfully described by the Arrhenius law. This study shows that non-isothermal frozen storage has a marked effect on pumpkin quality [E.M. Gonçalves*, Pinheiro, M. Abreu, T.R.S. Brandão, C.L.M. Silva (Unidade de Investigação de Tecnologia Alimentar, Instituto Nacional de Recursos Biológicos, Estrada do Paço do Lumiar, 22, 1649-038 Lisboa, Portugal), *Journal of Food Engineering*, 2011, **106**(1), 40-47].

NPARR 2(4), 2011-0473, Application of oven drying method on moisture content of ungrounded and grounded (long and short) rice for storage

This study was conducted on ungrounded, grounded, long and short rice grains to determine the moisture content for storage. The rice samples were dried in an oven at 105°C; in this regard every sample was divided in 6 parts with equal volume. The moisture contents were measured in six different ways such as 1st part with 1 h interval, 2nd with 2 h, 3rd with 4 h, 4th with 6 h, 5th with 12 h and 6th part after 24 h. It is observed that an ungrounded grain sample with weight of 28.9 g showed in 1, 2, 4, 6, 12, and 24 h moisture release 5.81, 7.82, 9.10, 9.62, 10.48, and 11.11%, respectively. However, long grains weighing 44.86 g released moisture in 1, 2, 4, 6, 12, 24 h as 4.41, 6.87, 8.76, 9.59, 10.63 and 11.39% respectively. While the short grains with weight of 45.68 g showed

moisture release in the interval of 1, 2, 4, 6, 12 and 24 h as 3.96, 6.17, 7.99, 8.76, 9.68 and 10.29% respectively. It is evident from the study that ungrounded grains may be stored for long time as the moisture is easily released from them and they may retain the quality as compared to grounded short grains [M. A Talpur, J Changying*, F. A Chandio, S. A Junejo and I. A Mari (Department of Agricultural Mechanization, College of Engineering, Nanjing Agricultural University, Post Code 210031, Nanjing, Peoples Republic of China), *Journal of Stored Products and Postharvest Research*, 2011, **2**(12),245-247].

NPARR 2(4), 2011-0474, The quality of maize stored using roof and sack storage methods in Katumba Ward, Rungwe District, Tanzania: Implications on household food security

The quality of maize stored using sack and roof storage methods was studied by investigating the presence of *Fusarium*, *Aspergillus* and *Penicillium* infections using qualitative methods in 130 maize samples that were randomly collected from the roof and sack storage facilities in Katumba ward, Rungwe district, Tanzania. Levels of fumonisins, aflatoxins, ochratoxins and T-2 toxins were determined using quantitative methods on selected 77 maize samples. It was found that 86% of the selected maize samples were infected by one, two or all of the three pathogenic fungi investigated, whereas 88% were contaminated by one, two or three types of the investigated mycotoxins. The average concentrations of the mycotoxins were as follows: 596.48 ± 38.85 µg/kg of aflatoxins, 745.73 ± 105.57 µg/kg of ochratoxins 87717.95 ± 14984.32 µg/kg (or 87.2 ± 15 mg/kg) of fumonisins, and 1803.77 ± 244.56 µg/kg (or 1.8 ± 0.241 mg/kg) of T-2 toxins. The concentrations of the mycotoxins were a lot higher than the internationally accepted levels. These observations indicated that in Katumba ward, maize stored using roof and sack storage methods was exposed to infection by *Fusarium*, *Aspergillus* and *Penicillium* species, and that the farm households were at risk of ill health due to the mycotoxins [Rose Mboya*, Pangirayi Tongoona, Kwasi Sackey Yobo, John Derera, Maxwell Mudhara and Augustine Langyintuo (Food Security, University of KwaZulu-Natal, Pietermaritzburg, South Africa), *Journal of Stored Products and Postharvest Research*, 2011, **2**(9), 189 – 199].

Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. National Seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, 2 to 4 February 2012 Navsari, Gujarat, India; Website: <http://www.nau.in/Links/seminar%20aspee.pdf>
2. National Symposium on Biotechnology: Research & Development , 4 February 2012 Chandigarh, India; Website: <http://www.ggdsd.ac.in/docs/SymposiumBrochure.pdf>
3. 10 International Kimberlite Conference 2012 , 6 to 11 February 2012 Bangalore, Bangalore, India ; Website: <http://www.10ikcbangalore.com/index.html>
4. International Symposium on Recent Advances in Cancer Research Therapeutics to Chemoprevention, 8 to 9 February 2012 , Gandhinagar, gujarat, India ; Website: <http://www.cug.ac.in/cancer-symposium.html>
5. International Conference on Yoga and Naturopathy, 9 to 13 February 2012 , Bangalore, Karnataka, India ;Website: http://icyn.net/wp-content/themes/Fantastic_Blue/International-conf-bro.pdf
6. National Conference on Current Status & Recent Advances in Medicinal and Aromatic Plants Research, 10 to 11 February 2012 , Hyderabad, Andhra Pradesh, India , Website: http://www.adc.edu.in/images/stories/printing_purpose_-_280_x_210_-_web.pdf
7. 4th Indo-Korean Conference on Integrative Bioscience Research - Opportunities and Challenges 10 to 11 February 2012 coimbatore, Tamilnadu, India, Website: <http://www.avinuty.ac.in/IKCIBR/FINAL%20ikbr.pdf>
8. National Conference On Biodiversity Assessment, Conservation And Utilization, 10 to 11 February 2012, Pune, Maharashtra, India; Website: <http://www.mesbiodiversity.in>
9. Green Technologies for Environmental Rehabilitation 11 to 13 February 2012, Haridwar, Uttarakhand, India; Website: <http://gkvharidwar.org/events/gter/broch.pdf>
10. 3rd International Conference on Bioinformatics and Systems biology (INCOBS 2012), 16 to 18 February 2012, Annamalaiagar, Tamil Nadu, India , Website: http://annamalaiuniversity.ac.in/conference_dde_zlg.htm
11. National Seminar on Depletion of Forests and Livelihood Concerns , 17 to 18 February 2012 , Bangalore, India ; Website: <http://www.christuniversity.in/msgdisplay.php?id=86259&f=1>
12. 2nd International Conference on Bioscience, Biochemistry and Bioinformatics "C ICBBB 2012; 10 to 11 March 2012, Chennai, India; Website: <http://www.icbbb.org/>
13. International Conference on Advances in Biological Sciences (ICABS), 15 to 17 March 2012 , Kannur, Kerala, India, Website: <http://www.icabs.org>
14. National Symposium on Plant Biology and its Role in Sustainable Food and Energy Production, 17 to 18 March 2012, Bilaspur, Chhattishgarh, India, Website: <http://ggu.ac.in/download/botany%20symposium.pdf>

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. 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; parmod@niscair.res.in; npr@niscair.res.in