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Natural Products and Resources Repository

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Natural Products and Resources**

*Inaugural
Issue*



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From the Director's Desk

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

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Gangan Prathap

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

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

(A Quarterly Electronic Repository of Current Information on
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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

BEVERAGES

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

NPARR 1(1), 2010-01, Effect of roasting degree, equivalent thermal effect and coffee type on the radical scavenging activity of coffee brews and their phenolic fraction

The radical scavenging activity (RSA) of coffee brews obtained from different types of coffee was studied as a function of the roasting degree and equivalent thermal effect (expressed as C^zT_{ref}), and the relative contribution of the phenolic fraction (PF) and non-phenolic fraction (NPF) to the overall RSA was evaluated. Brews extracted from medium roasted coffee showed a higher RSA than those from green coffee due to an increase of the RSA of the NPF upon roasting. The RSA of the NPF increased with increasing roasting degree together with the accumulation of brown coloured Maillard reaction products (MRPs). Brews from dark coffee showed lower RSA than those from medium roasted coffee due to polyphenols degradation which, in turn, caused an RSA depletion not counterbalanced by an increase of the RSA of NPF. The relative contribution of NPF to the overall RSA of the brew is in fact much lower than that of the PF. Roasting processes with similar values C^zT_{ref} resulted in the same RSA independent of an average temperature variation from 170 to 190°C and coffee type. The antioxidant activity (AOA) changes in brews from commercial coffee samples (medium and dark roasted) were more dependent on roasting severity than on the type of coffee [Giampiero Sacchetti Carla Di Mattia^a, Paola Pittia and Dino Mastrocola (^aDipartimento di Scienze degli Alimenti, Via Carlo R. Lerici 1, Mosciano Stazione, 64023 Teramo, Italy), *J Food Eng*, 2009, **90**(1), 74-80].

NPARR 1(1), 2010-02, Effects of processing parameters on colour stability of strawberry nectar from puree

The effect of processing steps on the colour stability and the anthocyanin content of nectars made from strawberry puree was investigated, including (i) the use of frozen strawberries, (ii) processing temperature (10°C vs. 20°C), (iii) sieving, (iv) pH reduction and (v) storage temperature (20°C vs. 4°C). The use of frozen strawberries significantly improved the colour stability of the nectar even for long storage periods and allowed the production of strawberry nectars with a shelf-life of up to 12 months without any additives. Moreover, half-life of anthocyanin monomers increased significantly. A negative effect of a higher processing temperature on the content of anthocyanins after pasteurisation could be observed as well as the reduction of the pH value during processing on the colour and the content of anthocyanin monomers. Sieving had no significant effect on colour stability and the content of anthocyanin monomers. Storage temperature had a strong impact on colour stability and degradation of anthocyanin monomers. At 4°C, the nectar colour remained acceptable over even more than 12 months. Compared to frozen strawberries stored at -80°C, frozen strawberries stored at -18°C had a lower activity of polyphenoloxidase (PPO) and peroxidase (POD) of about 53% and 22%, respectively. No complete inactivation of PPO and POD could be achieved during the different processing steps. POD activity was more affected by pH treatment than PPO activity [Manfred Gössinger^a, Stefan Moritz, Monika Hermes, Silvia Wendelin, Hannes Scherbichler, Heidrun Halbwirth, Karl Stich and Emmerich Berghofer (^aDepartment of Fruit Processing, Federal College and Institute for Viticulture and Pomology, A-3400 Klosterneuburg, Austria), *J Food Eng*, 2009, **90**(2), 171-178].

NPARR 1(1), 2010-03, Concentration of apple and pear juices in a multi-plate freeze concentrator

The process for concentration of apple and pear juices as well as concentration of sugar solutions modelling pear juice (simulation fluid) using a descending film multi-plate freeze concentrator was examined. It

has been determined in advance the freezing point of those fluids in the working concentration and temperature intervals. In addition, different parameters were studied to allow tracking of the process of freeze concentration, such as ice accumulation, variation of the content of soluble solids in the solution and in the ice removed, ice production and energy consumption. The apple and pear juices tested showed similar behaviour, while the mixture of sugars used for simulation showed better behaviour, due perhaps to the absence of foam in the process and to the quicker formation of ice. It has been obtained concentrations of 30.2 and 30.8 Bx with the apple and pear juices, respectively and up to 32.7 Bx with the simulation fluid. The clarified juices usually are concentrated on an evaporation stage. In this stage the juice is subjected to high temperatures that cause undesirable reactions, such as non enzymatic browning and destruction of nutritive compounds. The freeze concentration is a technology that allows eliminating water from the juices at temperatures below the water's freezing point, what allows obtaining products of better quality. This technology to concentrate apple and pear juices has obtained promising results [E. Hernández, M. Raventós, J.M. Auleda and A. Ibarz^a (^aFood Technology Department, XaRTA-UTPV, University of Lleida, Av. Rovira Roure 191, 25198 Lleida, Spain), *Innov Food Sci Emerg Technol*, 2009, **10**(3), 348-355].

NPARR 1(1), 2010-04, Preparation of a resveratrol-enriched grape juice based on ultraviolet C-treated berries

Grapes are rich in bioactive phenolics. However, most of them remain in the by-product after juice processing and only a minor part pass to the juice. A study was done to obtain a resveratrol-enriched white grape juice based on UVC-treated berries in combination with different conditions during juice production. Postharvest UVC treatment of berries enabled the further selective stilbenes enrichment of the juice, especially resveratrol. Macerating enzymes did not modify the phenolic profile but increased juice yield up to 30%, keeping its phenolic concentration and thus reducing the phenolics remaining in the by-product. Maceration with Na₂S₂O₅ was critical to increase the phenolic content in the juice whereas β-

cyclodextrin only tended to increase the stilbenes content. Optimum conditions for juice production (maceration for 2h at 45°C with 0.2% Na₂S₂O₅) using UVC-treated grape berries significantly increased stilbenes concentration (up to 35-fold over the control), without affecting the sensory properties of the juice. The phenolic (resveratrol)-enriched grape juice obtained here could be an ideal alternative to wine in the search of grape-derived health benefits [R. González-Barrio, M.L. Vidal-Guevara, F.A. Tomás-Barberán and J.C. Espín^a (^aResearch Group on Quality, Safety and Bioactivity of Plant Foods, Department of Food Science and Technology, CEBAS-CSIC, P.O. Box 164, 30100 Campus de Espinardo, Murcia, Spain), *Innov Food Sci Emerg Technol*, 2009, **10**(3), 374-382].

NPARR 1(1), 2010-05, Inactivation kinetics of pectin methylesterase and cloud retention in sonicated orange juice

The effect of sonication on pectin methylesterase (PME) activity and cloud stability of orange juice was studied. Ultrasonic acoustic energy density (AED) levels of 0.42, 0.47, 0.61, 0.79 and 1.05W/ml and treatment times of 0 (Control), 2, 4, 6, 8 and 10min were investigated. The highest PME inactivation level observed was 62% for sonication at the highest AED level and treatment time. A fraction conversion model adequately described the PME inactivation compared to first order or polynomial models. A significant change in particle size distribution was observed in sonicated samples due to cavitation effects. These results indicate that the cloud stability of sonicated orange juice depends not only on PME inactivation but also on particle size reduction.

Power ultrasound is a non thermal pasteurisation method that has been identified to meet the US FDA requirement for a 5 log reduction in *E. coli* pertinent to fruit juices. Apart from microbial inactivation, cloud stability is a critical orange juice quality parameter influencing product shelf-life and consumer acceptance. This work demonstrates that sonication at low AED levels and temperatures can be employed to achieve the desired cloud stability [B.K. Tiwari, K. Muthukumarappan, C.P. O'Donnell and P.J. Cullen^a,

(^aSchool of Food Science and Environmental Health, Dublin Institute of Technology, Dublin 1, Ireland), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 166-171].

COSMECEUTICALS

NPARR 1(1), 2010-06, Cosmeceuticals and silibinin

Cosmeceuticals are used for nourishing and improving the appearance of the skin and are also documented as effective agents for treating various dermatologic conditions. Cosmeceutical preparations from herbal origin are most popular among consumers because these agents are mostly nontoxic and possess strong antioxidant activity. Because oxidative stress is one of the major mechanisms for skin ageing and dermatologic conditions, phytochemicals with proven antioxidant activity, such as silibinin, could be useful for treating many dermatologic conditions as well as skin ageing. Silibinin is a flavonolignan compound from *Silybum marianum* Gaertn. (milk thistle plant) that possesses strong antioxidant activity and also modulates many molecular changes caused by xenobiotics and ultraviolet radiation to protect the skin. This contribution reviews the evidence generated from laboratory studies to support the scientific rationale for the effective use of silibinin in cosmeceutical preparations [Rana P Singh^a and Rajesh Agarwal (^aCancer Biology Laboratory, 104 School of Life Sciences, Jawaharlal Nehru University, New Delhi 110067, India), *Clinics Dermatol*, 2009, **27**(5), 479-484].

NPARR 1(1), 2010-07, Traditional uses of plants in the Eastern Riviera (Liguria, Italy)

The aim of the present study was to explore the traditional plant knowledge of a zone of the Ligurian coast, known as Riviera spezzina (RS), Eastern Liguria, Italy. Traditional cosmetic uses of plants concerns hair lightening or staining (*Urtica* and *Hedera* leaves or *Juglans* mallow), or the treatment of dandruff (*Castanea* leaves) and lice (*Lupinus* seeds). Topical application of sap from grape shoots is indicated to strengthen the hairs. *Umbilicus rupestris* leaves are used to heal feet calluses, while the aerial parts of *Clematis* and *Rubus* are recommended to prepare refreshing baths for feet [L Cornara^a, A La Rocca S.

Marsili and M.G. Mariotti (^aPolo Botanico "Hanbury", Dip. Te. Ris., Università degli Studi di Genova, C.so Dogali 1M, 16136 Genova, Italy), *J Ethnopharmacol*, 2009, **125**(1), 16-30].

NPARR 1(1), 2010-08, Effect of green *Coffea arabica* Linn. seed oil on extracellular matrix components and water-channel expression in *in vitro* and *ex vivo* human skin models

Coffea arabica Linn. seed oil is being widely used in cosmetic formulations, although its effects on human skin cells are not clear and most observations are unpublished. In this study, the *in vitro* effects of green coffee (*C. arabica*) oil (GCO) on the synthesis of collagen, elastin, and glycosaminoglycans (GAG) and in the release of transforming growth factor- β 1 (TGF- β 1) and granulocyte-macrophage colony-stimulating factor (GM-CSF) by human skin fibroblasts was evaluated. The ability of GCO to increase aquaglyceroporins-3 (AQP-3) mRNA expression in cultured keratinocytes and human skin explants was also investigated.

Human fibroblasts were incubated for 48h with several GCO concentrations (3.12, 6.25, 12.5, 25.0 and 50.0mg/ml). The levels of growth factors and extracellular matrix compounds in the culture supernatant were measured using commercial kits. To evaluate AQP-3 relative expression, using real-time reverse transcription polymerase chain reaction, keratinocytes were incubated for 3–6h with the GCO optimal concentration of 25.0mg/ml. Histological sections of human skin were also incubated with GCO (25.0mg/ml) and immunostained by antiserum against AQP-3. The results demonstrated that incubation with GCO produces a dose-dependent stimulation in the synthesis of collagen, elastin, and GAG, in addition to increasing the release of the growth factors TGF- β 1 and GM-CSF. GCO also induced the expression of AQP-3 mRNA, which reached levels up to 6.5-fold higher than those of the control cultures. Thus, GCO might improve physiological balance in the skin, allowing the formation of new connective tissue and preventing epidermis dryness by increasing AQP-3 levels. Taking into account the limitations of *in vitro* studies, it is encouraging in this context to consider CGO as an

adjuvant to be used in dermocosmetic formulations. Clinical studies are in progress aiming to further investigate the protective effects of CGO in the skin [Maria Del Carmen Velazquez Pereda, Gustavo de Campos Dieamant, Samara Eberlin, Cecília Nogueira, Débora Colombi, Luiz Claudio Di Stasi and Mary Luci de Souza Queiroz^a (^aDepartment of Pharmacology/Hemocenter, University of Campinas, Campinas, Brazil), *J Cosmetic Dermatol*, 2009, **8**(1), 52-68].

NPARR 1(1), 2010-09, Eating chocolate can significantly protect the skin from UV light

Cocoa beans fresh from the tree are exceptionally rich in flavanols. Unfortunately, during conventional chocolate making, this high antioxidant capacity is greatly reduced due to manufacturing processes. This study was carried out to evaluate the photoprotective potential of chocolate consumption, comparing a conventional dark chocolate to a specially produced chocolate with preserved high flavanol (HF) levels. A double-blind *in vivo* study in 30 healthy subjects was conducted. Fifteen subjects each were randomly assigned to either a HF or low flavanol (LF) chocolate group and consumed a 20g portion of their allocated chocolate daily. The minimal erythema dose (MED) was assessed at baseline and after 12 weeks under standardized conditions. In the HF chocolate group the mean MED more than doubled after 12 weeks of chocolate consumption, while in the LF chocolate group; the MED remained without significant change. Thus the study demonstrated that regular consumption of a chocolate rich in flavanols confers significant photoprotection and can thus be effective at protecting human skin from harmful UV effects. Conventional chocolate has no such effect [Stefanie Williams^a, Slobodanka Tamburic and Carmel Lally (^aCosmetic Science Group, School of Management and Science, London University of the Arts, London, UK), *J Cosm Dermatol*, 8(3), 169-173].

DYES

(incl. Food colorants)

NPARR 1(1), 2010-10, Removal of methylene blue from aqueous solution by adsorption onto pineapple leaf powder

The ability of an unconventional bio-adsorbent, pineapple leaf powder (PLP) for the adsorption of methylene blue (MB) from aqueous solution was studied. It was observed that intra-particle diffusion was involved in the adsorption process and that the kinetic data fitted well with a pseudo-second-order equation. Fitting parameters revealed that the rate of adsorption increased with decrease in dye concentration and decrease in ionic strength while the mixing speed did not have a significant effect on adsorption. The adsorption was favourable at higher pH and lower temperature and the equilibrium data were well fitted by the Langmuir isotherm. The maximum adsorption capacity varied from 4.68×10^{-4} to 9.28×10^{-4} mol/g when pH increases from 3.5 to 9.5. Thermodynamic parameters suggest that the adsorption is a typical physical process, spontaneous and exothermic in nature. The results revealed that this agricultural waste has potential to be used as an economical adsorbent for the removal of methylene blue from aqueous solution [Chih-Huang Weng^a, Yao-Tung Lin and Tai-Wei Tzeng (^aDepartment of Civil and Ecological Engineering, I-Shou University, Da-Hsu Township, Kaohsiung 84008, Taiwan), *J Hazard Mat*, 2009, **170**(1), 417-424].

NPARR 1(1), 2010-11, Biosynthesis and synthesis of natural colours- Review article

In nature, the detection of colours requires an organism having some type of eye with a retina and two or three types of photoreceptor connected to a nervous system, which can interpret the signals received. Evidence that certain simple organisms were coloured 1 billion years ago and some more advanced creatures, which could have possessed eyes a few hundreds of million years ago, is exemplified. A vast array of chemicals essential to life are produced by living organisms and their biosynthesis depends upon individual genetic patterns, which determine the enzyme catalysts involved. Plants photosynthesise many pigments, which are essential for them to maximise the absorption of energy from the sun, while others offer protection from any harmful radiation. Such pigments, for example chlorophylls and the carotenoids, flavonoids and betalains, have traditionally been used as natural dyes, food colorants and medicines. This review compares

the chemical processes involved in their biosynthesis and the laboratory methods adopted to confirm their chemical structure. Some engineered biosynthetic methods are now used for commercial production of natural colours and these methods may involve the controversial use of genetic engineering [Timothy L Dawson (Heron Lea, 18 Hall Lane, Macclesfield, Cheshire SK11 0DU, UK), *Colorat Technol*, 2009, **125**(2), 61-73].

NPARR 1(1), 2010-12, Eco-friendly pretreatment of silk fabric for dyeing with *Delonix regia* Rafin. extract

The flowers of *Delonix regia* Rafin. have been evaluated for the natural dyeing of silk using a biomordant and enzymes. This is an eco-friendly textile pretreatment that does not utilise metal mordanting. The aqueous extract obtained from the dried red flowers was used for the dyeing of silk fabrics. A bright reddish-brown hue colour was observed when 30% of *Delonix* extract was used on the pretreated silk material. The silk fabric was treated with either an enzyme or biomordant. The resulting dyed fabric showed resistance to fading. Finally, all dyed specimens were tested for wash and light fastness properties, making *Delonix* a viable alternative to synthetic red dyes. Through desorption studies, the order of reactivity of enzymes towards dye uptake in the one-step process was found to be lipase>diasterase>protease-amylase=Pyru (biomordant). For the two-step process, the order of reactivity of enzymes was found to be protease-amylase>lipase>Pyru (biomordant) >diasterase. Overall, it can be concluded that, treatments, the two-step process was better in terms of larger colour yield values, fastness properties and both dye adherence ability [Padma S Vankar^a and Rakhi Shanker (^aFacility for Ecological and Analytical Testing (FEAT), Indian Institute of Technology, Kanpur 208 016, India), *Colorat Technol*, 2009, **125**(3), 155-160].

NPARR 1(1), 2010-13, Cytohistological and phytochemical study of madder root extracts obtained by ultrasonic and classical extractions

Madder (*Rubia tinctorum* Linn.) has been used since ancient times as a source of pigments for dyeing and

painting. Madder dyes are localized in roots and the native chemical population is composed of glycosided and aglycone compounds. The study was conducted to elaborate an efficient extraction process without any chemical denaturation of dyes and to compare an optimized ultrasonic process, using for madder dye extraction, with two conventional procedures and to determine the efficiency of ultrasound on these vegetable matrix. Madder roots were extracted in a methanol-water mixture in 37:63 (v/v) for ultrasound and 80:20 (v/v) for reflux and agitation. HPLC-PAD analyses showed the anthraquinone proportion for each extraction process and their denaturing effects. Finally, cytohistological observations were made to show the consequence of each process on the cell organization in madder roots. The results showed that the amount of extracted dyes was higher with UAE than with agitation and reflux. HPLC-PAD analysis revealed that the anthraquinone composition differed according to the extraction procedure. The UAE extracts presented an important richness in terms of anthraquinonic compounds that suggests a preserving effect. Cytohistological observations showed that the main alterations concerned the cell walls of phloem. After UAE the walls exhibited numerous pitted areas reflecting an ultrasound-induced cavitation that enhances the extraction effectiveness of this method. The study has shown the improvement of madder roots extraction both quantitatively and qualitatively using the efficiency of ultrasound-assisted extraction in comparison with magnetic agitation and reflux techniques [Guillaume Cuoco, Carole Matheno:^a, Paul Archier, Mohamed El Maâtaoui, Cathy Vieillescazes (^aLaboratoire de Chimie Bio-Organique et des Systèmes Moléculaires Vectoriels, Université d'Avignon et des Pays de Vaucluse, Faculté des Sciences, 33 rue Louis Pasteur, F-84000 Avignon, Franc), *Phytochem Anal*, 2009, **20**(6), 484-490].

NPARR 1(1), 2010-14, Consumer's colour acceptance of Strawberry nectars from puree

In two surveys (600 consumers) (1) the importance of colour on a consumer's decision to buy strawberry nectar and jam, (2) the consumer's colour acceptance of strawberry nectars from puree and adequate products containing colorants from the market as well as specially

prepared samples and (3) the associated attributes to these samples were studied. In addition, a test was carried out in order to (4) characterize strawberry colour and its changes during storage sufficiently with one value. Colour has a big impact on a consumer's decision to buy strawberry nectars as well as strawberry jam. Neither gender nor age or consumption habits of consumers had a significant impact on colour acceptance. For colour assessment, an "acceptance factor" (AF) was calculated from colorimetric data that provides processors the prediction of color quality of nectars from puree. Nectars with an AF lower than 0.4 were not accepted, whereas nectars with an AF higher than about 0.7 were described as excellent.

The results of this study show the first time that it is possible to characterize the colour of strawberry products by means of the calculation of an "acceptance factor" ($AF = a^*/h$), and to predict whether the color will be accepted from the consumers or not (excellent [$AF > 0.7$], acceptable [$AF > 0.4$] or not acceptable [$AF < 0.4$]). This data could be used as basis for the production of new strawberry nectars (containing colorants) and the assessment for the stability and shelf life of strawberry products from puree [M. Gössinger^a, F. Mayer, N. Radocha, M. Höfler, A. Boner, E. Groll, E. Nosko, R. Bauer and E. Berghofer (^aDepartment of Fruit Processing, Federal College and Institute for Viticulture and Pomology, Wienerstrasse 74, A-3400 Klosterneuburg, Austria), *J Sensory Studies*, 2009, **24**(1), 78-92].

NPARR 1(1), 2010-15, Dyeing of modified acrylic fibers with curcumin and madder natural dyes

Hydrophobic fibers are highly crystalline and non-polar polymers hence pose a big problem for dyes. Modified acrylic fiber containing different amounts of amidoxime groups as a function of the nitrogen content was obtained and dyed with curcumin and madder natural dyes. The dyeing parameters, such as dye concentration, dye bath pH, salt concentration, temperature, and time and the effect of alum and ferrous sulfate used as mordants were investigated. Compared with the dyeings obtained from modified acrylics, those of blank samples appeared less in color strength values.

The color strength was proportional to the nitrogen content of the sample and the maximum value was obtained at pH 2 and pH 5 using madder and curcumin, respectively. The fixation of the dye molecules to the modified acrylic fibers was investigated to show mainly ionic and physical bonds. The washing, perspiration, and rubbing fastness properties for the dyed samples were enhanced by application of alum. The light fastness ratings were also improved using ferrous sulfate especially for the case of the samples dyed with madder [Reda M. El-Shishtawy^a, G.M. Shokry, Nahed S.E. Ahmed and M.M. Kamel (^aFaculty of Science, Chemistry Department, King Abdul-Aziz University, P. O. Box 80203, Jeddah, 21589, Saudi Arabia), *Fibers Polym*, 2009, **10**(5), 617-624].

NPARR 1(1), 2010-16, Ultrasound assisted enhancement in natural dye extraction from beetroot for industrial applications and natural dyeing of leather

There is a growing demand for eco-friendly/non-toxic colorants, specifically for health sensitive applications such as coloration of food and dyeing of child textile/leather garments. Recently, dyes derived from natural sources for these applications have emerged as an important alternative to potentially harmful synthetic dyes and pose a need for suitable effective extraction methodologies. The present paper focuses on the influence of process parameters for ultrasound assisted leaching of coloring matter from plant materials. Extraction of natural dye from beetroot using ultrasound has been studied and compared with static/magnetic stirring as a control process at 45°C. The influence of process parameters on the extraction efficiency such as ultrasonic output power, time, pulse mode, effect of solvent system and amount of beetroot has been studied. The use of ultrasound is found to have significant improvement in the extraction efficiency of colorant obtained from beetroot. Based on the experiments it has been found that a mixture of 1:1 ethanol-water with 80W ultrasonic power for 3h contact time provided better yield and extraction efficiency. Pulse mode operation may be useful in reducing electrical energy consumption in the extraction process. The effect of the amount of beetroot used in relation to extraction efficiency has also been

studied. Two-stage extraction has been studied and found to be beneficial for improving the yield for higher amounts of beetroot. Significant 8% enhancement in % yield of colorant has been achieved with ultrasound, 80W as compared to MS process both using 1:1 ethanol-water. The coloring ability of extracted beet dye has been tested on substrates such as leather and paper and found to be suitable for dyeing. Ultrasound is also found to be beneficial in natural dyeing of leather with improved rate of exhaustion. Both the dyed substrates have better colour values for ultrasonic beet extract as inferred from reflectance measurement. Therefore, the results clearly offer efficient extraction methodology from natural dye resources such as beetroot with ultrasound even dispensing with external heating. Thereby, also making eco-friendly non-toxic dyeing of fibrous substances a potential viable option [Sivakumar V^a, Anna JL, Vijayeeswarri J and Swaminathan G.^aChemical Engineering Division, Central Leather Research Institute (CLRI), Council of Scientific and Industrial Research (CSIR), Adyar, Chennai - 600020, India), *Ultrason Sonochem*, 2009, **16**(6), 782-789]

NPARR 1(1), 2010-17, The production of hypocrellin colorants by submerged cultivation of the medicinal fungus *Shiraia bambusicola*

Hypocrellin production using submerged cultivation of the medicinal fungus *Shiraia bambusicola* revealed that both glucose and $(\text{NH}_4)_2\text{SO}_4$ were optimal carbon and nitrogen sources. Hypocrellin production increased with increasing initial glucose concentration within the range of 10-50g/lit and $(\text{NH}_4)_2\text{SO}_4$ concentration in the range of 1-2g/lit. The effects of carbon and nitrogen concentration were optimized using central composite experimental design and response surface analysis; maximum hypocrellin production (196.94 ± 6.93 mg/lit) was achieved using 45.7g/lit glucose and 1.93g/lit $(\text{NH}_4)_2\text{SO}_4$ [Hailong Yang, Caixia Xiao, Wenxin Ma and Guoqing He^a (^aCollege of Biosystem Engineering and Food Science, Zhejiang University, 268 Kaixuan Road, Hangzhou 310029, PR China), *Dyes Pigments*, 2009, **82**(2), 142-146].

NPARR 1(1), 2010-18, *Serratula tinctoria*, a source of natural dye: Flavonoid pattern and histolocalization

In the context of new alternative crop development in Europe, flavonoids were investigated in saw-wort, *Serratula tinctoria* Linn., a perennial herb (Family-Asteraceae) which was used as a yellow dye until the 19th century. The phytochemical study described in this report indicates that leaves rather than stems should be used and harvested at the end of the plant growing cycle, when flavonoids are particularly concentrated. Microspectrofluorometry showed a specific distribution of the flavonoid aglycone, luteolin in stomatal cells whereas the corresponding glycoside (luteolin-7-*O*-glucoside) was observed in palisade parenchyma cells. The flavonoids luteolin-42 -*O*-glucoside and 3-methylquercetin were isolated for the first time in *S. tinctoria* leaves and identified by NMR spectroscopy. The role of these flavonoids is discussed in this paper. Using a rapid and simple method, *i.e.* flavonoid histolocalization associated with UV, it was demonstrated that saw-wort contains high concentrations of luteolin derivatives and could be considered for use again as a natural dye [P. Guinot, A. Gargadennec, P. La Fisca, A. Fruchier, C. Andary and L. Mondolot^a (^aLaboratoire de Botanique, Phytochimie et Mycologie, UMR 5175 CEFÉ, Faculté de Pharmacie, Université Montpellier 1, 15 Avenue Charles Flahault, BP 14491, 34 093 Montpellier Cedex 5, France), *Industr Crops Prod*, 2009, **29**(2-3), 320-325].

ESSENTIAL OILS

NPARR 1(1), 2010-19, Extraction of essential oils from five cinnamon leaves and identification of their volatile compound compositions

Five cinnamon species, viz. *Cinnamomum cassia* Blume, *Cinnamomum zeylanicum* Breyn., *Cinnamomum tamala* Nees & Eberm., *Cinnamomum burmannii* Blume, *Cinnamomum pauciflorum* Nees, were chosen to prepare essential oils by hydrodistillation and to identify and quantify their volatile compound compositions. *C. cassia* was determined to have the highest yield (1.54%) of essential oil, followed by *C. zeylanicum*, *C. pauciflorum*, *C. burmannii* and *C. tamala*. Gas chromatography/mass spectrometry (GC/MS) was used to identify and quantify the volatile compound composition. The results

indicated the apparent difference in the volatile compound compositions of essential oils between species. The total numbers of volatile compounds identified from *C. cassia*, *C. zeylanicum*, *C. tamala*, *C. burmanii* and *C. pauciflorum* leaves were 22, 22, 13, 6 and 21, respectively. *trans*-Cinnamaldehyde was found in the essential oil of each species, which was also the major volatile component of *C. cassia* and *C. burmannii* leaves. Besides *trans*-cinnamaldehyde, 3-methoxy-1, 2-propanediol was the main volatile compound of *C. cassia* leaf, while eugenol of *C. zeylanicum* and *C. pauciflorum* and *C. burmanii* leaves, and 5-(2-propenyl)-1, 3-benzodioxole of *C. tamala* leaf were also the main substances.

The essential oil of cinnamon is an important bioactive substance which has many disease prevention effects. In this work, five species of cinnamon leaves were chosen as materials to prepare the essential oils. The yield of essential oil was determined. The volatile compounds of essential oil were identified by GC/MS analysis. The results showed the significant difference of volatile compound composition between species. *trans*-Cinnamaldehyde was detected to exist in all the species tested as an important volatile component. This work is helpful for extensive development of this medicinal herb [Rui Wang, Ruijiang Wang^a and Bao Yang (^aSouth China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, China), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 289-292].

NPARR 1(1), 2010-20, Antimicrobial activity in the vapour phase of a combination of cinnamon and clove essential oils

The antimicrobial activity of the vapour generated by a combination of cinnamon and clove essential oils against the growth of four Gram-negative (*Escherichia coli*, *Yersinia enterocolitica*, *Pseudomonas aeruginosa* and *Salmonella choleraesuis*) and four Gram-positive bacteria (*Staphylococcus aureus*, *Listeria monocytogenes*, *Bacillus cereus* and *Enterococcus faecalis*) was assessed by means of the fractional inhibitory concentration index (FIC) of the mixture. The presence of synergism or antagonism

effects depended on the reference parameter used to estimate such an index. If the minimal inhibitory concentrations were applied, the vapours of the combination of essential oils exerted an antagonistic effect on the growth of *E. coli*, while they wielded a synergistic effect for the inhibition of *L. monocytogenes*, *B. cereus* and *Y. enterocolitica* when the concentrations of maximal inhibition were used. This fact revealed a clear concentration-dependent interaction.

The headspace of the cinnamon and clove essential oils and their combination was sampled by solid-phase microextraction (SPME) and the constituents identified and quantified by gas chromatography-ion trap mass spectrometry (GC/ITMS). Eugenol was the most abundant compound for the three antibacterial atmospheres. The differences in behaviour could be attributed to minor compounds. The combined headspace contained slightly larger amounts of 1, 8-cineole and camphor, which are believed to enhance the eugenol activity. The mechanisms responsible for the antagonism are, however, less known and much further investigation is required. This is the first time a combination of essential oils in the vapour phase has been tested as a preservative method to prevent microorganism proliferation [P. Goñi, P. López^a, C. Sánchez, R. Gómez-Lus, R. Becerril and C. Nerín (^aDepartment of Analytical Chemistry, Aragón Institute of Engineering Research, i³A, CPS-University of Zaragoza, María de Luna St. 3, E-50018 Zaragoza, Spain), *Food Chem*, **116**(4), 982-989].

NPARR 1(1), 2010-21, Impact of cinnamon oil-enrichment on microbial spoilage of fresh produce

Cinnamon (*Cinnamomum zeylanicum* Linn.) oil (ranging between 25 and 500ppm) was tested for antifungal activity against *Colletotrichum coccodes*, *Botrytis cinerea*, *Cladosporium herbarum*, *Rhizopus stolonifer* and *Aspergillus niger* *in vitro*. Oil-enrichment resulted in significant ($P < 0.05$) reduction on subsequent colony development for the examined pathogens. Fungal spore production inhibited up to 63% at 25ppm of cinnamon oil concentration when compared with equivalent plates stored in ambient air. In the highest oil concentration (500ppm) employed, fungal sporulation (except for *B. cinerea*) was completely retarded. *In*

vitro, cinnamon oil reduced spore germination and germ tube length in *C. coccodes*, *B. cinerea*, *C. herbarum* and *R. stolonifer* with the effects were dependent on oil concentration. However, cinnamon oil (up to 100ppm) accelerated spore germination for *A. niger*. Wound-inoculated pepper fruit accelerated *B. cinerea* and *C. coccodes* development following 3days vapour exposure to cinnamon and this effect was not persisted for longer exposure but no differences observed for tomato fruit. Pre-exposing tomato fruit to 500ppm cinnamon vapours for 3days and then inoculated with fungi, reduced *B. cinerea* and *C. coccodes* lesion development [Nikos G. Tzortzakis (Department of Hydroponics and Aromatic plants, Institute of Olive Tree and Subtropical Plants, National Agricultural Research Foundation (N.AG.RE.F.), Agrokipion, 73100 Chania, Greece), *Innov Food Sci Emerg Technol*, 2009, **10**(1), 97-102].

NPARR 1(1), 2010-22, Impact of plant essential oils on microbiological, organoleptic and quality markers of minimally processed vegetables

The efficacy of plant essential oils (EOs) for control of the natural spoilage microflora on ready-to-eat (RTE) lettuce and carrots whilst also considering their impact on organoleptic properties was evaluated. Initial decontamination effects achieved using EOs was comparable to that observed with chlorine and solution containing oregano recorded a significantly lower initial TVC level than the water treatment on carrots ($p < 0.05$). No significant differences were found between the EO treatments and chlorine considering gas composition, colour, texture and water activity of samples. The sensory panel found EO treatments acceptable for carrots throughout storage, while lettuce washed with the EO solutions were rejected for overall appreciation by Day 7. Correlating microbial and sensory changes with volatile emissions identified 12 volatile quality markers. Oregano might be a suitable decontamination alternative to chlorine for RTE carrots, while the identification of volatile quality markers is a useful complement to sensory and microbiological assessments in the monitoring of organoleptic property changes and shelf-life of fresh vegetables [Jorge Gutierrez, Paula Bourke^a, Julien Lonchamp and Catherine Barry-Ryan

(^aSchool of Food Science and Environmental Health, Dublin Institute of Technology, Cathal Brugha Street, Dublin 1, Ireland), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 195-202].

FEED/FODDER

NPARR 1(1), 2010-23, Production performance and milk composition of dairy cows fed extruded canola seeds treated with or without lignosulfonate

Eight multiparous Holstein cows averaging 538kg of body weight and 62 days in milk were used in a double 4x4 Latin square design with four 21-d experimental periods to determine the effects of feeding extruded *versus* non-extruded canola seed treated with, or without, 50g/kg lignosulfonate on apparent whole tract digestibility, feed intake, milk production, milk composition and milk fatty acid profile. Intake of dry matter (DM) and its components was similar among treatments. Extrusion had no effect on digestibility but decreased milk fat concentration. Lignosulfonate treatment of canola seeds decreased digestibility of DM and crude protein (CP). Milk production, milk concentrations of CP, lactose and total solids, and milk yields of CP and fat were similar among treatments. In general, there was no interaction between extrusion and lignosulfonate for milk fatty acid profile. Feeding extruded canola seeds increased milk fat concentration of *trans* 11:18:1 to a greater extent without, than with, lignosulfonate treatment (150% *versus* 113%). Thus, it is clear that extrusion had more effects than lignosulfonate treatment on milk fatty acid profile, but changes were small and likely of little biological importance for human health [CA Neves, WBR dos Santos, GTD Santos, DC da Silva, CC Jobim, FS Santos, JV Visentainer and HV Petit^a (^aDepartamento de Zootecnia, Universidade Estadual de Maringá, Maringá, PR 87020-900, Brazil), *Anim Feed Sci Technol*, 2009, **154**(1-2), 83-92].

NPARR 1(1), 2010-24, Stability of fatty acids in grass and maize silages after exposure to air during the feed out period

Lipids in forages are extensively hydrolysed in the silo with a concomitant increase in the level of free fatty

acids (FFA). After opening of the silo, exposure of the FFA to air and light with, a concomitant increase in pH and microbial growth, could induce oxidization. The present study investigated the stability of FA in grass and maize silages exposed to air for 0, 12 and 24h. Eight maize silages were selected with varying dry matter (DM) contents, being very wet, wet, normal and dry. In addition, eight grass silages were chosen on the basis of ammonia (NH₃) concentration and pH level. Grass and maize silages were sampled 8-10 weeks after ensiling and anaerobically transported to the lab in cooled plastic bags. After mixing, each sample was divided into three subsamples and exposed to air for 0, 12 or 24h. Concentrations of individual FA were quantified by gas chromatography. Among the investigated silages, concentrations of total FA varied greatly and ranged from 16.4 to 23.9 and 9.5 to 21.6g/kg DM in grass and maize silages, respectively. Exposure to air up to 24h lowered ($P<0.01$) the contents of linolenic acid (C18:3), linoleic acid (C18:2), oleic acid (C18:1) and total FA in maize silages. In grass silages, 24h exposure to air decreased ($P<0.05$) concentrations of C18:3, C18:2 and total FA ($P<0.01$). In both grass and maize silages a decline in concentrations of major unsaturated FA (UFA) was associated with a concomitant increase ($P<0.01$) in the proportion (g/g total FA) of palmitic acid (C16:0). The relative decrease in total FA after 24h exposure to air was higher in maize silages with a high moisture content, and progressively decreased with increasing DM content. In contrast, pH and NH₃ levels of grass silages had no effect on the stability of FA during feed out. The present study demonstrates that extended exposure of silages to air during feeding increased the proportion (g/g total FA) of C16:0 and lowered the concentration of polyunsaturated FA [NA Khan^a, JW Cone and WH Hendriks (^aAnimal Nutrition Group, Department of Animal Sciences, Wageningen University, PO Box 338, 6700 AH Wageningen, The Netherlands), *Anim Feed Sci Technol*, 2009, **154**(3-4), 183-192]

NPARR 1(1), 2010-25, Evaluation of groundnut straw based complete feed blocks alone and in combination with yeast in ration of sheep

Groundnut straw based complete feed blocks with (YS) or without (YU) yeast (*Saccharomyces cerevisiae*) were fed to sheep to study the effect on nutrient utilization, growth performance and rumen fermentation pattern by conducting a growth trial of 120 days followed by metabolism trial of 7 days on 12 male Magra lambs divided in two groups of 6 in each. The dry matter intake was 72.13 and 74.33 g/kgW^{0.75} and 3.52 and 3.56 kg/100 kg BW, respectively in YU and YS groups. Apparent digestibility of dry matter, organic matter, gross nutrients and fibre fractions were comparable between two groups. Average daily gain was significantly higher in YS group (88.57g) compared to YU group (80.26g), whereas, feed conversion ratio was similar. The DCP and TDN contents were 10.53 and 51.82 per cent in YU group and 11.32 and 56.38 per cent in YS group, respectively. Animals of both groups were in positive nitrogen, calcium and phosphorus balance. Yeast supplementation significantly improved rumen fermentation by stabilizing rumen pH, decreased concentrations of lactic acid, ammonia nitrogen, NPN and increased TVFA, total protozoal counts, total nitrogen and TCA perceptible nitrogen. It was concluded that groundnut straw based complete feed blocks along with yeast supplementation could be beneficial to improve performance of sheep due to a marked improvement in rumen fermentation pattern [DD Garg^a, T Sharma and R K Dhuria (^aDepartment of Animal Nutrition, Navsari Agriculture University, Navsari-396 450, India), *Anim Nutr Feed Technol*, 2009, **9**(2), 137-144].

NPARR 1(1), 2010-26 Evaluation of supplementary feeding value of local tree foliages in goats fed on Napier Bajra green fodder

Six metabolism trials were conducted using four male goats (local nondescript breed; BW 13.5 kg) in a crossover design to study the supplementary feeding value of fresh foliage of subabul (*Leucaena leucocephala*), sesbania (*Sesbania grandiflora* Pers.), acacia (*Acacia auriculaeformis* A Cunn.), jack (*Artocarpus heterophyllus* Lam.), yellow gold mohur (*Peltophorum ferrugineum* Benth.) and cashew (*Anacardium occidentale* Linn.). Respective foliages were supplemented @ 300g/head/day to goats fed *ad*

libitum quantity of Napier Bajra green fodder as basal feed. The crude protein content of NB green fodder, subabul, sesbania, acacia, jack, yellow gold mohur and cashew were, respectively, 10.38, 21.31, 34.44, 15.94, 12.82, 12.69 and 9.69 per cent. Total DM intake (g/day) of goats was 380, 444, 459, 477, 424 and 352, respectively, for the six experimental diets. Digestibility of DM and OM were enhanced ($P < 0.05$) in goats fed on all the tree foliage-supplemented diets, except for that supplemented with cashew leaves. Greatest depression was observed in the digestibility of NDF (38.32%) and ADF (23.86%) when goats were fed on cashew ($P < 0.05$), followed by yellow gold mohur and jack as supplementary feeds. Based on nitrogen and calcium retention and nutrient intake data, it was concluded that sesbania, subabul, jack and acacia foliage were better than yellow gold mohur and cashew in their supplementary role [DV Reddy^a, CM Tiwari, N Elanchezian and Uma D Maheswari (Department of Animal Nutrition, Rajiv Gandhi College of Veterinary and Animal Sciences, Pondicherry-605 009, India), *Anim Nutr Feed Technol*, 2009, **9**(2), 155-163].

FIBRES

(incl. Textile and other utility fibres)

NPARR 1(1), 2010-27, **Chemical composition of lipophilic extractives from jute (*Corchorus capsularis* Linn.) fibers used for manufacturing of high-quality paper pulps**

The chemical composition of the lipophilic extractives from jute (*C. capsularis* Linn.) fibers, which are used for high-quality paper pulp manufacturing, was thoroughly studied. The extractives content was low (0.4%), and its composition was studied by gas chromatography-mass spectrometry. For a better characterization of the different homologous series and compounds present in minor amounts, the extract was also fractionated by solid-phase extraction. The most predominant lipophilic compounds present in jute fibers were high molecular weight ester waxes (24% of total extract), followed by free fatty acids (17%), free fatty alcohols (17%) and \pm -hydroxyfatty acids (14%). Additionally, significant amounts of alkanes (6%),

\acute{E} -hydroxyfatty acids (6%), sterols (6%), steroid and triterpenoid ketones (3%) and steryl glycosides (1%) were also identified, together with minor amounts of mono- and diglycerides [José C. del Río^a, Gisela Marques, Isabel M. Rodríguez and Ana Gutiérrez (^aInstituto de Recursos Naturales y Agrobiología de Sevilla, CSIC, P.O. Box 1052, E-41080 Seville, Spain), *Industr Crops Prod*, 2009, **30**(2), 241-249].

NPARR 1(1), 2010-28, **Potential of kenaf fibres as reinforcement for tribological applications**

This paper presents an attempt to use kenaf fibres as reinforcement for tribo-composite based on epoxy for bearing applications. Kenaf fibres reinforced epoxy (KFRE) composite was fabricated using a closed mould technique associated with vacuum system. Sliding wear and frictional behaviour of the composite were studied against polished stainless steel counterface using Block-On-Disc (BOD) machine at different applied loads (30-100N), sliding distances (0-5km) and sliding velocities (1.1-3.9m/s). The effect of the fibre orientations, with respect to the sliding direction, was considered; these orientations are parallel (P-O), anti-parallel (AP-O) and normal (N-O). The morphology of the worn surfaces of the composite was studied using a scanning electron microscope (SEM). The result revealed that the presence of kenaf fibres in the composite enhanced the wear and frictional performance of the epoxy. Applied load and sliding velocity have less effect on the specific wear rate of the composite in all the three orientations. The composite exhibited better wear performance in N-O compared to P-O and AP-O [CW Chin and BF Yousif^a (^aFaculty of Engineering, University of Nottingham, Jalan Broga 43500 Semenyih, Selangor Darul Ehsan, Malaysia), *Wear*, 2009, **267**(9-10), 1550-1557].

NPARR 1(1), 2010-29, **Effect of bio-friendly conditioning agents on jute fibre spinning**

From early times, jute fibre has been generally conditioned for easy spinning by adding oil and water in the form of an emulsion. The commonly used oil consists of C_{12} - C_{31} fractions of mineral oil that sometimes impart different intensities of oily (kerosene) or fishy smell to the end product. In the present work, efforts have been

made to find a suitable sustainable substitute of mineral oil based conditioning agent for spinning of jute yarn and for this, three types of vegetable oil (rice bran oil, palmolein oil and castor oil), a silicone emulsion, a mixed enzyme system and glycerine have been used separately or in combinations as conditioning agents for jute fibre before its mechanical processing for making yarn in jute spinning machines. Considering comparable mechanical process performance for spinning of jute fibre, viz. fibre loss as droppings during processing, moisture retention prior to spinning stage and spinning end breakage rate, tensile properties of yarn and lower yarn hairiness, it may be suggested to use 2.5% castor oil alone, or 2% castor oil in combination with 0.1-0.5% glycerine in the form of oil-in-water emulsion as the most suitable alternatives to conventional mineral oil-based jute conditioning agent to spin ordinary jute yarn [G Basu^a, S S De and AK Samanta, (^aNational Institute of Research on Jute and Allied Fibre Technology, I.C.A.R., Kolkata 700040, India), *Industr Crops Prod*, 2009, **29**(2-3), 281-288].

NPARR 1(1), 2010-30, Study of water sorption on modified Agave fibres

Polymer composite materials are usually reinforced by synthetic matter such as carbon or glass fibres. However, owing to their good mechanical properties and low density, natural fibres are now increasingly being considered as reinforcement. With the aim of a new natural fibre based composite, various chemical treatments have been performed on *Agave americana* Linn. fibres in order to improve their compatibility with the polymer matrix and to reduce their affinity for water. The effect of these treatments on the fibre water sorption power has been investigated by means of a micro-balance. Equilibrium water sorption isotherms have been deduced from weight variations of the fibres under water vapour pressure increments. Several specific physico-chemical models have been tested to describe the water sorption isotherms. The Park's model was found to describe the experimental results accurately and over a wide activity range. The sorption kinetics was also exploited in order to evaluate the diffusivity of water in the fibres. The variation of the water diffusion coefficient with water concentration is in agreement with the triple

sorption mode described by the Park's model. These results show a global increase of moisture resistance of the fibres after chemical treatment. This effect is interpreted in terms of chemical and structural modifications of the cell-wall structure [A Bessadok, D Langevin^a, F Gouanvé, C Chappey, S Roudesli and S Marais (^aLaboratoire "Polymères, Biopolymères, Surfaces", FRE 3101 Université de Rouen/CNRS, UFR des Sciences, 76821 Mont-Saint-Aignan Cedex, France), *Carbohydrate Polym*, 2009, **76**(1), 74-85].

NPARR 1(1), 2010-31, Natural cellulose fibres from soybean straw

This paper reports the development of natural cellulose technical fibres from soybean straw with properties similar to the natural cellulose fibers in current use. About 220 million tons of soybean straw available in the world every year could complement the byproducts of other major food crops as inexpensive, abundant and annually renewable sources for natural cellulose fibres. Using the agricultural byproducts as sources for fibres could help to address the concerns on the future price and availability of both the natural and synthetic fibres in current use and also help to add value to the food crops. A simple alkaline extraction was used to obtain technical fibres from soybean straw and the composition, structure and properties of the fibres was studied. Technical fibres obtained from soybean straw have high cellulose content (85%) but low% crystallinity (47%). The technical fibres have breaking tenacity (2.7g/den) and breaking elongation (3.9%) higher than those of fibres obtained from wheat straw and sorghum stalk and leaves but lower than that of cotton. Overall, the structure and properties of the technical fibres obtained from soybean straw indicates that the fibres could be suitable for use in textile, composite and other industrial applications [[Narendra Reddy and Yiqi Yang^a (^aDepartment of Textiles, Clothing and Design, 234, HECO Building, University of Nebraska-Lincoln, Lincoln, NE 68583-0802, USA), *Bioresour Technol*, 2009, **100**(14), 3593-3598].

NPARR 1(1), 2010-32, Tensile properties of polymethyl methacrylate coated natural fabric *Sterculia urens* Roxb.

The newly identified natural fabric from the tree of *S. urens* Roxb. was coated with polymethyl methacrylate. The tensile properties of both the uncoated and polymethyl methacrylate coated fabrics were studied. The tensile parameters such as maximum stress, Young's modulus and % elongation at break were determined using a Universal Testing Machine. The effect of alkali treatment and the polymethyl methacrylate coating on tensile properties of the fabric was studied. The morphology of the fabric before and after alkali treatment and polymethyl methacrylate coating was studied using the scanning electron microscopy and polarized optical microscopic techniques respectively. The improvement in the tensile properties on polymethyl methacrylate coating was attributed to the filling up of the void regions of the uniaxial fabrics with polymethyl methacrylate facilitating continuity [J Jayaramudu, BR Guduri and A Varada Rajulu^a(^aDepartment of Polymer Science and Technology, Sri Krishnadevaraya University, Anantapur-515 003, India), *Mat Lett*, 2009, **63**(9-10), 812-814].

NPARR 1(1), 2010-33, Properties and potential applications of natural cellulose fibres from the bark of cotton stalks

Natural cellulose fibres have been obtained from the bark of cotton stalks and the fibres have been used to develop composites. Cotton stalks are rich in cellulose and account for up to 3 times the quantity of cotton fibre produced per acre. Currently, cotton stalks have limited use and are mostly burned on the ground. Natural cellulose fibres obtained from cotton stalks are composed of approximately 79% cellulose and 13.7% lignin. The fibres have breaking tenacity of 2.9g per denier and breaking elongation of 3% and modulus of 144g/denier, between that of cotton and linen. Polypropylene composites reinforced with cotton stalk fibres have flexural, tensile and impact resistance properties similar to jute fibre reinforced polypropylene composites. Utilizing cotton stalks as a source for natural cellulose fibres provides an opportunity to increase the income from cotton crops and make cotton crops more competitive to the biofuel crops [Narendra Reddy and Yiqi Yang^a(^aDepartment of Textiles, Clothing and Design, 234, HECO Building, University of Nebraska-Lincoln, Lincoln, NE 68583-0802, USA), *Bioresour Technol*,

2009, **100**(14), 3563-3569].

FOOD

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

NPARR 1(1), 2010-34, Chemical composition and nutritional value of protein concentrates isolated from potato (*Solanum tuberosum* Linn.) fruit juice by precipitation with ethanol or ferric chloride

Effects of protein precipitators, ethanol and ferric chloride, on yield, resolubility, chemical composition and nutritional value of protein concentrates isolated from industrial potato fruit juice (PFJ) were studied. Optimum precipitating concentrations of ethanol and ferric chloride in PFJ were 4 M (23.1% v/v) and 20 mM (2% w/v), resulting in yield of 69% and 86.5% of total protein, respectively. Contents of total glycoalkaloids and potassium in both protein concentrates were significantly lower ($P < 0.05$) as compared with contents in PFJ dry matter. Both protein concentrates exhibited high nutritional value; values of essential amino acid index (EAAI) were 81.7 and 82.7%, respectively. Fraction of patatin proteins (39-43kDa) represented with EAAI value of 86.1% the nutritionally improving protein component. Lipid acyl hydrolase activity of patatin family was not negatively affected by cooled ethanol precipitation. It can be thus suggested that biological and enzymatic activities of this protein family are utilizable after this type of precipitation [B Veronika^a and B (^aDepartment of Plant Production, Faculty of Agriculture, University of South Bohemia, Studentsk 13, 37005 esk Budjovice, Czech Republic), *J Agric Food Chem*, 2009, **57**(19), 9028-9034].

NPARR 1(1), 2010-35, Effect of various levels of rosemary or Chinese mahogany on the quality of fresh chicken sausage during refrigerated storage

The purpose of this study was to evaluate the effect of rosemary or Chinese mahogany, at levels of 500, 1000 and 1500ppm, of the phenolic compounds, on the quality of fresh chicken sausage stored at 4°C for 14 days. The results showed that sausages with addition of Chinese mahogany or rosemary underwent less pH value reduction. The intense colour of Chinese mahogany

or rosemary resulted in samples with lower *L* values and higher *a* values. Samples with more Chinese mahogany or rosemary added had higher total phenolic compounds. Lower TBA (thiobarbituric acid) and VBN (volatile basic nitrogen) values, and lower total plate counts were observed for the samples with Chinese mahogany or rosemary added. Samples with Chinese mahogany added had higher overall acceptance than had samples with rosemary added. Some volatile compounds, including alcohols, acids, esters, aldehydes, ethers and phenolic compounds, were isolated from the samples and identified [Deng-Cheng Liu, Ruei-Tsz Tsau, Yen-Chih Lin, Shyh-Shyan and Fa-Jui Tan^a (^aDepartment of Animal Science, National Chung Hsing University, 250 Kuo Kuang Rd., Taichung 402, Taiwan), *Food Chem*, 2009, **117**(1), 106-113].

NPARR 1(1), 2010-36, Amaranth protein presents cholesterol-lowering effect

This study describes amaranth's protein cholesterol-lowering effect and investigates its mechanisms hypercholesterolaemia was induced in male hamsters through diet rich in casein (300g/kg diet) containing regular levels of cholesterol (0.5kg/g) fed during 3 weeks. An amaranth protein isolate (API) was prepared from hexane-defatted amaranth (*Amaranthus cruentus* Linn.) flour with protein extraction at pH 11 and subsequent isoelectric precipitation at pH 5.7. Animals were divided into three groups and fed *ad libitum* diets for 4 weeks containing as the sole source of protein: casein (control), amaranth protein isolate or, casein+amaranth protein isolate. Plasma concentrations of cholesterol and triacylglycerols were measured at four different points: at the beginning of the study, after hypercholesterolaemia was induced, in the first week and then at the end of the experimental diet period. The reduction of the total plasma cholesterol concentration at the end of experimental period for animals fed on diets containing amaranth protein isolate pure and with casein were 27% ($P < 0.05$) and 48% ($P < 0.05$), respectively, being the non-HDL fractions the most affected. Digestibility of protein as well as excretion of cholesterol and bile acid, were investigated as the possible mechanisms for this significant hypocholesterolaemic effect. Cholesterol excretion was

related to the hypocholesterolaemia but could not explain all the observed reduction. The results suggest that amaranth protein has a metabolic effect on endogenous cholesterol metabolism [Simone Mendonça^a, Paulo H Saldiva, Robison J Cruz and José AG Arêas (^aEmpresa Brasileira de Pesquisa Agropecuária, Embrapa Agroenergia, PqEB W3 Norte (final), s/n Asa Norte, 70770-901-Brasília, DF-Brazil), *Food Chem*, 2009, **116**(3), 738-742].

NPARR 1(1), 2010-37, Antioxidant activity of Carob fruit extracts in cooked pork meat systems during chilled and frozen storage

The purpose of this study was to evaluate the effect of adding condensed tannins in the form of non-purified (Liposterine[®]) or purified (Exxenterol[®]) extracts obtained from Carob fruit Carob fruits (*Ceratonia siliqua* Linn.) to prevent lipid cooked pork meat systems from oxidizing during chilling and frozen storage. The antioxidant activity of these extracts was compared with that of \pm -tocopherol. Meat lipid alteration was evaluated as thiobarbituric acid reactive substances content (TBARS) and polar material-related triglyceride compounds followed by high-performance size-exclusion chromatography (HPSEC). TBARS levels were lower ($P < 0.05$) in samples containing Liposterine (LM), Exxenterol (EM), and \pm -tocopherol (TM) than in control sample (CM) under chilled storage. TBARS formation was similar ($P > 0.05$) for LM and EM but lower ($P < 0.05$) than for TM. Polar material increased several times in all samples, but significantly less in TM and EM than in LM. Thermal oxidation compounds determined by HPSEC were lower ($P < 0.05$) in EM than in LM or TM. The changes in polar material were proportionally smaller after six months frozen storage than after chilled storage, with Exxenterol displaying the highest antioxidant protection. Therefore, Carob fruit extracts can be successfully used to reduce fat alteration in cooked pork meat at chilled and frozen temperatures [Sara Bastida, Francisco J. Sánchez-Muniz, Raul Olivero, Lourdes Pérez-Olleros, Baltasar Ruiz-Roso and Francisco Jiménez-Colmenero^a (^aDepartamento de Ciencia y Tecnología de Carne y Productos Cárnicos y

del Pescado y Productos de la Pesca, Instituto del Frío (CSIC), C/Jose Antonio Novais, 10, 28040 Madrid, Spain), *Food Chem*, 2009, **116**(3), 748-754].

NPARR 1(1), 2010-38, Bananas, raw materials for making processed food products

Musa spp., comprising banana and plantain, are among the world's leading fruit crops. Worldwide, 103 million tonnes were produced in 2004, according to FAO statistics database. Few bananas produced undergo industrial processing. Plantain and unripe banana are consumed cooked, whereas, mature dessert banana is eaten raw. Characterising bananas, their processed products and processed consumption forms, is a key precondition for objective communication on these foodstuffs. This will enable niche markets for this major crop, undifferentiated product flows of which are in competition on the worldwide market, to be structured on an objective qualitative basis. Present paper is a review article on bananas [Guylène Aurore, Berthe Parfait and Louis Fährasmane^a (^aINRA, UMR 1270 QUALITROP, Domaine Duclos Prise d'eau F-97 170 Petit-Bourg, France), *Trends Food Sci Technol*, 2009, **20**(2), 78-91].

NPARR 1(1), 2010-39, Effect of Sodium Alginate coating with preservatives on the quality of meat patties during refrigerated (4 ± 1°C) storage

Edible coatings are the substances that are used to preserve and enhance food quality. An attempt was made to improve the quality of buffalo meat patties (BMPs) by method of alginate coating involving dipping BMPs during the end of the broiling process in alginate solution with preservatives for 30 s, followed by dipping in calcium chloride solution for 30 s, followed by draining for 30 s. The coated BMPs were kept at refrigeration (4±1°C) temperature in a polyethylene bag. They were analyzed for quality changes at regular intervals. Alginate coating significantly ($P < 0.05$) decreased the overall shear force values, thiobarbituric acid and tyrosine value, total plate count, psychrophilic count and yeast and mold count. The enterobacteriaceae count could not be detected. The coating at 2% level significantly ($P < 0.05$) improved the overall appearance and colour,

juiciness, flavour, texture and overall palatability of the product. During storage, the overall values for shear force, TBA, pH, tyrosine and count for total plate, psychrophilic, yeast and mold and staphylococcal, increased linearly. The overall sensory scores of the products decreased linearly with storage time. Thus edible coating of meat products provides better protection against oxidative and microbiological deterioration. It can also significantly enhance the sensory qualities of meat products. The freshness of meat products is comparatively prolonged [Chidanandaiah^a, RC Keshri and M K Sanyal (^aDepartment of Livestock Products Technology Veterinary College Vidyanagar, Shimoga 577 203, India), *J Muscle Foods*, **20**(3), 275-292].

NPARR 1(1), 2010-40, Studies on the use of acidified and cultured whey as coagulant in the manufacture of paneer

Acidified and cultured whey were used as coagulants in the manufacture of paneer at coagulation temperatures of 80 and 90°C. The yield and recovery of fat, total solids and the sensory and textural qualities were studied. It was observed that the yield of paneer decreased with increase in coagulation temperature from 80 to 90°C and the use of acidified and cultured whey further increased the yield of paneer. The percentage recovery of fat and total solids was not greatly influenced by coagulation temperature. However, recovery of these was optimum in paneer made using cultured whey of *Lactobacillus acidophilus* and acidified whey at 1%. The *Streptococcus lactis*-cultured whey yielded lowest fat and total solids. No significant differences ($P > 0.05$) were observed in all the sensory attributes of paneer made at 80°C using cultured or acidified whey. At 90°C, the sensory score for body and texture differed significantly ($P < 0.05$). The use of cultured whey with *S. lactis* resulted in paneer with a soft and loose body and open texture and was not found suitable for paneer-making [Dhanaji S Deshmukh, Prabhakar N Zanjad, Vithal D Pawara^a and Girish M Machewad (^aDepartment of Food Science and Technology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India), *Intern J Dairy Technol*, 2009, **62**(2), 174-181.

NPARR 1(1), 2010-41, Production and quality evaluation of instant lassi

Instant lassi was prepared from cows' milk standardized to 4% fat and 8.5% solids-nonfat and heated to 85°C for 30min, followed by cooling at 37°C and adding 50% v/v lactic acid to adjust the pH to 3.4, 3.6 and 3.8. The sugar was added at the rate of 8, 10 and 12% and mixed thoroughly in a Waring blender. The synthetic flavours vanilla, strawberry and pineapple were also added at the rate of 0.2% and stored at refrigeration temperature. The sensory evaluation of flavoured instant lassi adjusted to pH 3.8 and 12% sugar indicated no influence in colour, appearance or overall acceptability of compared to control. Among the different flavours used, pineapple-flavoured instant lassi scored highest for colour, appearance and overall acceptability. Both pH and sugar had significant effects, flavoured instant lassi having a higher specific gravity and lower viscosity than the control [Sanjay R Hingmire, Arvind F Lembhe, Prabhakar N Zanjad, Vithal D Pawar^a and Girish M Machewad (^aDepartment of Food Science and Technology, College of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India), *Intern J Dairy Technol*, 2009, **62**(1), 80-84].

NPARR 1(1), 2010-42, Production and evaluation of a probiotic yoghurt using *Lactobacillus casei* ssp. *casei*

Skimmed milk was inoculated with the commercial starter and *Lactobacillus casei* ssp. *casei*. pH changes, viable counts, and organoleptic properties of the produced control and probiotic yoghurts were analysed. The pH decrease during the fermentation period was faster in the milk inoculated with *L. casei* plus starter. The growth of both starters in probiotic yoghurt was significantly lower than their growth in control yoghurt during the fermentation period. The viable count of the probiotic bacterium remained higher than the standard limit for probiotic products. There was no significant difference between the organoleptic properties of the control and the probiotic yoghurts, [^aHassan Korbekandi, Mahshid Jahadi, Mohammad Maracy, Daryoush Abedi and Mohammad Jalali (^aGenetics and Molecular Biology Department, School of Medicine, Isfahan University of Medical Sciences,

Isfahan, Iran), *Intern J Dairy Technol*, 2009, **62**(1), 75-79].

NPARR 1(1), 2010-43, Moisture sorption characteristics of curd (Indian yogurt) powder

The moisture sorption behaviour of curd (Indian yogurt) powder was studied at 20, 30, 40 and 50°C for water activity ranging from 0.07 to 0.85. GAB, BET, Henderson, Halsey, Chung & Pfost, Smith, Oswin and Peleg models were applied to analyse the data. Estimated parameters and fitting ability for sorption models were evaluated. The GAB model showed the best fit to the sorption data of curd powder at 20, 30 and 40°C, and the Peleg model fitted well at 50°C [Shiby Varghese K, Sinija V Ramachandran Nair and ^aHari Niwas Mishra (^aAgricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur-721302, India), *Intern J Dairy Technol*, 2009, **62**(1), 85-92].

NPARR 1(1), 2010-44, The functional, rheological and sensory characteristics of icecreams with various fat replacers

The effects of fat replacers (Simplese® D-100, N-Lite D and inulin) on the melting characteristics, overruns, hardness, rheological parameters and sensory attributes of reduced (RF, 60.0g/kg), low (LF, 40.0g/kg) and nonfat (NF, 1.0g/kg) icecreams were investigated. The magnitudes of the melting rates were in the order RF>LF>NF for samples that contained Simplese® D-100 or inulin, but the reverse order was found for samples with N-Lite D. The nonfat ice creams had lowest overrun values of around 10%. Inulin-containing icecreams possessed higher overrun values than others ($P>0.05$). The use of fat replacer decreased the hardness of icecreams. All icecream samples showed pseudoplastic (shear-thinning) behavior. The addition of N-Lite D and inulin decreased the flow behaviour index of ice cream samples. The reduced and low fat icecream samples were rated as similar to the control by a sensory panel. On the other hand, no correlations ($P>0.05$) were observed between rheological parameters and sensory texture and mouthfeel [^aOya Berkay Karaca, Mehmet Güven, Kurban Yasar, Sevim Kaya And Talip Kahyaoglu (^aKarata School of Tourism

and Hotel Management, University of Çukurova, 01903 Bahçe, Adana, Turkey), *Intern J Dairy Technol*, 2009, **62**(1), 93-99].

NPARR 1(1), 2010-45, The impact of fluoridated milks on the availability of trace elements in milk

Milk is a nutritious food and also used as a vehicle for fluoride (F) administration. However, the impact of added F on milk's nutritional profile is unknown. *In vitro* simulated gastrointestinal digestion with enzymatic steps was used to measure and compare the availability of trace elements (Fe, Zn, Cu, Cr, Mo and Se) in pasteurized skimmed (0.3% fat) and whole (4% fat) milk samples with four concentrations of F (0, 2.5, 3.75 and 5.0 ppm) as well as in non-F and F ultrahigh-temperature (UHT)-processed 4% fat milks. Post-centrifugation supernatant trace element concentrations were measured after each stage of digestion by inductively coupled plasma mass spectroscopy. F showed a negative effect on Cu availability in cow's milk. Fat removal increased the availabilities of Cu, Zn, Cr and Se but decreased the Mo availability. There was a greater Cr availability in the UHT milk sample compared with pasteurized samples. These initial data suggest that adding F to milk does not have a marked effect on its trace element profile, with the exception of reduced Cu availability. However, these findings would benefit from further studies both *in vitro* and *in vivo* [Vida Zohoori, Christopher J Seal, Paula J Moynihan, Ian N Steen, Anne Maguire (School of Dental Sciences, Newcastle University, Framlington Place, Newcastle upon Tyne NE2 4BW, UK), *J Sci Food Agric*, 2009, **89**(4), 595-602].

FRUITS

NPARR 1(1), 2010-46, Antioxidant and tyrosinase inhibitory activity of mango seed kernel by product

The antioxidant and tyrosinase inhibitory properties of extracts of mango seed kernel (*Mangifera indica* Linn.), which is normally discarded when the fruit is processed, were studied. Extracts contained phenolic components by a high antioxidant activity, which was assessed in homogeneous solution by the 2, 2-diphenyl-

1-picrylhydrazyl radical and 2, 2'-azinobis(3-ethylbenzothiazolinesulfonic acid) radical cation-scavenging assays and in an emulsion with the ferric thiocyanate test. The extracts also possessed tyrosinase inhibitory activity. Drying conditions and extraction solvent were varied and optimum conditions for preparation of mango seed kernel extract were found to be sun-drying with ethanol extraction at room temperature. Refluxing in acidified ethanol gave an increase in yield and the obtained extract had the highest content of total phenolics and also was the most effective antioxidant with the highest radical-scavenging, metal-chelating and tyrosinase inhibitory activity. The extracts did not cause acute irritation of rabbit skins. The study reveals the high total phenol content, radical-scavenging, metal-chelating and tyrosinase inhibitory activities of the extract from mango seed kernel. This extract may be suitable for use in food, cosmetic, nutraceutical and pharmaceutical applications [Pitchaon Maisuthisakul and Michael H. Gordon (^aDepartment of Food Science and Technology, School of Science, University of the Thai Chamber of Commerce, 126/1 Vibhavadee-Rangsit Road, Bangkok 10400, Thailand), *Food Chem*, 2009, **117**(2), 332-341].

NPARR 1(1), 2010-47, Evaluation of Ethiopian plant extracts, *Acacia seyal* Delile and *Withania somnifera* (Linn.) Dunal to control green mould and ensure quality maintenance of citrus (*Citrus sinensis* Linn.)

Green mould, *Penicillium digitatum* (Pers.: Fr.) Sacc., causes economically important postharvest disease in citrus. Ethiopian plant extracts of *Acacia seyal* Del. var. *seyal* and *Withania somnifera* Dunal were used to test the control of green mould in wound-inoculated fruit, stored for 21 d at 7°C and at >85%RH. The chemical compositions of the two extracts were determined using high-performance chromatography. Thereafter, freshly harvested (naturally infected) fruit were subjected to different postharvest treatments and stored for 50 d to investigate the effects of the two plant extracts on fruit quality parameters. Treatments included (pre-wax + leaf extracts), (wax + leaf extracts incorporated into wax, Citrosol A[®]), (leaf extract alone), (fruit washed in chlorinated water at 5.25%), (untreated

fruit) and (commercially treated fruit). Extracts of *A. seyal* and *W. somnifera* reduced the incidence of green mould by 56.1 and 50%, respectively, in wound-inoculated fruit. *A. seyal* extract contained a high concentration of gallic acid (60.3mg/ml) whilst *W. somnifera* contained low concentrations of caffeic acid (8.7mg/ml), salicylic acid (6.3mg/ml) and 3,4 dihydroxy benzoic acid (3.8mg/ml). Green mould was absent in naturally infected fruit subjected to pre-wax + leaf extracts, wax mixed with leaf extracts and leaf extracts treatments. Pre-wax + leaf extracts and wax mixed with leaf extract treatments significantly reduced weight loss; retained firmness and colour; and they maintained eating qualities and a maturity index (SSC/TA) similar to commercial treatment. Both extracts of *A. seyal* and *W. somnifera* showed potential to be used as an alternative in combined applications with wax application under low temperature storage to replace synthetic fungicides, to ultimately control green mould and retain overall fruit quality [Sissay B Mekbib, Thierry JC Regnier, Dharini Sivakumar and ^aLise Korsten (^aPostharvest Technology Group, Department of Microbiology Plant Pathology, University Pretoria, Pretoria, 0002, South Africa), *Fruits*, 2009, **64**(5), 285-294].

NPARR 1(1), 2010-48, Weaning (acclimatization) of *in vitro*-produced banana plants

The protocol describes a method for promoting the acclimatization and protection of rooted *in vitro* banana plants between rooting in the laboratory and their establishment in a nursery. The principle, key advantages, starting plant material and time required are presented. This part describes the weaning house installation, the weaning medium used to transplant the *in vitro* plants, the two steps for acclimatizing the plantlets: receipt of rooted laboratory plants in flasks and planting, and factors affecting the growth of the plantlets in weaning conditions (light, misting system, temperature, humidity, wind, pest control and nutrition). Possible problems for troubleshooting are listed. Under normal conditions, new roots appear 4–5 days after the start of weaning, and new leaves start to grow within 8-10 days. At the end of the weaning phase, young plants are healthy, well developed and they can be established in a nursery [John

Charles Robinson and ^aVictor Galán Sáuco (^aInst. Canario Investig. Agrar. (ICIA), Apartado Correos 60, 38208 La Laguna, Tenerife, Canary Islands, Spain), *Fruits*, 2009, **64**(5), 325-332].

NPARR 1(1), 2010-49, Physiological changes in relation to growth and ripening of khirni [*Manilkara hexandra* (Roxb.) Dubard] fruit

Fruit ripening is the process resulting in changes in colour, taste and texture, which make the fruit acceptable for consumption. Since a wide spectrum of physiological, biochemical and organoleptic changes are involved in the development of a soft, edible, ripe fruit, these changes in an underutilized fruit, khirni [*Manilkara hexandra* (Roxb.) Dubard] were studied. The changes in biochemical composition, which includes chlorophylls, carotenoids, anthocyanins, sugars, starch, free amino acids, phenols and proteins and the specific activity of enzymes such as amylase, invertase, catalase, peroxidase, pectin methylesterase, polygalacturanase and cellulase were analyzed in the fruit at five sequential developmental stages (young, premature, mature, preripened and ripened fruit stages). The pulp of khirni fruit tastes sour during its growth period, but turns sweet when it ripens. A decreasing trend in chlorophylls occurs simultaneously with an increase in the quantity of total carotenoids and anthocyanins. Further, an increase in the quantity of sugars, proteins and phenols occurs towards the ripened stage, but starch and total free amino acids show a decrease in their quantities. Also, khirni fruit exhibits climacteric behavior with its increased rate of respiration and ethylene production. The moderate to significant changes in the activity of enzymes such as amylase, invertase, catalase and peroxidase involved in a number of catabolic and anabolic reactions indicate that these enzymes also have an active role in the process of khirni fruit growth and ripening [^aPrakash Ramanbhai Patel and Tadapaneni Venkata Ramana Rao (^aDepartment Biosciences, Sardar Patel University, Vallabh Vidyanagar, Gujarat-388120, India), *Fruits*, 2009, **64**(3), 139-146].

NPARR 1(1), 2010-50, The Chilgoza of Kinnaur. Influence of the *Pinus gerardiana* Wall. edible seed market chain organization on forest

regeneration in the Indian Himalayas

In the north of India, in the Himalayas, the high-altitude slopes (between 1800 and 3300m) are covered by forests where *Pinus gerardiana* Wall. dominates. This pine is known for its edible seeds (Chilgoza). The recent evolution of nut harvest methods means that there is danger of the disappearance of natural seedlings and the ageing of the forests. Therefore, a survey was carried out from 1998 with a hundred farmers, which was supplemented with field visits and discussions with resource people involved in the commercial chain. In the 1950s, traditional harvesting rules made it possible to respect trees and to allow a small portion of seeds to reach the ground. So, in spite of particularly difficult ecological conditions, the forest was able to regenerate. During the five last decades, the roads opening have allowed an irrigated cash-arboriculture development in the valleys. The village communities have become less dependent on the Chilgoza trade and sell the nut harvest contracts to private contractors who employ foreign workers, cut many branches and practically collect all the seeds. So, regeneration has become practically non-existent. The poorest inhabitants cannot have access to this resource anymore. In town, the retail sale of Chilgoza represents a market of 100 to 300 tonnes/year. This unit would centralize Chilgoza buying, drying and storage in the production place. Then, it would ensure sales to urban sellers, at the time of the peak of market demand. This would allow for a more significant part of the market chain added value to remain in the valley; this money at the same time would make it possible to fight against poverty and to regenerate natural resources. The authors are campaigning to see that research and development projects, financed with national or international funds, come to support these proposals [Régis Peltier and Vincent Dauffy^a (^aInventaire Forestier National (IFN), Château des Barres, 45290 Nogent-sur-Vernisson, France), *Fruits*, 2009, **64**(2), 99-110].

NPARR 1(1), 2010-51, Biochemical characterization of Banana cultivars from Southern India

Eleven cultivars of banana from Southern India were analyzed for different biochemical parameters. 'Nendran' showed highest content of total carotene and reducing sugars, whereas 'Grand Naine' showed highest

activity of enzyme PPO in the pulp. 'Rasbalei' exhibited high levels of total phenolics and flavonoids. Mineral analysis depicted 'Basrai' and 'Jawari' to be rich sources of iron and zinc, respectively. Significant cultivar differences with reference to geographical distribution were revealed by Bray Curtis Cluster and Principal Component analysis. The present study also adds to the current knowledge of the nutritive values (micronutrients), antioxidant potential, PPO enzyme and some biochemical aspects of banana [Mahesh H Deshmukh, Sandeep R Pai, Mansingraj S Nimbalkar and ^aRajaram P Patil (^aDepartment of Agrochemicals and Pest Management, Shivaji University, Kolhapur, India), *Intern J Fruit Sci*, 2009, **9**(4), 305-322].

NPARR 1(1), 2010-52, Production of brandy from Apple by different methods

In this study, brandy was produced from 'Golden Delicious' apples by three different methods. The main differences in production of brandies were the production of alcoholic mash from apple mash, the production of apple wine from apple cider and the preparation of macerate by adding neutral alcohol (60% v/v) to apple mash. The quality properties of the raw material (apple) and the products obtained (alcoholic mash, apple wine, raw brandy, fine brandy and brandy) were determined by chemical-physical and sensory analyses. The chemical-physical and sensory properties of the brandies were compared with the criteria in the related Codex and found to be acceptable. In the sensory evaluation performed out of 20 points in total, the brandy obtained from apple wine ranked the first, and it was followed by the brandies obtained from alcoholic mash and apple macerate [Selma Guven and ^aSelin Karagoz (^aDepartment of Food Engineering, Faculty of Engineering and Architecture, Canakkale Onsekiz Mart University, Terzioğlu, Canakkale, Turkey), *Intern J Fruit Sci*, 2009, **9**(3), 247-256].

NPARR 1(1), 2010-53, Paternity analysis of Mango (*Mangifera indica* Linn.) hybrids with their parents

A method of identifying fourteen mango hybrids along with their parents was designed using a DNA typing procedure employing RAPD markers. Ten of the 80 operon primers screened produced 139 usable bands.

Cluster analysis based on Jaccard's coefficient of similarity using UPGMA revealed low to medium diversity among hybrids. Hybrids, which had 'Neelum', 'Alphonso', and 'Mulgoa' as one of their parents, formed into distinct cluster. Hybrid 'Neelgao' with 'Mulgoa' as its male parent stood distinctly in the dendrogram comprising hybrids along with their parents. The study indicates the potential for use of RAPD markers in identification of parent similarity among hybrids [Hemanth K N Vasanthaiah^a (^aCenter for Viticulture and Small Fruit Research, Florida A & M University, Tallahassee, Florida, USA), *Intern J Fruit Sci*, 2009, **9**(1), 1-10].

NPARR 1(1), 2010-54, Use of low cost resources for banana micropropagation

The conventional laboratory procedure for micropropagation of different crops including banana needs high cost resource utilization. The invention of reliable and cost effective tissue culture methods without compromising on quality has now been addressed. The experiment was conducted with this outlook on banana tissue culture where in distilled water was substituted by normal tap water; laboratory grade sucrose was substituted by table sugar and agar was substituted by isabgol in the common MS multiplication medium. In case of root initiating MS medium, in addition to the above substitutions, saw dust, groundnut husk, rice husk, coir pith and coconut fibre were used in place of agar. The time required for the initiation of multiple shoots was more or less similar in each treatment, however, number of multiple shoots was found higher in the medium where only isabgol substituted agar, followed by the medium where both isabgol and tap water substituted agar and distilled water, respectively. When laboratory grade sucrose was substituted by table sugar, initial vitrification was noticed. Among the root promoting media, initiation of roots was found earlier when coconut fibre was used. Root development was better in both the media containing coconut fibre and isabgol. Plantlets raised on these two media also responded well to hardening [Das A^a and Gupta SN (Department of Plant Physiology, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia 741 252.), *Indian J Hortic*, 2009, **66**(3), 295-300].

NPARR 1(1), 2010-55, On-farm non-destructive determination of maturity of intact mango fruits

Dry matter and a maturity index defined as a function of TSS were linearly correlated with hue and chroma colour values of 125 and 150 mangoes, respectively taken by the Hunter Lab colorimeter and the predicted maturity index was validated with another set of same number of samples and through sensory evaluation. The performance of the developed models was tested, based on standard error of calibration (SEC), standard error of prediction (SEP), and multiple correlation coefficients (R). The SEC, SEP and R of the model based on maturity index were found to be 12.91%, 12.20%, and 0.91%, respectively, while they were found to be poor for dry matter content. The sensory test also showed agreements between predicted maturity index and taste after ripening, which indicated that maturity of mango fruits could be predicted by measuring colour using a colorimeter [Jha SN^a, Chopra S and Kingsly ARP (^aCentral Institute of Post-Harvest Engineering & Technology (CIPHET), PO PAU, Ludhiana 141 004), *Indian J Hortic*, 2009, **66**(3), 353-357].

NPARR 1(1), 2010-56, Combined high pressure-mild temperature processing for optimal retention of physical and nutritional quality of strawberries (*Fragaria x ananassa*)

Response surface methodology was used to determine the optimal high pressure-temperature condition for the processing of strawberries for maximal inactivation of oxidative enzymes as well as best retention of nutritional and physicochemical quality following processing and during storage. High pressure treatment at 20-40°C resulted in visual quality closest to the fresh product. High pressure combined with mild temperature caused substantial inactivation of peroxidase in strawberries with a maximum of 58% inactivation after 10min treatment at 600MPa and 60°C. No significant inactivation of polyphenol oxidase was observed in strawberries under the studied condition. Combined high pressure-mild temperature processing did not have significant effect on the total polyphenol and total anthocyanin content of strawberries. However, an average of 22±13% loss of total polyphenol content and 27±10% loss of total anthocyanin contents was

observed after 3 months of refrigerated storage. The work described in this research is relevant to the high pressure processing of strawberries and other berry fruits. The results of the study have shown that best quality retention of strawberry products is obtained when high pressure processing is combined with vacuum packaging in high barrier packaging material and refrigerated storage since strawberry polyphenol oxidase is highly resistant to high pressure inactivation [Netsanet Shiferaw Terefe^a, Kerstin Matthies, Lloyd Simons and Cornelis Versteeg, (^aInnovative Food Center, CSIRO Food Science Australia, 671 Sneydes Rd, Werribee 3030, VIC, Australia), *Innov Food Sci Emerg Technol*, 2009, **10**(3), 297-307].

FUEL

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

NPARR 1(1), 2010-57, Energy-dense liquid fuel intermediates by pyrolysis of guayule (*Parthenium argentatum* Linn.) shrub and bagasse

Guayule is a perennial shrub grown in the southwestern United States that is used to produce high quality, natural rubber latex. However, only about 10% of the plant material is used for latex production; the remaining biomass, called bagasse, can be used for renewable fuel production. Fast pyrolysis of guayule, both whole shrub and bagasse was performed. From both feedstocks a very viscous, high energy content (~30MJ/kg) pyrolysis liquid (bio-oil) was produced in yields averaging over 60% without any catalyst. The properties and compositions of the bio-oils were found to be similar in the two feedstocks. Co-products, charcoal (20-30wt %) and non-condensable gas (5-15%), were also dense and had a high energy content. Of the two feedstocks, the whole shrub yielded higher quantities of charcoal that also had higher energy content than the charcoal produced from bagasse. As a result, the energy recovery, estimated as the percentage of the energy products, to energy input into the reactor was lower (60%) for guayule bagasse than for the whole shrub (73%). This notwithstanding, the bagasse is a more attractive feedstock for thermo chemical conversion, not only because it is a residue from a

primary process (latex extraction) that is on-site, but also because it has a high energy content. Moreover, it produces high quality pyrolysis products. Co-production of latex rubber from the whole shrub and renewable fuels from the residual bagasse by pyrolysis should improve the already positive economics of the guayule latex rubber industry [Akwas A. Boateng^a, Charles A. Mullen, Neil M. Goldberg, Kevin B. Hicks, Colleen M. McMahan, Maureen C. Whalen and Katrina Cornish (^aEastern Regional Research Center, Agricultural Research Service, US Department of Agriculture, 600 E. Mermaid Lane, Wyndmoor, PA 19038, United States), *Fuel*, 2009, **88**(11), 2207-2215].

NPARR 1(1), 2010-58, Performance, emission and combustion characteristics of a compression ignition engine operating on neat orange oil

Biomass derived fuels are preferred as alternate fuels for I.C Engines due to their abundant availability and renewable nature. Fuels such as methanol and ethanol have proved to be suitable alternate fuels in the transport sector. In the present work the performance, emission and combustion characteristics of a single cylinder, constant speed, direct injection diesel engine using orange oil as an alternate fuel were studied and the results are compared with the standard diesel fuel operation. Results indicated that the brake thermal efficiency was higher compared to diesel throughout the load spectra. Carbon monoxide (CO) and hydrocarbon (HC) emissions were lower and oxides of nitrogen (NO_x) were higher compared to diesel operation. Peak pressure and heat release rate were found to be higher for orange oil compared to diesel fuel operation [K. Purushothaman^a and G. Nagarajan (^aDepartment of Mechanical Engineering, St. Peter's Engineering College, Chennai, Tamil Nadu 600 054, India), *Renewable Energy* 2009, **34**(1), 242-245].

NPARR 1(1), 2010-59, Utilization of unattended *Putranjiva roxburghii* Wall. non-edible oil as fuel in diesel engine

The search for alternative sources of energy has been driven by the increased cost and depletion of supply of fossil fuels. The alternatives are mainly vegetable oils.

Putranjiva roxburghii Wall., a non-edible vegetable oil can be used in diesel engine for its fuel properties which are comparable with diesel. Blends (10, 20, 30 and 40%v/v) of pure *Putranjiva* oil and diesel are used in Ricardo Variable Compression Diesel Engine to study the performance and emission characteristics at various brake power. *Putranjiva* oil blends yield better performance at 45°C CA bTDC injection timing in comparison to 40°C CA bTDC timing for diesel. Maximum 30% blend of *Putranjiva* oil with diesel can be used as an alternative fuel in diesel engine for it differs very little from diesel in performance and is better than diesel with regard to emissions [S.K. Haldar, B.B. Ghosh and A. Nag^a (Department of Chemistry, Indian Institute of Technology, Kharagpur 721302, West Bengal, India), *Renewable Energy*, 2009, **34**(1), 343-347]

NPARR 1(1), 2010-60, Cellulase production using biomass feed stock and its application in lignocellulose saccharification for bio-ethanol production

A major constraint in the enzymatic saccharification of biomass for ethanol production is the cost of cellulase enzymes. Production cost of cellulases may be brought down by multifaceted approaches which include the use of cheap lignocellulosic substrates for fermentation production of the enzyme, and the use of cost efficient fermentation strategies like solid state fermentation (SSF). In the present study, cellulolytic enzymes for biomass hydrolysis were produced using solid state fermentation on wheat bran as substrate. Crude cellulase and a relatively glucose tolerant BGL were produced using fungi *Trichoderma reesei* RUT C30 and *Aspergillus niger* MTCC 7956, respectively. Saccharification of three different feed stock, i.e. sugar cane bagasse, rice straw and water hyacinth biomass was studied using the enzymes. Saccharification was performed with 50 FPU of cellulase and 10 U of α -glucosidase per gram of pretreated biomass. Highest yield of reducing sugars (26.3g/l) was obtained from rice straw followed by sugar cane bagasse (17.79g/l). The enzymatic hydrolysate of rice straw was used as substrate for ethanol production by *Saccharomyces cerevisiae*. The yield of ethanol was 0.093g/g of

pretreated rice straw [Rajeev K. Sukumaran, Reeta Rani Singhania, Gincy Marina Mathew and Ashok Pandey^a (Biotechnology Division, National Institute for Interdisciplinary Science and Technology, CSIR, Trivandrum-695 019, India), *Renewable Energy*, 2009, **34**(2), 421-424].

NPARR 1(1), 2010-61, Improving the low temperature properties of biodiesel fuel

The use of biodiesel as a diesel fuel extender and lubricity improver is rapidly increasing. While most of the properties of biodiesel are comparable to petroleum based diesel fuel, improvement of its low temperature flow characteristic still remains one of the major challenges when using biodiesel as an alternative fuel for diesel engines. The biodiesel fuels derived from fats or oils with significant amounts of saturated fatty compounds will display higher cloud points and pour points. This paper is aimed to investigate the cold flow properties of 100% biodiesel fuel obtained from *Madhuca indica* J. F. Gmel., one of the important species in the Indian context. The cold flow properties of biodiesel were evaluated with and without pour point depressants towards the objectives of identifying the pumping and injecting of these biodiesel in CI engines under cold climates. Effect of ethanol, kerosene and commercial additive on cold flow behavior of this biodiesel was studied. A considerable reduction in pour point has been noticed by using these cold flow improvers. The performance and emission with ethanol blended Mahua biodiesel fuel and ethanol-diesel blended Mahua biodiesel fuel have also been studied. A considerable reduction in emission was obtained. Ethanol blended biodiesel is totally a renewable, viable alternative fuel for improved cold flow behavior and better emission characteristics without affecting the engine performance [Purnanand Vishwanathrao Bhale^a, Nishikant V. Deshpande and Shashikant B. Thombre (Visvesvaraya National Institute of Technology, Mechanical Engineering, South Ambazari Road, Near Bajaj Nagar, 440011 Nagpur, Maharashtra, India), *Renewable Energy*, 2009, **34**(3), 794-800].

NPARR 1(1), 2010-62, Methyl ester of peanut (*Arachis hypogea* Linn.) seed oil as a potential feedstock for biodiesel production

The peanut (*Arachis hypogaea* Linn.) seed oil was extracted from the seeds of the peanut that grows in SE Anatolia of Turkey. Oil was obtained in 50wt/wt %, by solvent extraction. Peanut seed oil was investigated as an alternative feedstock for the production of a biodiesel fuel. Biodiesel was prepared from peanut by transesterification of the crude oil with methanol in the presence of NaOH as catalyst. Maximum oil to ester conversion was 89%. The viscosity of biodiesel oil is nearer to that of petroleum diesel and the calorific value is about 6% less than that of diesel. Peanut seed oil have about 8.3% less heating value than that of diesel oil due to the oxygen content in their molecules. The quality of biodiesel is most important for engine part of view and various standards have been specified to check the quality. The important properties of peanut oil and its methyl ester (biodiesel) such as density, kinematic viscosity, flash point, iodine number, neutralization number, pour point, cloud point, cetane number are found out and compared to those of no. 2 petroleum diesel, ASTM and EN biodiesel standards. The comparison shows that the methyl ester has relatively closer fuel properties to diesel than that of raw peanut seed oil [Canan Kaya, Candan Hamamci^a, Akin Baysal, Osman Akba, Sait Erdogan and Abdurrahman Saydıt (^aDicle University, Science and Art Faculty, Chemistry Department , TR-21280 Diyarbakir, Turkey), *Renewable Energy*, 2009, **34**(5), 1257-1260].

NPARR 1(1), 2010-63, Production of ethanol from cassava pulp via fermentation with a surface-engineered yeast strain displaying glucoamylase

Cassava (*Manihot esculenta* Crantz) pulp, produced in large amounts as a by-product of starch manufacturing, is a major biomass resource in Southeast Asian countries. It contains abundant starch (approximately 60%) and cellulose fiber (approximately 20%). To effectively utilize the cassava pulp, an attempt was made to convert its components to ethanol using a sake-brewing yeast displaying glucoamylase on the cell surface. *Saccharomyces cerevisiae* Kyokai no. 7 (strain K7) displaying *Rhizopus oryzae* glucoamylase, designated strain K7G, was constructed using the C-terminal-half region of \pm -agglutinin. A sample of cassava pulp was pretreated with a hydrothermal reaction

(140°C for 1h), followed by treatment with a *Trichoderma reesei* cellulase to hydrolyze the cellulose in the sample. The K7G strain fermented starch and glucose in pretreated samples without addition of amylolytic enzymes and produced ethanol in 91 and 80% of theoretical yield from 5 and 10% cassava pulp, respectively [Akihiko Kosugi, Akihiko Kondo, Mitsuyoshi Ueda, Yoshinori Murata, Pilanee Vaithanomsat, Warunee Thanapase, Takamitsu Arai and Yutaka Mori^a (^aPost-harvest Science and Technology Division, Japan International Research Center for Agricultural Sciences (JIRCAS), 1-1 Ohwashi, Tsukuba, Ibaraki 305-8686, Japan), *Renewable Energy*, 2009, **34**(5), 1354-1358].

NPARR 1(1), 2010-64, The utilization of acid-tolerant bacteria on ethanol production from kitchen garbage

In order to achieve ethanol production from kitchen garbage under non-sterilized fermentation, the acid-tolerant *Zymomonas mobilis* named GZNS1 was selected and applied in the fermentation system. Ethanol production from kitchen garbage under non-sterilized fermentation with GZNS1 was proved to be feasible. The utilization of control strain and acid-tolerant strain under different conditions demonstrated that the sequence of ethanol yield was followed: sterilized garbage with control strain inoculated under pH of 6 (52g/l) > sterilized garbage with GZNS1 inoculated under pH of 4 (48g/l) > non-sterilized garbage with GZNS1 inoculated under pH of 4 (46g/l). Furthermore, the distillery waste during fermentation was adopted to recycle fermentation and acquired 50g/l ethanol, higher than those adjusted with tap water. The utilization of acid-tolerant bacteria combining with the utilization of distillery waste associated with the process can increase ethanol production, save energy and reduce the cost of ethanol production [Hongzhi Ma, Qunhui Wang^a Dayi Qian, Lijuan Gong and Wenyu Zhang (^aDepartment of Environmental Engineering, University of Science and Technology Beijing, Beijing 100083, China), *Renewable Energy*, 2009, **34**(6), 1466-1470

NPARR 1(1), 2010-65, A comparative evaluation of compression ignition engine characteristics

using methyl and ethyl esters of Karanja oil

The scope of utilizing biodiesel developed from both through the methyl as well as ethyl alcohol route (methyl and ethyl ester) from Karanja oil as an alternative diesel fuel was investigated by authors. The major problem of using neat Karanja oil as a fuel in a compression ignition engine arises due to its very high viscosity. Transesterification with alcohols reduces the viscosity of the oil and other properties have been evaluated to be comparable with those of diesel. In the present work, methyl and ethyl esters of Karanja oil were prepared by transesterification using both methanol and ethanol. The physical and chemical properties of ethyl esters were comparable with that of methyl esters. However, viscosity of ethyl esters was slightly higher than that of methyl esters. Cold flow properties of ethyl esters were better than those of methyl esters. Performance and exhaust emission characteristics of the engine were determined using petrodiesel as the baseline fuel and several blends of diesel and biodiesel as test fuels. Results show that methyl esters produced slightly higher power than ethyl esters. Exhaust emissions of both esters were almost identical. These studies show that both methyl and ethyl esters of Karanja oil can be used as a fuel in compression ignition engine without any engine modification [B. Baiju^a, M.K. Naik and L.M. Das (^aCentre for Energy Studies, Indian Institute of Technology Delhi, New Delhi 16, India), *Renewable Energy*, 2009, **34**(6), 1616-1621].

NPARR 1(1), 2010-66, The role of marginal agricultural land-based mulberry planting in biomass energy production

Biomass energy is the main energy source in rural China. The low per capita cropland in China makes it impractical to convert cropland to energy crop cultivation as in other countries; development of energy crops must not compete with food and other cash crops for prime cropland. Mulberry planted on marginal lands like land risers, land boundaries and waste slopelands in Ningnan County of China's southwestern Sichuan Province not only yielded enough leaf biomass to support a production of over 6000 t of cocoons in 2005, but also produced large amounts of woody biomass

through annual pruning. Mulberry planted on marginal lands would not be replaced by food or other cash crops if cocoon prices drop. The average annual dry matter biomass of pruned mulberry branches is 1.7kg/plant, or approximately 17.0-22.5t/ha, which is high compared to the annual biomass growth of many fast growing trees and perennial herbaceous energy crops. Mulberry prunings exceed household needs for fuelwood because household energy requirements are met with multiple sources. Income from cocoons is the major driving force for the expansion of mulberry planting on marginal land, as lack of incentives has accounted for slow development of firewood in China. Large scale development of marginal land-based planting of mulberry can also help reduce greenhouse gas emissions to the atmosphere, conserve forests and promote biodiversity [Li Lu, Ya Tang^a, Jia-sui Xie and Yuan-liang Yuan (^aDepartment of Environmental Sciences, Sichuan University, Moziqiao, No. 24. South Section One, First Ring Road, Chengdu, Sichuan 610065, China), *Renewable Energy*, 2009, **34**(7), 1789-1794].

NPARR 1(1), 2010-67, Optimization of ethanol production from hot-water extracts of sugar maple chips

Hot-water extracts from sugar maple chips prior to paper making was employed in this study to produce ethanol by *Pichia stipitis* 58784. The effects of several factors, seed culture age, fermentation time, inoculum quantity, agitation rate, percent extract, concentration of inorganic nitrogen source $(\text{NH}_4)_2\text{SO}_4$ and pH value, on ethanol production were investigated by orthogonal experiments. Orthogonal analysis shows that the optimal fermentation was obtained in the condition of 48h seed culture, 120h fermentation, 16% inoculum, 180rpm, containing 30% extracts, 8% ammonium sulphate supplement and pH 5. This optimal condition was verified at 800-ml level in a 1.3l fermentor. The ethanol yield reached 82.27% of the theoretical (20.57g/l) after 120h [Jian Xu^a and Shijie Liu (^aDepartment of Paper and Bioprocess Engineering, College of Environmental Science and Forestry, State University of New York, 1 Forestry Drive, Syracuse, NY 13210, USA), *Renewable Energy*, 2009, **34**(11), 2353-2356].

NPARR 1(1), 2010-68, Evaluation of biodiesel obtained from cottonseed oil

Esters from vegetable oils have attracted a great deal of interest as substitutes for petrodiesel to reduce dependence on imported petroleum and provide a fuel with more benign environmental properties. In this work biodiesel was prepared from cottonseed oil by transesterification with methanol, using sodium hydroxide, potassium hydroxide, sodium methoxide and potassium methoxide as catalysts. A series of experiments were conducted in order to evaluate the effects of reaction variables such as methanol/oil molar ratio (3:1-15:1), catalyst concentration (0.25-1.50%), temperature (25-65°C) and stirring intensity (180-600rpm) to achieve the maximum yield and quality. The optimized variables of 6:1 methanol/oil molar ratio (mol/mol), 0.75% sodium methoxide concentration (wt %), 65 C reaction temperature, 600rpm agitation speed and 90min reaction time offered the maximum methyl ester yield (96.9%). The obtained fatty acid methyl esters (FAME) were analyzed by gas chromatography (GC) and ¹H NMR spectroscopy. The fuel properties of cottonseed oil methyl esters (COME), cetane number, kinematic viscosity, oxidative stability, lubricity, cloud point, pour point, cold filter plugging point, flash point, ash content, sulfur content, acid value, copper strip corrosion value, density, higher heating value, methanol content, free and bound glycerol were determined and are discussed in the light of biodiesel standards such as ASTM D6751 and EN 14214 [Umer Rashid, Farooq Anwar^a and Gerhard Knothe (^aDepartment of Chemistry and Biochemistry, University of Agriculture, Faisalabad-38040, Pakistan), *Fuel Proc Technol*, 2009, **90**(9), 1157-1163].

NPARR 1(1), 2010-69, Full chain energy analysis of biodiesel production from palm oil in Thailand

Biodiesel from palm oil has been considered for partial substitution of diesel fuel for transportation in Thailand. The Government of Thailand recently has set up a production target of 8.5million liters per day of palm oil-based biodiesel by 2011. The aim of this study was to investigate the energy consumption of palm methyl ester (PME) production in Thailand using a life cycle approach compared to other possible oil crops for

biodiesel production including jatropha and coconut. The main contributors to the energy use are cultivation, oil production, transesterification and transportation. Taking into account only fossil fuel or petroleum inputs in the production cycle, the energy analysis provides results in favour of PME in Thailand. The net energy balance (NEB) and net energy ratio (NER) of PME and co-products are 100.84GJ/ha and 3.58, respectively. The NER of PME without co-products is 2.42, which is still higher than one indicating a favourable result. The results are important in selecting an appropriate feedstock for biodiesel production and this study will support policy makers in the energy sector to make informed decisions vis-à-vis promotion of oil palm plantation for biodiesel. This will also support the Government of Thailand in its policy to promote the use of indigenous and renewable sources for transportation fuels [Somporn Pleanjai and Shabbir H. Gheewala^a (^aThe Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, 126 Pracha-Uthit Road, Bangmod, Tungkru, Bangkok 10140, Thailand), *Applied Energy*, 2009, **86**(Supplement 1), S209-S214].

GUMS/RUBBER

(incl. Latex, Resin, Pectin, Mucilage, etc.)

NPARR 1(1), 2010-70, Effect of Kaolin on Adhesion Property of Epoxidized Natural Rubber-based Pressure-sensitive Adhesive Using Gum Rosin as the Tackifier

The viscosity, loop tack and peel strength of kaolin-filled epoxidized natural rubber (ENR 25 grade) adhesive was investigated using gum rosin as the tackifying resin. Kaolin loading was varied from 10-50 parts per hundred parts of rubber (phr), whereas the gum rosin concentration was fixed at 40 phr. Toluene was used as the solvent throughout the study. Polyethylene terephthalate substrate was coated at various adhesive coating thicknesses, i.e., 30, 60, 90, and 120 µm using a SHEEN hand coater. A HAAKE Rotary Viscometer Viscosity was used to measure the viscosity of the adhesive. Loop tack and peel strength were determined by a Llyod Adhesion Tester operating at 30cm/min.

Results show that viscosity of the adhesive increases gradually with increase of kaolin loading due to the concentration effect of the filler. Loop tack and peel strength, however, show maximum value at 20 phr and 30 phr kaolin, respectively, an observation which is attributed to the maximum wettability and compatibility of adhesive on the substrate [B.T. Poh^a and C.E. Chew (^aSchool of Industrial Technology, Universiti Sains Malaysia 11800 Penang, Malaysia), *J Elastom Plast*, 2009, **41**(5), 447-456].

NPARR 1(1), 2010-71, Rheological properties of aqueous blends of high purity barley β -glucan with high purity commercial food gums

Rheological properties such as flow behaviour, viscosity, viscoelasticity and thixotropy of solutions of β -glucan purified from barley fibre concentrate and twelve commonly used food gums, alone and in combinations, were characterized using an oscillatory rheometer. Pure gums and gum combinations were evaluated at 0.5 and 0.75% (w/w) total gum concentration in aqueous medium, whereas the β -glucan/gum ratios were kept at 90/10 or 80/20 (w/w). Viscosity synergism was observed for β -glucan solutions in combination with xanthan, *iota*-carageenan, and carboxymethyl cellulose. However, barley β -glucan blends with *lambda*-carageenan, Konjac, high- and low-methoxyl pectin, microcrystalline cellulose, alginate and gum arabic showed marked lowering of the viscosity compared to β -glucan alone. In addition, β -glucan/xanthan gum blends demonstrated improved shear tolerance compared to xanthan dispersions alone and soft gel transformation. Non-thixotropic behaviour was observed for 0.5 and 0.75% (w/w) β -glucan dispersions and its gum combinations. None of the gum combinations studied demonstrated thixotropy [Baljit S. Ghotra, Thava Vasanthan^a and Feral Temelli (^aDepartment of Agricultural, Food and Nutritional Science, 4 -10 Ag-For Building, University of Alberta, Edmonton, Alberta, Canada T6G 2P5), *Food Chem*, 2009, **17**(3), 417-425].

NPARR 1(1), 2010-72, Effect of epoxidized natural rubber-organoclay nanocomposites on NR/high styrene rubber blends with fillers

Epoxidized natural rubber (ENR) and organoclay nanocomposites (Cloisite 20A) were prepared by solution mixing in this study. The obtained nanocomposites were incorporated in natural rubber (NR) and high styrene rubber (HSR) blends in presence of ISAF and SRF types of carbon black as reinforcing fillers. Morphology, curing characteristics, mechanical and thermal properties and wear characteristics of the nanocomposites against standard abraders and different mining rock surfaces were analyzed. The morphology of the ENR/nanoclay showed a highly intercalated structure. The nanocomposites containing SRF N774 type of carbon black has showed increase in cross-link density, maximum torque and cure rate index compared to ISAF N231 type of carbon black. The overall mechanical properties and thermal stability was higher for the nanocomposites containing SRF type of carbon blacks. The compounds containing EC in NR-HSR have higher barrier properties compared to without EC. EC with SRF N774 carbon black has showed minimum compression set value due to the increased formation of effective network chains due to higher reinforcing efficiency of the nanoclay in the rubber matrix. EC with SRF N774 type of carbon black showed high abrasion resistance property against Du-Pont abraders, DIN abraders and rock-rubber experimental study and also it has been found to be the toughest rubber compound against all types of rock under the present study. Concrete has been identified as the major abraders against the blends than other rock types [Kaushik Pal^a, R. Rajasekar, Dong Jin Kang, Zhen Xiu Zhang, Jin Kuk Kim and C.K. Das (^aPolymer Science and Engineering, School of Nano and Advanced Materials, Gyeongsang National University, Jinju 660-701, South Korea), *Mat Design*, 2009, **30**(10), 4035-4042].

NPARR 1(1), 2010-73, Effect of water on mechanical properties of unsaturated polyester-acetylated Hydroxypropyl Guar Gum Composites

The use of natural, eco-friendly, renewable resources in composites, as a reinforcing material, requires chemical or physical treatment to improve compatibility with the polymer matrix. In the present study hydroxypropyl guar gum (HPG) was acetylated to investigate its influence on the behaviour of its unsaturated

polyester (UPR) composites on exposure to water. The kinetics of water diffusion and effect on mechanical properties were studied with respect to the degree of acetylation and filler concentration. The absorption behavior of all composites was found to follow Fick's law. Mechanical properties of HPG composites were found to be superior compared to pure UPR and acetylated HPG composites [M.A. Shenoy and D.J. D'Melo^a (^aDepartment of Polymer Engineering and Technology, University Institute of Chemical Technology, Nathalal Parikh Marg, Matunga, East, Mumbai, India), *J Reinf Plast Comp*, 2009, **28**(21), 2561-2576].

NPARR 1(1), 2010-74, Rheological properties of pectin-enriched products isolated from butternut (*Cucurbita moschata* Duch. ex Poiret)

Rheological behaviour of five different pectin-enriched products obtained from a cell wall enriched powder of butternut (*Cucurbita moschata* Duch ex Poiret) was evaluated through flow and oscillatory assays. The product SE was obtained through treatment with citrate buffer; C1 and C2 were obtained using cellulase and different enzyme-substrate ratios while H1 and H2 resulted from hemicellulase treatment at different levels. SE- and H1-pectin-enriched fractions showed the best performance as thickeners as indicated by their highest Newtonian viscosities and time constants on shear-thinning along the flow. These fractions showed a structure with the highest density of interactions between the hydrated macromolecules when solutions were evaluated at rest. Fractions obtained with a higher activity of hemicellulase (H2) or with the lowest activity of cellulase assayed (C1) showed the same degree of structure when evaluated at rest, while C2-fraction presented the lowest density of macromolecular interactions in water, behaving as a diluted hydrocolloid solution as confirmed by its fitting to the Cox-Merz rule. Molecular weight distribution of polysaccharide fractions along with chemical composition helped to explain the rheological behavior of these isolated fractions which contained between 39 and 78g of galacturonic acid per 100g of product. With the exception of C2 fraction, pectin-enriched products isolated from butternut showed an interesting range of

thickening properties and can be used as thickeners in the food industry [E.N. Fissore, L. Matkovic, E. Wider, A.M. Rojas and L.N. Gerschenson^a (^aIndustry Department, School of Exact and Natural Sciences, Buenos Aires University (UBA), Ciudad Universitaria, Intendente Güiraldes 2620, (1428) Ciudad Autónoma de Buenos Aires, Argentina), *LWT-Food Sci Technol*, 2009, **42**(8), 1413-1421].

NPARR 1(1), 2010-75, Thermal stabilization of *Erwinia chrysanthemi* pectin methylesterase a for application in a sugar beet pulp biorefinery

Directed evolution approaches were used to construct a thermally stabilized variant of *Erwinia chrysanthemi* pectin methylesterase A. The final evolved enzyme has four amino acid substitutions that together confer a T(m) value that is approximately 11°C greater than that of the wild-type enzyme, while maintaining near-wild-type kinetic properties. The specific activity, with saturating substrate, of the thermally stabilized enzyme is greater than that of the wild-type enzyme when both are operating at their respective optimal temperatures, 60°C and 50°C. The engineered enzyme may be useful for saccharification of biomass, such as sugar beet pulp, with relatively high pectin content. In particular, the engineered enzyme is able to function in biomass up to temperatures of 65°C without significant loss of activity. Specifically, the thermally stabilized enzyme facilitates the saccharification of sugar beet pulp by the commercial pectinase preparation Pectinex Ultra SPL. Added pectin methylesterase increases the initial rate of sugar production by approximately 50% [Au:Chakiath C^a, Lyons MJ, Kozak RE and Laufer CS (^aDepartment of Biology, Hood College, Frederick, MD 21701, USA), *Appl Environ Microbiol*, 2009, **75**(23), 7343-49].

NPARR 1(1), 2010-76, Structure elucidation and properties of a non-ionic galactomannan derived from the *Cassia pleurocarpa* seeds

A non-ionic water soluble galactomannan made up of d-galactose and d-mannose was isolated from the seed endosperm of *Cassia pleurocarpa*. Acid catalyzed fragmentation, periodate oxidation, methylation and selective enzymatic hydrolysis revealed that the repeating unit of the heteropolysaccharide had a

backbone of $\beta(1\rightarrow4)$ linked d-mannopyranosyl units to which d-galactopyranosyl units are linked as side chains through $\alpha(1\rightarrow6)$ linkages. The properties such as viscosity, water/saline retention, gelling behavior, and shelf life of the galactomannan indicated that the material may be exploited in biomedical applications for example drug delivery and tissue engineering fields [Vandana Singh^a Rupali Sethi and Ashutosh Tiwari (^aDepartment of Chemistry, University of Allahabad, Allahabad-211002, India), *Intern J Biol Macrom*, 2009, **44**(1), 9-13].

NPARR 1(1), 2010-77, Benghalensin, a highly stable serine protease from the latex of medicinal plant *Ficus benghalensis* Linn.

A serine protease was purified to homogeneity from the latex of medicinal plant *Ficus benghalensis* Linn. by a single step procedure using anion exchange chromatography. The enzyme, named benghalensin, has a molecular mass of 47 kDa (MALDI-TOF and SDS-PAGE). The purified protein is a glycoprotein and the enzymatic activity is solely inhibited by PMSF and chymostatin, indicating that the enzyme belongs to the serine protease class. The isoelectric point of the enzyme is pH 4.4 with optimum pH and temperature of pH 8.0 and 55°C, respectively. The extinction coefficient [$\epsilon(1\%)_{280}$] of the enzyme is 29.25 and the molecular structure consists of 17 tryptophan, 31 tyrosine and 09 cysteine residues. Peptide mass finger printing and , *de novo* sequencing of tryptic-digested fragments of the protein did not find any putative conserved domains in BLAST analysis. The enzyme is stable and retains full activity over a broad range of pH and temperature or prolonged storage at 4°C. Simple purification, high yield and stability enable exploration of the protein for structure-function relationship studies as well as other applications [Sharma A, Kumari M, Jagannadham MV^a (^aInstitute of Medical Sciences, Banaras Hindu University, Varanasi, India), *J Agric Food Chem*, 2009, **57**(23), 11120-26].

INSECTICIDES

(incl. Fungicides, Nematicides, Larvicides, etc

NPARR 1(1), 2010-78, Degradation of organo-

phosphorus pesticides in wheat during cookie processing

For investigating carryover of some organophosphorus pesticide residues in the cereal food chain from grain to consumer, a study was set up on wheat bran, flour and cookies, with and without bran. Special emphasis was given to malathion and chlorpyrifos-methyl residues in cookies for better protection of consumers. Pesticide-free wheat was placed in a small-scale model of a commercial storage vessel and treated with these pesticides. The residue levels of insecticides were determined in wheat, as well as in bran, flour and cookies produced from stored wheat at various time intervals during storage. A multi-residue analysis was performed using GC-NPD and GC-MS. Malathion and chlorpyrifos-methyl residue levels were higher than the maximum residue limits (MRLs) in wheat after 240days of storage. MRLs established by the EC for malathion and chlorpyrifos-methyl in wheat are 8 and 3mg/kg, respectively. The residue levels of insecticides in flour samples also exceeded the MRL (2mg/kg for both insecticides). Eight months of storage were not effective for reducing the residues in wheat to the levels below MRLs. Although, considerable amounts of the insecticides remained in the bran and flour, the cookie processing significantly reduced the concentrations in general. Chlorpyrifos-methyl was more persistent than was malathion and comparatively less degradation occurred during milling and cookie processing due to its physicochemical properties. Degradation of organophosphorus pesticides in wheat during cookie processing [Umran Uygun^a, Berrin Senoz, Serpil Öztürk and Hamit Koksel (^aDepartment of Food Engineering, Hacettepe University, 06800 Beytepe, Ankara, Turkey), *Food Chem*, 2009, **117**(2), 261-264].

NPARR 1(1), 2010-79, Induction of systemic resistance in pearl millet (*Pennisetum glaucum*) against downy mildew (*Sclerospora graminicola*) by *Datura metel* Linn. extract

A leaf extract of *Datura metel* Linn. protected pearl millet plants against downy mildew disease caused by *Sclerospora graminicola*. Of the different concentrations tested, the highest seed germination and

seedling vigor was recorded when seeds were treated with a 2% extract for 3h. When tested for induction of resistance against downy mildew disease, seed treatment with *D. metel* extract resulted in 79 and 67% protection under greenhouse and field conditions, respectively. The resistance offered by *D. metel* extract was demonstrated to be systemic acquired resistance (SAR) and was active at both early and later stages of plant growth. An association between induction of resistance and salicylic acid (SA) content was drawn by quantifying the enhanced level of endogenous salicylic acid in root (4-fold) and shoot (10-fold) portions of induced seedlings. The highest levels of salicylic acid were observed in roots and shoots of highly resistant (HR) and SAR seedlings 3 and 6h after inoculation, respectively. The defense related enzymes, peroxidase, β -1, 3-glucanase and chitinase, showed 1.5-2.6-fold increased activity in SAR seedlings. In addition to disease protection, plants with induced resistance showed 1.2–1.3-fold increased growth, in biomass, number of earheads and grain yield. Taken together, our results strongly suggest that seed treatment with *D. metel* extract provides protection against the downy mildew pathogen [Shivakumar Pattada Devaiah^a, Geetha Heluvarahundi Mahadevappa and Huntrike Shekar Shetty (^aDowny Mildew Research Laboratory, Department of Studies in Applied Botany, Seed Pathology and Biotechnology, University of Mysore, Manasagangotri, Mysore 570 006, Karnataka, India), *Crop Prot*, 2009, **28**(9), 783-791]

NPARR 1(1), 2010-80, Antibacterial effect of *Allium sativum* Linn. and *Ficus carica* Linn. extracts on tomato bacterial pathogens

Bacterial pathogens are a serious problem on tomato plants. Amongst them, *Pseudomonas syringae* pv. *tomato* (Pst), *Xanthomonas vesicatoria* (Xv) and *Clavibacter michiganensis* subsp. *michiganensis* (Cmm), causal agents of bacterial speck, bacterial spot and bacterial canker, respectively, affect tomato production under greenhouse and field conditions. In *in vitro* tests with bacterial strains at a population density of 10^6 and 10^8 cfu/ml, vegetal extracts from cloves of *A. sativum* and fruits of *F. carica* at concentrations of 1 and 30%, respectively, showed best effects at 10^6 cfu/

ml bacterial concentration. In *in vivo* tests bacterial strains were tested at 10^5 cfu/ml; *A. sativum* and *F. carica* extracts reduced disease incidence by 58 and 30% and disease severity by 68 and 22%, respectively. Moreover, these vegetal extracts resulted in effective disease control of up to 65% (*A. sativum*) and 38% (*F. carica*) of that of the standard copper treatment. The antibacterial effects of *A. sativum* and *F. carica* extracts are useful for protecting tomato plants against Pst, Xv and Cmm in the greenhouse [G.M. Balestra^a, A. Heydari, D. Ceccarelli, E. Ovidi and A. Quattrucci (^aDipartimento di Protezione delle Piante, Università degli Studi della Tuscia, Via S. Camillo de Lellis, 01100 Viterbo, Italy), *Crop Prot*, 2009, **28**(10), 807-811].

NPARR 1(1), 2010-81, Control of virus diseases in intensively cultivated vanilla plots of French Polynesia

The results of long term virus surveys in intensively cultivated vanilla plots in the Society Islands (French Polynesia), between 1999 and 2007 are reported in this paper. The data confirmed a potential for high incidence of aphid borne viruses in particular *Cucumber mosaic virus* (CMV) and *Watermelon mosaic virus* (WMV) as well as the non vectored *Cymbidium mosaic virus* (CymMV). CMV had a particularly high prevalence (over 30% of the plots) and could severely damage up to 50% of the vines before blossom. Severe outbreaks of CMV were correlated to the presence of the weed *Commelina diffusa* Burm. as a reservoir of virus and aphid vectors. The application in 2003 of simple prophylactic measures resulted in a sharp reduction of virus incidence in new plantations, compared to levels of virus diseases recorded in the previous decade. Indeed, at the beginning of fruiting, the incidence of aphid borne viruses did not exceeded 1.6% of vines for the 29 shade houses which adopted the virus prophylaxis. The three remaining shade houses were severely (20-50%) infected by WMV or CymMV because of the planting of virus-infected cuttings. These results demonstrate the benefit of implementing prophylaxis at the scale of an archipelago, and widen the possibilities of developing intensive cultivation of vanilla in other areas confronted with similar virus constraints [A. Richard, K. Farreyrol, B. Rodier, K. Leoce-Mouk-San, M.

Wong, M. Pearson and M. Grisoni^a (^aCirad, UMR-PVBM, Pôle de Protection des Plantes, 97410 Saint Pierre, La Réunion, France), *Crop Prot*, 2009, **28**(10), 870-877].

NPARR 1(1), 2010-82, Aqueous extracts of some medicinal plants are as toxic as Imidacloprid to the sweet potato whitefly, *Bemisia tabaci* Genn.

Aqueous extracts of nine plants, known to have medicinal activity, were tested for their toxicity against the sweet potato whitefly, *Bemisia tabaci* Genn. (Homoptera: Aleurodidae) compared to the toxicity of the insecticide, Imidacloprid. Extracts of *Lepidium sativum* Linn. (Brassicales: Brassicaceae) killed 71 % of early stage nymphs, which was not significantly different from mortality caused by Imidacloprid. Treatment of pupae with three plant extracts, *L. sativum*, *Achillea biebersteinii* Linn. (Asterales: Asteraceae) or *Retama raetam* (Forssk.) Webb. & Berthel (Fabales: Fabaceae) prevented adult development and treatment with *R. raetam* extract killed adults, at levels that were not significantly different from Imidacloprid. None of the other plants showed significant toxicity. However, extracts of four plants, *Pimpinella anisum* Linn. (Apiales: Apiaceae), *Galium longifolium* (Sibth. & SM.) (Gentianales: Rubiaceae), *R. raetam* and *Ballota undulata* Benth. (Lamiales: Lamiaceae) had a repellent effect [Ateyyat MA^a, Al-Mazra'awi M, Abu-Rjai T, Shatnawi MA. (^aAsh-Shoubak University College, Al-Balqa' Applied University, 17119 Al Salt, Jordan), *J Insect Sci*, 2009, 9, 15].

NPARR 1(1), 2010-83, Larvicidal property of essential oils against *Culex quinquefasciatus* Say (Diptera: Culicidae)

Essential oils from 22 aromatic plant species were tested for mortality of the mosquito larvae *Culex quinquefasciatus*. Lethal concentrations were determined for individual essential oils. Essential oils obtained from *Thymus vulgaris* Linn., *Satureja hortensis* Linn. and *Thymus satureioides* Coss. plants showed the highest effect, with LC₅₀ found lower than 50 µg/ml (33, 36 and 44 µg/ml, respectively). Analyses showed that majority substances for *T. vulgaris* were thymol and p-cymene (60.3 and 10.1%, respectively);

carvacrol and γ-terpinene for *S. hortensis* (48.1 and 36.7%, respectively), and borneol and thymol for *T. satureioides* (30.3 and 32.5%, respectively).

The selected essential oils also showed very good effectiveness with respect to mortality and percentage of adult emergence upon short-term exposure in water contaminated with lethal doses of individual oils. While there was 77% adult emergence from the larvae in the control, in *T. vulgaris*, *T. satureioides* and *S. hortensis* there was only 12.3, 15.3 and 16.0% adult emergence, respectively. High antioviposition effectiveness was found in all selected oils. Almost 100% deterrence of female oviposition was determined for all oils in concentrations of 0.02%. Significant differences were seen with tested concentrations of 0.01 and 0.005%, where the oil of *T. vulgaris* proved most effective (repellency about 99.8 and 62.3%, respectively) [Roman Pavela^a (^aCrop Research Institute, Drnovska 507, 161 06 Prague 6-Ruzyne, Czech Republic), *Industr Crops Prod*, 2009, **30**(2), 311-315].

NPARR 1(1), 2010-84, Fumigation with essential oil of mustard retards fungal growth and accumulation of ergosterol and free fatty acid in stored shelled groundnuts

Shelled groundnut (*Arachis hypogaea* Linn.) samples with moisture contents (m.c.) between 7.5 and 10.5% and inoculated with conidia of *Aspergillus glaucus* and *A. parasiticus* were stored for 15-90 days at 25±2°C and fumigated with synthetic food grade essential oil of mustard (100µ l/l space). Deterioration of the samples was assessed by estimating the percentage of kernels colonized by fungi, the number of colony forming units (CFUs)/kernel, and the accumulation of ergosterol and free fatty acids (FFA). The values of these variables increased with the m.c. and storage period, independent of the fumigation treatment; however, the rate of increase was significantly lower in fumigated samples. After 90 days storage, the proportion of kernels yielding *A. glaucus* was similar in all samples, but the number of CFUs was 300×, ergosterol content 3.6× and FFA 4× higher in non-fumigated than in fumigated samples. In fumigated samples, no molded kernels were visible, while many were seen in non-fumigated samples after 30 or 60 days

storage at 10.5 or 9.3% m.c., respectively. The deterioration retardation featured a reduced inoculum on kernel surfaces. *Aspergillus parasiticus* did not colonize kernels independently of m.c. and fumigation treatments. There was a strong positive correlation between CFUs and ergosterol or FFA content when the data of fumigated and non-fumigated samples were analyzed separately. However, this relationship was absent when data were pooled to disregard the fumigation effect. The correlation between ergosterol and FFA content remained high regardless of the fumigation treatment ($r=0.99$). The ergosterol or FFA content of stored groundnuts can be used interchangeably, as a sensitive indicator, to assess deterioration caused by xeric storage fungi. However, the latter was preferable because it was simpler to assess and provided a direct indication of economic losses due to reduced oil yield [O.D. Dhingra, G.N. Jham, F.Á. Rodrigues^a, G.J. Silva Jr. and M.L.N. Costa (^aDepartamento de Fitopatologia, Universidade Federal de Viçosa, Av. Ph Rolfs s/n, 36570-000 Viçosa, Minas Gerais, Brazil), *J Stored Prods Res*, 2009, **45**(1), 24-31].

NPARR 1(1), 2010-85, Efficacy of combining Niger seed oil with malathion 5% dust formulation on maize against the maize weevil, *Sitophilus zeamais* (Coleoptera: Curculionidae)

The combined effects of Niger seed oil and malathion, 5% dust, against the maize weevil, *Sitophilus zeamais*, were evaluated to determine the minimum effective rate(s) of the combinations that can provide adequate protection to maize seed against attack by weevils. Niger seed oil at the rates of 0, 10, 20, 30, 40, 50 and 100% of the recommended application rate, 5ml/kg, was combined with malathion at the respective rates of 100, 50, 40, 30, 20, 10 and 0% of the recommended application rate, 0.5g/kg. All combinations provided complete protection to maize seed from the maize weevil up to 90 days after infestation. To determine the residual effects of the treatments, weevils were reintroduced to the grain that had been treated 90 days previously. In addition to 100% malathion, 10% Niger seed oil+50% malathion and 20% Niger seed oil +40% malathion, were fully effective in controlling *S. zeamais* for a further

156 days after this re-infestation. Therefore, these combinations could be considered as a potential component in an effort to establish integrated management of the maize weevil. Residual performance of both oil and malathion against the weevils was primarily affected by the dose of malathion, with higher doses of malathion providing greater protection for a longer period. Niger seed oil treatment lowered the level of seed germination at the application rate of 5ml/kg of maize [Ahmed Ibrahim Yuya, Abraham Tadesse, Ferdu Azerefegne and Tadele Tefera^a (^aGeorg-August-University, Department of Crop Science, Agricultural Entomology Section, Grisebachstr. 6, 37077 Goettingen, Germany), *J Stored Prod Res*, 2009, **45**(1), 67-70].

OILS/FATS

(incl. Edible oils, Butter, etc.)

NPARR 1(1), 2010-86, Apparent solidification time test for detection of foreign oils and fats adulterated in clarified milk fat, as affected by season and storage

An apparent solidification time (AST) test was developed for the detection of foreign fats and oils in milk fat. AST values at 18°C for buffalo and cow milk fats ranged from 2min 30s to 2min 48s and 2min 56s to 3min 26s, while for pig body fat, goat body fat and hydrogenated vegetable oils, AST values were 1min 30s, 0min 40s and 1min 50s, respectively. Vegetable oils yielded no AST values, suggesting that adulteration can be detected using the AST method in the case of some but not all possible adulterants [Arun Kumar, Darshan Lal Ghai^a, Raman Seth and Vivek Sharma (^aDairy Chemistry Division, National Dairy Research Institute, Karnal, India), *Intern J Dairy Technol*, 2009, **62**(1), 33-38].

NPARR 1(1), 2010-87, Conjugated linoleic acid content of milk from buffaloes fed a mustard oil-based diet

Fifteen Murrah buffaloes were distributed in groups I, II and III. The group I animals were fed with groundnut cake-based concentrate, group II animals with mustard cake-based concentrate and group III with 2% of

mustard oil added to the group II feed. Conjugated linoleic acid (CLA) estimation in milk was done by using GC. The average total CLA contents (mg/g milk fat) in the three groups were 6.84, 12.12 and 19.50mg/g of fat, respectively. Hence, it was concluded that addition of 2% mustard oil resulted in a 185% increase in milk fat total CLA content [C Kathirvelana and A K Tyagi (^aDairy Cattle Nutrition Division, National Dairy Research Institute, Karnal 132 001, Haryana, India), *Intern J Dairy Technol*, 2009, **62**(2), 141-146].

NPARR 1(1), 2010-88, The role of comprehensive chromatography in the characterization of edible oils and fats-A Review

Chromatography has a very long history in the analysis of edible oils and fats. Hyphenations of two chromatographic methods, or couplings of a chromatographic separation technique with spectroscopic detection and identification devices, are used if the resolving power of the technique needs to be improved. More recently, the analytical benefits of comprehensive two-dimensional (2D) chromatography, in its various operational modes, have been exploited by the oil and fat chromatographic community. In comprehensive 2D chromatography, the entire sample injected is subjected to two independent separation processes. In the present contribution, the principles of comprehensive 2D chromatography are briefly discussed. Next, the advantages of comprehensive separations for lipid analysis are illustrated using the concept of generic chromatographic applications. This concept distinguishes three generic reasons to apply chromatographic separations: target compound analysis, group-type separation, and chromatographic fingerprinting. Examples of how comprehensive multi-dimensional methods were successfully applied to solve problems in the edible oils and fats area are given. We believe that these multi-dimensional techniques truly add new dimensions to oil and fat analysis, providing researchers in the area with novel tools for unraveling edible oil or fat samples with their complex compositions [Hans-Gerdssen I^a, Herrald Steenbergen, Sjaak de Koning (^aUnilever Research and Development, Vlaardingen, The Netherlands), *Eur J Lipid Sci Technol*, 2009, **111**(12), 1171-1184].

NPARR 1(1), 2010-89, Lipids and of fatty acids of edible crabs of the north-western Pacific

Analyses of lipids and fatty acids in muscles and hepatopancreas of five commercially exploited crabs inhabiting the Sea of Japan and the Okhotsk Sea, namely *Paralithodes camtschaticus*, *Paralithodes platypus*, *Chionoecetes opilio*, *Chionoecetes angulatus* and *Chionoecetes japonicus*, have been carried out. The total lipid level (TL) in muscles ranged from 0.53% of wet weight (ww) to 1.57% of ww and the amount of phospholipids exceeded that of triglycerides. The TL contents in the hepatopancreas of all crabs were higher than in muscles and varied between 10.2% ww in *C. angulatus* and 19.8% ww in *P. platypus*, the major class of lipids being triglycerides. The main polar lipids in the hepatopancreas and muscles were phosphatidylcholine (PC) and phosphatidylethanolamine (PE). Among polyunsaturated fatty acids (PUFAs), the *n*-3 fatty acids have dominated; 16:0, 18:1*n*-9, 20:5*n*-3 and 22:6*n*-3 were the main fatty acids contained in the tissues studied. In all the crabs, excluding *C. angulatus*, the PUFAs *n*-3/*n*-6 ratio in muscles varied between 7.02 and 10.3 while, in the hepatopancreas, the ratio varied between 4.00 and 6.62 [Nikolay A. Latyshev, Sergey P. Kasyanov^a, Vladimir I. Kharlamenko and Vasily I. Svetashev (^aA. V. Zhirmunsky Institute of Marine Biology, Far East Branch, Russian Academy of Sciences, Palchevsky 17, Vladivostok 690041, Russia), *Food Chem*, 2009, **116**(3), 657-661].

NPARR 1(1), 2010-90, Effect of solvent hydration and temperature in the deacidification process of sunflower oil using ethanol

This work presents liquid-liquid experimental data for systems composed of sunflower seed oil, ethanol and water from 10 to 60 °C. The influence of process variables (temperature (*T*) and water concentration in the solvent (*W*)) on both the solvent content present in the raffinate (S_{RP}) and extract (S_{EP}) phases and the partition of free fatty acids (k_2) was evaluated using the response surface methodology, where flash calculations were performed for each trial using the UNIQUAC equation. Water content in the solvent was the most important factor on the responses of S_{EP} and k_2 .

Additionally, statistical analysis showed that the S_{RP} was predominantly affected by temperature factor for low water content in the solvent [Maitê S. Cuevas, Christianne E.C. Rodrigues^a and Antonio J.A. Meirelles (^aLES, Separation Engineering Laboratory, Department of Food Engineering (ZEA-FZEA), University of São Paulo (USP), P.O. Box 23, 13635-900 Pirassununga, São Paulo, Brazil), *J Food Eng*, 2009, **95**(2), 291-297].

NPARR 1(1), 2010-91, Pumpkin (*Cucurbita maxima* Duch.) seed oil extraction using supercritical carbon dioxide and physicochemical properties of the oil

Pumpkin (*Cucurbita maxima* Duch.) seed oil was extracted using supercritical carbon dioxide and the physicochemical properties of the oil were determined. A central composite rotatable design was used to analyse the impact of extraction parameters (temperature, time and pressure) and a response surface methodology was used to obtain optimal extraction conditions for the maximum oil yield. All three variables studied were significant demonstrating quadratic effects. The maximum yield of the extracted oil was 30.7% and the optimum conditions were 32,140kPa and 68.1°C for 94.6min which was within the experimental domain. Physicochemical properties of the oil showed that the extracted oil could be used as food oil supplement [Pranabendu Mitra, Hosahalli S. Ramaswamy and Kyu Seob Chang^a (^aDepartment of Food Science and Technology, Chungnam National University, Daejeon 305-764, Republic of Korea), *J Food Eng*, 2009, **95**(1), 208-213].

NPARR 1(1), 2010-92, Quantitative and qualitative determination of acid value of peanut oil using near-infrared spectrometry

Acid value (AV) is an important parameter to illustrate the quality as well as degree of refining of peanut oil. A rapid near-infrared reflectance spectroscopy (NIRS) method was applied to determine AV in peanut oils. A partial least squares (PLS) regression model with a coefficient of determination (R^2) of 0.9725 and a square error of cross-validation (SECV) of 0.308 was obtained. The prediction set gave a coefficient of

determination (r^2) and standard error of prediction (SEP) of 0.9379 and 0.333. Regarding qualitative evaluation, the classification of qualified peanut oil (with an acid value of less than or equal to 3mg/g) and unqualified peanut oils (with an acid value of more than 3mg/g) was conducted by using discriminant partial least squares analysis (DPLS). The results showed that DPLS technique was an effective method of classification model building, with a high correct percent of 96.55% [Yulan Rao, Bingren Xiang^a, Xiaohua Zhou, Zhimei Wang, Shaofei Xie and Jianping Xu (^aCenter for Instrumental Analysis, Key Laboratory of Drug Quality Control and Pharmacovigilance, Ministry of Education, China Pharmaceutical University, 210009 Nanjing, PR China), *J Food Eng*, 2009, **93**(2), 249-252].

NPARR 1(1), 2010-93, Comparative studies on the yield and quality of solvent-extracted oil from salmon skin

Oil was extracted from the skin of Atlantic salmon by solvent extraction with different solvent systems and analyzed for efficiency in terms of oil yield and quality. The yield of salmon skin oil (SSO) was significantly lower ($p<0.05$) with the hexane-isopropanol solvent system versus either of the chloroform-methanol systems, i.e., 32.21% on dry weight basis (dwb) against 35.15% dwb and 43.82% dwb, respectively. Second and third extractions were performed on the residue using the same solvent systems to verify any biases and to test the completeness of the first extraction. These successive extractions resulted in nominal increases in yield.

The yield of SSO from Soxhlet-hexane compared favorably with Soxhlet-petroleum ether at all the extraction times investigated. The Soxtec-hexane gave the highest oil yield of ca 62% dwb. Both hexane and petroleum ether were suitable solvents for the extraction of SSO, though the yield obtained with hexane was significant higher ($p<0.05$). The study further indicated that salmon skin was a rich source of oil (23.32-61.53% dwb) and for the various solvent systems, the free fatty acid (FFA) content was quite low (0.60-1.19%) [Alberta N.A. Aryee^a and Benjamin K. Simpson (^aDepartment of Food Science and Agricultural Chemistry, McGill University (Macdonald Campus), 21

111 Lakeshore Road, Ste. Anne de Bellevue, Que., Canada H9X 3V9), *J Food Eng*, 2009, **92**(3), 353-358].

PULP/PAPER

NPARR 1(1), 2010-94, Dissolving pulp from corn stalk residue and waste water of *Mercox* unit

The aim of this work was to study the production of cellulosic dissolving-grade pulp, alpha-cellulose, using corn stalk residue as non-wood material and industrial waste water as pulping liquid. Industrial waste water obtained from a *Mercox* unit operating at the Kermanshah Oil Refinery in Iran and corn stalk residue obtained from local agricultural farms were used as raw materials for the experiment. The pre-hydrolysis process was performed on the corn stalk for 30min at 160°C in a mini-digester. Subsequently, the corn stalk was subjected to Kraft pulping and to pulping with industrial waste water at 170°C over a period of 90min. Upon completion of the bleaching process of each mixture, the quality of the resulting cellulosic dissolving-grade pulps was studied. The laboratory investigation compared the following parameters of importance: influence of active alkali, sulfidity, and dilution ratio of the industrial waste water on pulp properties such as yield, kappa number and degree of polymerization. Under optimum conditions, the pre-hydrolysis/kraft pulping with 20% active alkali, 25% sulfidity and HEHP bleaching resulted in acceptable levels of alpha-cellulose content (94.8%), degree of polymerization (279) and ash content (0.75%) for the produced dissolving pulp. The kraft pulping was compared with the pulping of corn stalk with industrial waste water, which increased the alpha-cellulose content to 97.4%, with a degree of polymerization of 241 and an ash content of 0.96%. Comparison of both experiments indicates that using industrial waste water in the pulping process gives satisfactory results for industrial applications using a non-wood material, yields a quality product with reduced capital investment and operation costs, and considerably helps the environmental preservation of wood-based raw materials [J. Behin^a and M. Zeyghami^a (Department of Chemical Engineering, Faculty of Eng., Razi University, Baghe Abrisham, Kermanshah, Iran), *Chem Eng J*, 2009, **152**(1), 26-35].

NPARR 1(1), 2010-95, Adsorption of cationized barley husk xylan on kraft pulp fibres: influence of degree of cationization on adsorption characteristics

A water-soluble (glucurono)arabinoxylan (GAX) was isolated from barley husk using chlorite delignification followed by alkaline extraction and enzymatic purification of the extract. The isolated xylan was shown to adsorb on bleached softwood kraft fibres, but the degree of adsorption was rather low under the applied conditions. This can be explained by the inhibited adsorption of GAX molecules with a relatively high degree of arabinofuranosyl substitution, as indicated by iodine complexation and neutral carbohydrate analysis of the non-adsorbing xylans. In order to increase the driving force for adsorption of the more highly substituted GAX, the xylan was cationized through a reaction in an aqueous alkaline medium with 2, 3-epoxypropyltrimethylammonium chloride (EPTMAC). The chemical modification of xylan was confirmed by using ¹H-¹³C HSQC (Heteronuclear Single Quantum Coherence) NMR, and was quantified by using elemental analysis. The GAX cationization, which introduced cationic charge densities ranging from 110 to 740 µeq/g, was shown to increase the rate and magnitude of adsorption extensively, due to the induced electrostatic interaction between the anionic fibres and the cationic xylan. Similar to non-modified xylan, cationic xylan possessed a non-electrostatic cellulose surface affinity, as shown by adsorption at high ionic-strength and on esterified (carboxyl-free) pulp fibres [Tobias Köhnke^a, Harald Brelid and Gunnar Westman^a (Organic Chemistry, Department of Chemical and Biological Engineering, Chalmers University of Technology, 412 96 Göteborg, Sweden), *Cellulose*, 2009, **16**(6)].

NPARR 1(1), 2010-96, Effect of anthraquinone on brightness value and crystalline structure of pulp during soda processes

The dependence of crystalline structure and optical properties of pulp on anthraquinone (AQ) added to the soda process at different cooking times was determined in this study. Wheat (*Triticum aestivum* Linn.) straw was used as the raw material for pulp. Soda and soda-AQ processes were selected for pulping at 80 min and

120 min. The soda-AQ process improved the yield and viscosity of pulp delignification ratio for pulping in comparison with the soda process. Crystallinity of pulp samples decreased by adding anthraquinone to the soda process because of stabilized less ordered cellulose and amorphous hemicelluloses in pulp. It was determined that crystallinity of pulp samples decreased with longer cooking time, from 80min to 120min, in both soda and soda-AQ processes. Monoclinic structure was dominant in pulp samples; however, the triclinic structure ratio increased in both soda and soda-AQ processes compared to raw material. It was found that brightness and lightness values in pulp samples decreased when using anthraquinone depending on the changes of the crystalline structure [Esat Gümü_kaya^a, Evren Ersoy Kalyoncu and HüseyinKirci (^aDepartment of Pulp and Paper, Faculty of Forestry, Karadeniz Technical University, 61080, Trabzon, Turkey), *Chemical Papers*, 2009, **63**(6)].

NPARR 1(1), 2010-97, Cellulase production by solid state fermentation using bagasse with *Penicillium decumbens* L-06

The cellulase production by *Penicillium decumbens* L-06 in solid state fermentation (SSF) was investigated using bagasse as the substrate in this paper. The optimum conditions for cellulase production achieved by single factor testing were: the ratio of bagasse to wheat bran 1:1 (w/w), the ratio of water to material 3:1 (v/w), culture temperature 30°C, initial pH 5.0, ammonium sulphate as nitrogen source with the concentration of 1%, 6 day's fermentation period. BoxuBehnken factorial design (BBD) and response surface methodology (RSM) were further used to optimize conditions for cellulase (Filter paper activity) production. The maximal cellulase (Filter paper activity) production (3.89 FPu/g) was obtained under the optimized conditions (ratio of water to material 2.38:1, initial pH 5.28, cultivation time 150.5 h). It was well corresponded to the calculated results (3.97 FPu/g) by model prediction [Chuannan Long, Yueqin Ou, Ping Guo, YuntaoLi, Jingjing Cui, Minnan Long and Zhong Hu^a (^aDepartment of Biology, Shantou University, 515063 Shantou, China), *Annals Microbiol*, 2009, **59**(3)].

NPARR 1(1), 2010-98, Efficiencies of NaOH production methods in a kraft pulp mill

There are several processes in a Kraft pulp mill where there is a need for sodium hydroxide, e.g. in the digester and the bleaching plant. The objective of this study is to perform a preliminary evaluation, intended to select the best alternative for producing sodium hydroxide on a Kraft pulp mill site. The first step of the evaluation consists of screening available processes for producing sodium hydroxide needed in the mill. The first step of the evaluation shows that the two best options for increasing the production of sodium hydroxide for internal use in a mill are the conventional lime cycle process or direct causticization with titanates. The second step of the evaluation compares the lime cycle and the titanate process using first and second law analyses to determine the energy requirement and the exergy efficiencies of both processes. Such analyses show a higher energy requirement and a lower exergy efficiency in the titanate process than in the lime cycle process without any heat integration. However, the titanate process shows better performance in terms of energy requirement and exergy efficiency than the lime cycle, if heat is integrated into both processes. The titanate process requires, in the best case, only 80% of the energy required for a fully heat-integrated lime cycle process [Tobias Richards^a, Carlos Pavletic and Johan Pettersson (^aDepartment of Chemical and Biological Engineering, Chalmers University of Technology, SE 412 96 Göteborg, Sweden), *Intern J Energy Res*, 2009, **33**(15), 1341-1351].

NPARR 1(1), 2010-99, Evaluation of a screening method for classifying virgin and recycled paper and board samples

This paper deals with the study of volatile compounds released by recycled paper and board. The aim of the study was to demonstrate the feasibility of headspace procedure coupled to gas chromatography/mass spectrometry (GC/MS) applied to complex paper-based samples together with a chemometric procedure as a powerful method for screening potential volatile contaminants released by the recycled and virgin paper samples. Using this procedure, the identification of virgin or recycled paper could be achieved based on the

identification on specific markers of the recycled pulp. Fifteen different samples within virgin and recycled paper were studied. After equilibration, the vapour phase of the samples was analysed by automatic headspace coupled online to GC/MS. The analytical approach for volatile compounds, their identification and the selection of some compounds as markers for recycled pulp are shown and discussed. A discriminate analysis applied to the set of results obtained allows classification of the samples into four different groups according to the content of recycled pulp (0, 10-30 and >80% of recycled pulp), the surface treatment of the paper (no surface treatment, clay coating and plastic coating), the grammage (from <100 to > 300g/m²) and the sample thickness (from <300 to >600µm). The matrix effect on the volatilization of some compounds from the paper samples and the analytical behaviour are also discussed [Esther Asensio and Cristina Nerín^a (^aAnalytical Chemistry Department, University of Zaragoza, CPS-Torres Quevedo Building, C/Maria de Luna 3, Zaragoza 50.018, Spain), *Pack Technol Sci*, 2009, **22**(6), 311-322]

SPICES/CONDIMENTS

NPARR 1(1), 2010-100, The potential of cinnamon to reduce blood glucose levels in patients with type 2 diabetes and insulin resistance-A Review

Cinnamon has a long history as an antidiabetic spice, but trials involving cinnamon supplementation have produced contrasting results. The aim of this review was to examine the results of randomized controlled clinical trials of cinnamon and evaluate the therapeutic potential amongst patients with diabetes and insulin-resistant patients, particularly the ability to reduce blood glucose levels and inhibit protein glycation.

A systematic electronic literature search using the medical subject headings 'cinnamon' and 'blood glucose' was carried out to include randomized, placebo-controlled *in vivo* clinical trials using *Cinnamomum verum* or *Cinnamomum cassia* conducted between January 2003 and July 2008.

Five type 2 diabetic and three non-diabetic studies (total N=311) were eligible. Two of the diabetic studies illustrated significant fasting blood glucose (FBG)

reductions of 18-29% and 10.3% ($p<0.05$), supported by one non-diabetic trial reporting an 8.4% FBG reduction ($p<0.01$) vs. placebo and another illustrating significant reductions in glucose response using oral glucose tolerance tests ($p<0.05$). Three diabetic studies reported no significant results. Whilst definitive conclusions cannot be drawn regarding the use of cinnamon as an antidiabetic therapy, it does possess antihyperglycaemic properties and potential to reduce postprandial blood glucose levels. Further research is required to confirm a possible correlation between baseline FBG and blood glucose reduction and to assess the potential to reduce pathogenic diabetic complications with cinnamon supplementation [S Kirkham, R Akilen, S Sharma and A Tsiami^a (^aFaculty of Health & Human Sciences, Thames Valley University, Brentford, TW8 9 GA, UK), *Diabetes, Obesity Metab*, 2009, **11**(12), 1100-1113].

NPARR 1(1), 2010-101, Antibacterial and antioxidant effects of five spice and herb extracts as natural preservatives of raw pork

The aim of this study was to find natural spice and herb extracts with antibacterial and antioxidant capacities that could be potentially used as natural preservatives in raw pork. The inhibitory effects of cinnamon stick, oregano, clove, pomegranate peel and grape seed extracts on *Listeria monocytogenes*, *Staphylococcus aureus* and *Salmonella enterica* were evaluated in raw pork at room temperature (20°C). The influences of these extracts on lipid oxidation in the meat were also investigated. The pH, colour parameters and TBARS (thiobarbituric acid-reactive substances) values were tested periodically. The results showed that all five natural extracts, especially clove, were effective against the bacteria. During storage the colour parameters of the extract-treated pork samples changed slightly, in comparison with significant changes in the control. Treatments with these extracts increased the stability of raw pork against lipid oxidation. Clove was the most effective for retarding lipid oxidation and presented the highest antioxidant activity in raw pork. This study suggests that the tested extracts, especially clove, have potential as natural preservatives to reduce numbers of pathogenic bacteria, colour degradation and lipid

oxidation in raw pork [Bin Shan, Yi-Zhong Cai, John D Brooks and Harold Corke^a (^aSchool of Biological Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong), *J Sci Food Agric*, 2009, **89**(11), 1879-1885].

NPARR 1(1), 2010-102, Micropropagation and slow growth conservation of cardamom (*Elettaria cardamomum* Maton)

Cardamom (*Elettaria cardamomum* Maton) has great commercial value as a spice crop in India. A one-step protocol for direct regeneration of plants and *in vitro* conservation by slow growth method has been developed. A maximum of 6.5 shoots/culture were obtained in 2 months or 15.1 shoots/culture in 4 months on Murashige and Skoog (Physiol Plant 15:473-497, 1962) medium (MS)+5 μ M benzylaminopurine gelled with 0.7% agar (micropropagation medium). Rooting also occurred simultaneously on the same medium. Using one shoot tip or nodal explant, about 30,375 plants can be regenerated in a year on the micropropagation medium. *In vitro* conservation by slow growth method was achieved on 1/2 MS (major salts) +5 μ M BAP+0.7% agar (conservation medium); about 70% of the cultures survived up to 18 month at 25 \pm 2 $^{\circ}$ C. Successful regrowth of plants on micropropagation medium was obtained by culturing nodal explants excised from 18-month-old conserved plants. Some 96% of the plants survived the hardening treatment and grew normally in a greenhouse. If 24 cultures are conserved on the conservation medium, it is possible to regenerate at least 750 plants by using explants derived from 70% of the surviving shoots and culturing the same in micropropagation medium for 4 month. These plants may be used for planting or as a source of explants for the next conservation cycle. On the basis of 20 random amplified polymorphic DNA and 13 inter-simple sequence repeat primers analyses, no significant reproducible variation was detected among the *in vitro*-conserved plants compared with the mother plants [Rishi K. Tyagi^a, Rajni Goswami, Rajkumari Sanayaima, Rakesh Singh, Rajesh Tandon and Anuradha Agrawal (^aTissue Culture and Cryopreservation Unit, National Bureau of Plant Genetic Resources, New Delhi, 110012, India), *In Vitro Cellular & Development Biol-Plant*, 2009, **45**(6), 721-729].

NPARR 1(1), 2010-103, Role of gamma irradiation on the natural antioxidants in cumin seeds

Antioxidants quench oxidation by transferring hydrogen atoms to free radicals. In the present investigation, the effect of gamma irradiation on the natural antioxidants of irradiated cumin was studied. Cumin samples were purchased from retailers and then irradiated in a cobalt-60 irradiator to 0, 1, 3, 5 and 10 kGy at ambient temperature. The effect of irradiation on the antioxidant properties of the cumin seed were investigated by evaluating the radical-scavenging effect on the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radicals, determination of ferric reducing antioxidant power (FRAP), total polyphenol content (TPC) and the antioxidant index by β -carotene/linoleic acid co-oxidation. Electron spin resonance (ESR) was performed to assess ionization of cumin seeds by gamma irradiation. Irradiation was found to non-significantly increase and/or maintain all antioxidant parameters, TPC and the ESR signal intensity was found to be increased in cumin seeds [Jae Hun Kim, Mee-Hye Shin, Young-Jeong Hwang, Periasamy Srinivasan, Jae Kyung Kim, Hyun Jin, Park Myung Woo Byun and Ju Woon Lee^a (^aRadiation Food Science and Biotechnology Team, Advance Radiation Technology Institute, Korea Atomic Energy Research Institute, 1266 Sinjeong-dong, Jeongeup 580-185, Republic of Korea), *Radiat Phys Chem*, 2009, **78**(2), 153-157].

NPARR 1(1), 2010-104, Safety assessment of coriander (*Coriandrum sativum* Linn.) essential oil as a food ingredient- A Review

Coriander essential oil is used as a flavor ingredient, but it also has a long history as a traditional medicine. It is obtained by steam distillation of the dried fully ripe fruits (seeds) of *Coriandrum sativum*: Linn. The oil is a colorless or pale yellow liquid with a characteristic odour and mild, sweet, warm and aromatic flavor; linalool is the major constituent (~70%). Based on the results of a 28 day oral gavage study in rats, a NOEL for coriander oil is approximately 160mg/kg/day. In a developmental toxicity study, the maternal NOAEL of coriander oil was 250mg/kg/day and the developmental NOAEL was 500mg/kg/day. Coriander oil is not

clastogenic, but results of mutagenicity studies for the spice and some extracts are mixed; linalool is non-mutagenic. Coriander oil has broad-spectrum, antimicrobial activity. Coriander oil is irritating to rabbits, but not humans; it is not a sensitizer, although the whole spice may be. Based on the history of consumption of coriander oil without reported adverse effects, lack of its toxicity in limited studies and lack of toxicity of its major constituent, linalool, the use of coriander oil as an added food ingredient is considered safe at present levels of use [George A. Burdock^a and Ioana G. Carabin (^aBurdock Group, 801 N Orange Ave, Suite 710, Orlando, FL 32801, United States), *Food Chem Toxicol*, 2009, **47**(1), 22-34].

THERAPEUTICS

NPARR 1(1), 2010-105, **Plantain (*Plantago* Linn.) species as novel sources of flavonoid antioxidants**

To examine the antioxidant properties of methanol extracts of selected *Plantago* species (*P. argentea* Chaix., *P. holosteam* Scop., *P. major* Linn., *P. maritima* Linn. and *P. media* Linn.), various assays that measure free radical scavenging ability were carried out: DPPH, hydroxyl radical, superoxide anion and nitric oxide scavenger capacity tests, reducing power (FRAP) assay and Fe²⁺/ascorbate induced lipid peroxidation. In all of the tests extracts showed a potent antioxidant effect compared with BHT, a well-known synthetic antioxidant, and the extract of *P. major*, accepted as an official remedy. Besides, in examined extracts the total phenolic amount (ranging from 38.43 to 70.97 mg of GAE/g of dw) and the total flavonoid content (5.31-13.10mg of QE/g of dw) were determined. Furthermore, the presence and content of selected flavonoids (luteolin-7-*O*-glucoside, apigenin-7-*O*-glucoside, luteolin, apigenin, rutin and quercetin) were studied using LC-MS/MS technique. LC-MS/MS analysis showed noticeable qualitative and quantitative differences between the species according to which the examined *Plantago* species could be regarded as a possible new source of natural antioxidants. In this study three of the species examined, *P. maritima*, *P. argentea*, and *P. holosteam*, have been analyzed for the first time [Ivana N. Beara^a, Marija M. Lesjak, Emilija

. Jovin, Kristina J. Balog, Goran T. Ana kov, Dejan Z. Or and Neda M. Mimica-Duki (^aDepartment of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, University of Novi Sad, Trg Dositeja Obradovia 3, Novi Sad, Serbia), *J Agric Food Chem*, 2009, **57**(19), 9268-9273].

NPARR 1(1), 2010-106, **Inhibition of angiogenesis and inflammation by an extract of red clover (*Trifolium pratense* Linn.)**

Antiangiogenic compounds are gaining more and more interest as a new approach in the prevention and treatment of cancer and inflammatory diseases. The objective of this study was the evaluation of the antiangiogenic effect of a red clover extract (RCE) used in food supplements for menopausal complaints as well as of its main isoflavones in an *in vivo* system, the chorioallantoic membrane assay of fertilized hen's eggs. At a dosage of 250 µg/pellet the red clover extract showed excellent inhibition of angiogenesis. The antiangiogenic activity of the non-methylated isoflavones daidzein and genistein was higher than that of the methylated compounds formononetin and biochanin A. The results demonstrate that RCE is not only suitable for menopausal complaints, but might also be a powerful chemopreventive agent against chronic diseases e.g. which have a high incidence especially in elderly female [L. Krenn and D.H. Paper^a (^aDepartment of Pharmakognosie, University Vienna, A-1090 Vienna, Austria), *Phytomedicine*, 2009, **16**(12), 1083-1088].

NPARR 1(1), 2010-107, **In vivo genotoxicity evaluation of a plant based antiarthritic and anticancer therapeutic agent Boswellic acids in rodents**

The genotoxic potential of anti-inflammatory/antiarthritic and anticancer plant based drug molecule Boswellic acids (BA) was studied by *in vivo* system. Systematic literature survey revealed that studies on the genotoxicity of BA are not available. Although reports on genotoxicity of *Boswellia serrata* Roxb. dry extract and modified 3-*O*-acetyl-11-keto-²-boswellic acid are available and these studies were conducted in *in vitro* systems. The earlier general toxicity study of BA has been conducted by us, revealed it to be non toxic. The

genotoxicity was carried out in Wistar rats using different cytogenetic assay system-abnormalities, viz. chromosomal aberrations; sperm morphology, micronuclei and comet assays. Six groups of animals, each comprised of five rats, were taken for each study. Group 1-4 received BA at 125, 250, 500 and 1000mg/kg p.o., respectively prepared as 2% gum acacia suspension, fifth group received a positive control cyclophosphamide (CP) 40mg/kg p.o. or metronedazole (MTZ) 130mg/kg p.o. or mercuric chloride (HgCl_2) 0.864mg/kg p.o. (as per the experiment requirement) whereas the sixth group kept as vehicle control. The results on the basis of the data obtained revealed that BA is quite safe as it did not show any genotoxicity at any dose level up to 1000mg/kg. The positive controls used in different experiments showed highly significant abnormal cytogenetic changes in comparison to the control group [R. Sharma, S. Singh^a, G.D. Singh, A. Khajuria, T. Sidiq, S.K. Singh, G. Chashoo, S.S. Pagoch, A. Kaul, A.K. Saxena, R.K. Johri and S.C. Taneja (^aDepartment of Pharmacology, Indian Institute of Integrative Medicine, CSIR, Canal Road, Jammu Tawi, J&K 180001, India), *Phytomedicine*, 2009, **16**(12), 1112-1118].

NPARR 1(1), 2010-108, Pomegranate (*Punica granatum* Linn.) purified polyphenol extract inhibits influenza virus and has a synergistic effect with oseltamivir

Influenza epidemics cause numerous deaths and millions of hospitalizations each year. Because of the alarming emergence of resistance to anti-influenza drugs, there is a need to identify new naturally occurring antiviral molecules. The hypothesis that pomegranate polyphenol extract (PPE) has anti-influenza properties was tested. Using real time PCR, plaque assay and TCID₅₀ haemagglutination assay, have shown that PPE suppresses replication of influenza A virus in MDCK cells. PPE inhibits agglutination of chicken red blood cells (cRBC) by influenza virus and is virucidal. The single-cycle growth conditions indicated that independent of the virucidal effect PPE also inhibits viral RNA replication. PPE did not alter virus ribonucleoprotein (RNP) entry into nucleus or translocation of virus RNP from nucleus to cytoplasm

in MDCK cells. Four major Polyphenols in PPE (ellagic acid, caffeic acid, luteolin and punicalagin) were evaluated and demonstrated that punicalagin is the effective, anti-influenza component of PPE. Punicalagin blocked replication of the virus RNA, inhibited agglutination of chicken RBC's by the virus and had virucidal effects. Furthermore, the combination of PPE and oseltamivir synergistically increased the anti-influenza effect of oseltamivir. Thus PPE inhibited the replication of human influenza A/Hong Kong (H3N2) *in vitro*. Pomegranate extracts should be further studied for therapeutic and prophylactic potential especially for influenza epidemics and pandemics [Mehran Haidari, Muzammil Ali, Samuel Ward Casscells III and Mohammad Madjid^a (^aUniversity of Texas Health Science Center at Houston, USA), *Phytomedicine*, 2009, **16**(12), 1127-1136].

NPARR 1(1), 2010-109, Vasodilatory actions of xanthenes isolated from a Tibetan herb, *Halenia elliptica* D. Don

In this study, six major xanthenes, isolated and identified from *Halenia elliptica* D. Don were investigated for their vasodilatory actions in isolated rat coronary artery. The xanthenes, including 1-hydroxy-2,3,5-trimethoxy-xanthone (HM-1), 1-hydroxy-2,3,4,7-tetramethoxy-xanthone (HM-2), 1-hydroxy-2,3,4,5-tetramethoxy-xanthone (HM-3), 1,7-dihydroxy-2,3,4,5-tetramethoxy-xanthone (HM-4), 1,5-dihydroxy-2,3-dimethoxy-xanthone (HM-5) and 1,7-dihydroxy-2,3-dimethoxy-xanthone (HM-7) caused vasodilation in the coronary artery pre-contracted with 1 μM 5-hydroxytryptamine (5-HT), with EC₅₀ values ranging from 1.4 \pm 0.1 μM (HM-1) to 6.6 \pm 1.4 μM (HM-2). The EC₅₀ values of the other xanthenes were between those of HM-1 and HM-2. Removal of endothelium of the coronary artery led to decreases in the vasorelaxant effects of HM-1, HM-7 but not HM-2, HM-3, HM-4 and HM-5. These results showed that xanthenes isolated from *H. elliptica* are vasoactive substances which exhibit either endothelium-dependent or endothelium-independent mechanisms in rat coronary artery. The potency and mechanism(s) of the vasorelaxant effects of these xanthenes may be relevant to the structure-activity differences in the level

and the position of the substituent groups with the primary xanthone structure [Yan Wang, Jian-Gong Shi, Mu-Zou Wang, Chun-Tao Che and John H.K. Yeung^a (^aDepartment of Pharmacology, Faculty of Medicine, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong, China), *Phytomedicine*, 2009, **16**(12), 1144-1150].

NPARR 1(1), 2010-110, *In vitro* antioxidant and antihyperlipidemic activities of *Bauhinia variegata* Linn.

The study was conducted to evaluate the ethanolic and aqueous extracts of *Bauhinia variegata* Linn. for *in vitro* antioxidant and antihyperlipidemic activity. Ethanolic and aqueous extracts of the stem bark and root of *B. variegata* Linn. were prepared and assessed for *in vitro* antioxidant activity by various methods namely total reducing power, scavenging of various free radicals such as 1,2-diphenyl-2-picrylhydrazyl (DPPH), super oxide, nitric oxide and hydrogen peroxide. The percentage scavenging of various free radicals were compared with standard antioxidants such as ascorbic acid and butylated hydroxytoluene (BHT). The extracts were also evaluated for antihyperlipidemic activity in Triton WR-1339 (iso-octyl polyoxyethylene phenol)-induced hyperlipidemic albino rats by estimating serum triglyceride, very low density lipids (VLDL), cholesterol, low-density lipids (LDL) and high-density lipoprotein (HDL) levels. Significant antioxidant activity was observed in all the methods, ($P < 0.01$) for reducing power and ($P < 0.001$) for scavenging DPPH, super oxide, nitric oxide, and hydrogen peroxide radicals. The extracts showed significant reduction ($P < 0.01$) in cholesterol at 6 and 24h and ($P < 0.05$) at 48h. There was significant reduction ($P < 0.01$) in triglyceride level at 6, 24, and 48h. The VLDL level was also significantly ($P < 0.05$) reduced from 24h and maximum reduction ($P < 0.01$) was seen at 48h. There was significant increase ($P < 0.01$) in HDL at 6, 24, and 48 h. From the results, it is evident that alcoholic and aqueous extracts of *B. variegata* Linn. can effectively decrease plasma cholesterol, triglyceride, LDL, and VLDL and increase plasma HDL levels. In addition, the alcoholic and aqueous extracts have shown significant antioxidant activity. By the virtue of its antioxidant activity, *B. variegata* Linn. may show

antihyperlipidemic activity [GP Rajani^a and Purnima Ashok (^aDepartment of Pharmacology, K. L. E. Society's College of Pharmacy, Bangalore, India), *Indian J Pharmacol*, 2009, **41**(5), 227-232].

NPARR 1(1), 2010-111, Antibacterial and antioxidant activity of methanol extract of *Evolvulus nummularius* (Linn.) Linn.

The study was conducted to evaluate the antibacterial and antioxidant activity of methanol extract of *Evolvulus nummularius* (Linn.) Linn. Disc diffusion and broth serial dilution tests were used to determine the antibacterial activity of the methanol extract against two Gram-positive bacterial strains (*Bacillus subtilis* NCIM 2718, *Staphylococcus aureus* ATCC 25923) and three Gram-negative bacterial strains (*Pseudomonas aeruginosa* ATCC 27853, *Klebsiella pneumoniae* ATCC 70063 and *Escherichia coli* ATCC 25922). The methanol extract was subjected to preliminary phytochemical analysis. Free radical scavenging activity of the methanol extract at different concentrations was determined with 2,2-diphenyl-1-picrylhydrazyl (DPPH). The susceptible organisms to the methanol extract were *Escherichia coli* (MIC=12.50 mg/ml) and *Bacillus subtilis* (MIC=3.125 mg/ml) and the most resistant strains were *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. The methanol extracts exhibited radical scavenging activity with IC₅₀ of 350 µg/ml. The results from the study show that methanol extract of *E. nummularius* has antibacterial activity. The antioxidant activity may be attributed to the presence of tannins, flavonoids and triterpenoids in the methanol extract. The antibacterial and antioxidant activity exhibited by the methanol extract can be corroborated to the usage of this plant in Indian folk medicine [PS Pavithra, N Sreevidya, Rama S Verma^a (^aDepartment of Biotechnology, Indian Institute of Technology Madras, Chennai - 600 036, TN, India), *Indian J Pharmacol*, 2009, **41**(5), 233-236].

NPARR 1(1), 2010-112, Mutagenic and antimutagenic activities of aqueous and methanol extracts of *Euphorbia hirta* Linn.

Euphorbia hirta Linn. is a weed commonly found in tropical countries and has been used traditionally for asthma, bronchitis and conjunctivitis. However, one of the constituents in this plant, quercetin was previously reported to be mutagenic. This work aimed to determine the level of quercetin in the aqueous and methanol plant extracts and to investigate the mutagenic effects of quercetin and the extracts in the Ames test utilising the mutant *Salmonella typhimurium* TA98 and TA100 strains. The antimutagenic activity of *E. hirta* aqueous and methanol extracts was also studied in *S. typhimurium* TA98. HPLC analyses showed that quercetin and rutin, a glycosidic form of quercetin, were present in the acid-hydrolysed methanol extract and non-hydrolysed methanol extract, respectively. The quercetin concentration was negligible in both non-hydrolysed and acid-hydrolysed aqueous extracts. The total phenolic contents in *E. hirta* were determined to be 268 and 93mg gallic acid equivalent (GAE) per gram of aqueous and methanol extracts, respectively. Quercetin (25µg/ml) was found to be strongly mutagenic in *S. typhimurium* TA98 in the absence and presence of S-9 metabolic activation. However, both the aqueous and methanol extracts did not demonstrate any mutagenic properties when tested with *S. typhimurium* TA98 and TA100 strains at concentrations up to 100 µg/ml in the absence and presence of S-9 metabolic activation. In the absence of S-9 metabolic activation, both the extracts were unable to inhibit the mutagenicity of the known mutagen, 2-nitrofluorene, in *S. typhimurium* TA98. On the other hand, the aqueous extracts at 100 µg/ml and methanol extracts at 10 and 100 µg/ml exhibited strong antimutagenic activity against the mutagenicity of 2-aminoanthracene, a known mutagen, in the presence of S-9 metabolic activating enzymes. The results indicated that these extracts could modulate the xenobiotic metabolising enzymes in the liver at the higher concentrations [Daphne Sue Yen Loh, Hui Meng Er^a and Yu Sui Chen (^aSchool of Pharmacy and Health Sciences, International Medical University, No. 126, Jalan 19/155B, 57000, Bukit Jalil, Kuala Lumpur, Malaysia), *J Ethnopharmacol*, 2009, **126**(3), 406-414].

NPARR 1(1), 2010-113, *In vivo* efficacy of

***Trachyspermum ammi* anticalcifying protein in urolithiatic rat model**

In this report, the antilithiatic activity of *Trachyspermum ammi* (Linn.) Sprag. anticalcifying protein (TAP) was studied in urolithiatic rat model. Urolithiasis was induced by exposure of 0.4% ethylene glycol (EG) and 1.0% ammonium chloride (NH₄Cl) for 9 days. The efficacy of TAP was studied in another group given same dose of EG and NH₄Cl in addition to 2mg/kg body weight of TAP. The ability of TAP to inhibit the attachment of calcium oxalate (CaO_x) crystal in kidney tissue and studied the consequences of CaO_x adhesion on renal functioning and tissue integrity was also evaluated. The antilithiatic potential of TAP was confirmed by its ability to maintain renal functioning, reduce renal injury and decrease crystal excretion in urine and retention in renal tissues. Thus, the present investigation suggests the potential of TAP in preventing calcium oxalate deposition and forms the basis for the development of antilithiatic drug interventions against urolithiasis [Tanzeer Kaur, Rakesh K. Bijarnia, Surinder K. Singla and Chandardeep Tandon^a (^aDepartment of Biotechnology and Bioinformatics, Jaypee University of Information Technology, Wagnaghat 173215, Solan, India), *J Ethnopharmacol*, 2009, **126**(3), 459-462].

NPARR 1(1), 2010-114, Antimycobacterial terpenoids from *Juniperus communis* Linn. (Cupressaceae)

Juniperus communis is a plant which has been reported as a traditional cure for tuberculosis (TB) and other respiratory diseases. The aim of this study was to isolate and identify the constituents responsible for the activity of the *n*-hexane extract of *Juniperus communis* Linn. roots against *Mycobacterium tuberculosis* H₃₇Rv and *J. communis* aerial parts against *Mycobacterium aurum*. Subsequently, it was to evaluate the activity of the pure isolated compounds against (i) drug-resistant *M. tuberculosis* variants, (ii) non-replicating *M. tuberculosis* and (iii) a range of non-tuberculous mycobacteria (NTM). The antimycobacterial activity of *J. communis* extracts, fractions and constituents was determined against *M. tuberculosis* H₃₇Rv and against

rifampicin-, isoniazid-, streptomycin- and moxifloxacin-resistant variants, using the microplate broth Alamar Blue assay (MABA) method. Isolated constituents were tested against non-replicating *M. tuberculosis* H₃₇Rv, using the low oxygen recovery assay (LORA) and against NTM (*M. aurum*, *M. phlei*, *M. fortuitum* and *M. smegmatis*), using a broth microdilution method. Cytotoxicity studies were performed using mammalian Vero cells.

The antimycobacterial activity of *J. communis* was attributed to a sesquiterpene identified as longifolene (1) and two diterpenes, characterised as totarol (2) and *trans*-communic acid (3). All compounds were identified following analysis of their spectroscopic data (1D- and 2D-NMR, MS) and by comparison with the literature and commercial authentic standards when available. Revised assignments for 3 are reported. Totarol showed the best activity against *M. tuberculosis* H₃₇Rv (MIC of 73.7 µM). It was also most active against the isoniazid-, streptomycin-, and moxifloxacin-resistant variants (MIC of 38.4, 83.4 and 60 µM, respectively). Longifolene and totarol were most active against the rifampicin-resistant variant (MICs of 24 and 20.2 µM, respectively). Totarol showed the best activity in the LORA assay (MIC of 81.3 µM) and against all NTM species (MICs in the range of 7-14 µM). *Trans*-communic acid showed good activity against *M. aurum* (MIC of 13.2 µM). The low selectivity indices (SI) obtained following cytotoxicity studies indicated that the isolated terpenoids were relatively toxic towards mammalian cells. This is the first report of the isolation of (1) and (2) from *J. communis* roots and of (3) from the aerial parts. The antimycobacterial activity of (1) and (3) and the activity of (2) against *M. aurum*, *M. fortuitum* and *M. phlei*, is reported for the first time. The effect of totarol on drug-resistant variants and non-replicating *M. tuberculosis* has never been published. The presence of antimycobacterial terpenoids in *J. communis* aerial parts and roots justifies, to some extent, the ethnomedicinal use of this species as a traditional anti-TB remedy [Andréa Y. Gordien, Alexander I. Gray, Scott G. Franzblau and Véronique Seidel^a (^aNatural Products Research Laboratories, Strathclyde Institute of Pharmacy and Biomedical

Sciences, University of Strathclyde, Glasgow G4 0NR, UK), *J Ethnopharmacol*, 2009, **126**(3), 500-505].

NPARR 1(1), 2010-115 **Assessment of antiradical potential of *Calluna vulgaris* (Linn.) Hull and its major flavonoid**

Antioxidant capacity of the chloroform, ethyl acetate, *n*-butanol and water fractions of the aerial parts of *Calluna vulgaris* (Linn.) Hull (Ericaceae) has been assessed in this study. Antioxidant capacity of the plant was screened by assays of 2, 2-diphenyl-β-picrylhydrazyl, superoxide anion and hydrogen peroxide scavenging, metal-chelating activity and reducing power. Butylated hydroxyanisole was used as reference in all assays; ethylene diamine tetraacetic acid was also used as reference in the assay of metal-chelating activity. Total phenolic contents of the fractions were determined by the Folin-Ciocalteu method. Liquid chromatography/diode array detection/mass spectrometry was used for phytochemical identification of the fractions. Kaempferol-3-*O*-β-D-galactoside was found to be the major constituent in the ethyl acetate fraction (37.1 ± 0.9%), followed by the *n*-butanol fraction (4.6 ± 0.1%). High occurrence of antioxidant capacity, with the exception of metal-chelating activity, was observed in the ethyl acetate and chloroform fractions as well as in kaempferol-3-*O*-β-D-galactoside. *C. vulgaris* and its major flavonoid, kaempferol-3-*O*-β-D-galactoside, show high antioxidant capacity in various assays. As far as is known, this is the first report on antioxidant capacity of *C. vulgaris* and its major flavonoid [Didem Deliorman-Orhan, Sezer Senol, Murat Kartal, Ilkay Orhan^a (^aDepartment of Pharmacognosy, Gazi University, 06330 Ankara, Turkey), *J Sci Food Agric*, 2009, **89**(5), 809-814].

NPARR 1(1), 2010-116, **Novel hypoglycemic effects of *Ganoderma lucidum* water-extract in obese/diabetic (+db/+db) mice**

In this study, the pharmacological effects of *Ganoderma lucidum* (*G. lucidum*) (water-extract) (0.003, 0.03 and 0.3g/kg, 4-week oral gavage) consumption using the lean (+db/+m) and the obese/diabetic (+db/+db) mice was evaluated. Different physiological parameters (plasma glucose and insulin

levels, lipoproteins-cholesterol levels, phosphoenolpyruvate carboxykinase (PEPCK), 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMG CoA reductase) and isolated aorta relaxation of both species were measured and compared. *G. lucidum* (0.03 and 0.3g/kg) lowered the serum glucose level in +db/+db mice after the first week of treatment whereas a reduction was observed in +db/+m mice only fed with 0.3g/kg of *G. lucidum* at the fourth week. A higher hepatic PEPCK gene expression was found in +db/+db mice. *G. lucidum* (0.03 and 0.3g/kg) markedly reduced the PEPCK expression in +db/+db mice whereas the expression of PEPCK was attenuated in +db/+m mice (0.3g/kg *G. lucidum*). HMG CoA reductase protein expression (in both hepatic and extra-hepatic organs) and the serum insulin level were not altered by *G. lucidum*. These data demonstrate that *G. lucidum* consumption can provide beneficial effects in treating type 2 diabetes mellitus (T2DM) by lowering the serum glucose levels through the suppression of the hepatic PEPCK gene expression [S.W. Seto, T.Y. Lam, H.L. Tam, A.L.S. Au, S.W. Chan, J.H. Wu, P.H.F. Yu, G.P.H. Leung, S.M. Ngai, J.H.K. Yeung, P.S. Leung, S.M.Y. Lee and Y.W. Kwan^a (^aInstitute of Vascular Medicine, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong), *Phytomedicine*, 2009, **16**(5), 426-436].

NPARR 1(1), 2010-117, Treatment of oral thrush in HIV/AIDS patients with lemon juice and lemon grass (*Cymbopogon citratus*) and gentian violet

The purpose of the study was to investigate the safety and efficacy of lemon juice and lemon grass (*Cymbopogon citratus*) in the treatment of oral thrush in HIV/AIDS patients when compared with the control group using gentian violet aqueous solution 0.5%. Oral thrush is a frequent complication of HIV infection. In the Moretele Hospice, due to financial constraints, the treatment routinely given to patients with oral thrush is either lemon juice directly into the mouth or a lemon grass infusion made from lemon grass (*Cymbopogon citratus*) grown and dried at the hospice. These two remedies have been found to be very efficacious therefore are used extensively. Gentian violet, the first line medication for oral thrush in South Africa, is not

preferred by the primary health clinic patients due to the visible purple stain which leads them to being stigmatized as HIV-positive. *Cymbopogon citratus* and *Citrus limon* have known antifungal properties [S.C. Wright^a, J.E. Maree and M. Sibanyoni (^aAdelaide Tambo School of Nursing Science, Tshwane University of Technology, Staatsartillerie Road, Pretoria-West, Pretoria 0001, Gauteng, South Africa), *Phytomedicine*, 2009, **16**(2-3), 118-124].

NPARR 1(1), 2010-118, Hepatoprotective activity of *Eugenia jambolana* Lam. in carbon tetrachloride treated rats

To estimate the hepatoprotective effects of the methanolic seed extract of *Eugenia jambolana* Lam. (Myrtaceae), in Wistar albino rats treated with carbon tetrachloride (CCl₄) was investigated. Liver damage in rats treated with CCl₄ (1ml/kg/Bw, administered subcutaneously, on alternate days for one week) was studied by assessing parameters such as serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP), acid phosphatase (ACP) and bilirubin (total and direct). The effect of co-administration of *E. jambolana* Lam. (doses 100, 200 and 400 mg/kg p. o.) on the above parameters was investigated. These biochemical observations were supplemented by weight and histological examination of liver sections. Liv.52[®] was used as positive control. Data were analyzed by one way ANOVA, followed by Scheff's/Dunnett's test. Administration of *E. jambolana* Lam. (doses 100, 200 and 400 mg/kg p. o.) significantly prevented carbon tetrachloride induced elevation of serum SGOT, SGPT, ALP, ACP and bilirubin (total and direct) level. Histological examination of the liver section revealed hepatic regeneration, after administration of various doses of *E. jambolana* Lam. The results were comparable to that of Liv.52[®]. The study suggests preventive action of *E. jambolana* Lam. in carbon tetrachloride induced liver toxicity. Hepatic cell regeneration process was dose dependent [SS Sisodia^a, M Bhatnagar (^aDepartment of Pharmacology, Bhupal Nobles' Girls College of Pharmacy, Udaipur, Rajasthan, India), *Indian J Pharmacol*, 2009, **41**(1), 23-27].

VEGETABLES

NPARR 1(1), 2010-119, Performance analysis of drying of carrot slices in a semi-industrial continuous band dryer

This paper presents the energy and exergy analysis of drying process in a semi-industrial continuous band dryer. Experiments were performed on thin layer drying of carrot slices with thickness of 5mm, at air temperatures of 50, 60 and 70 °C, drying air mass flow rates of 0.61, 1.22 and 1.83kg/s and feeding rates of 2.98×10^{-4} , 3.48×10^{-4} and 4.16×10^{-4} kg/s. The effects of drying variables were evaluated on weight loss of dried products, energy utilization, energy utilization ratio, exergy loss and exergy efficiency. An amount of 250g of fresh material was used on each band for drying experiments and the weight loss of dried samples were found to be in the range of 51.6-84.4% of initial weight. The energy utilization and energy utilization ratio varied between 3.78-25.57kJ/s and 0.1554-0.3752, respectively. The exergy loss and exergy efficiency were found to be in the range of 0.6677-14.1577kJ/s and 0.5527-0.9329, respectively [Mortaza Aghbashlo, Mohammad Hossien Kianmehr and Akbar Arabhosseini (Department of Agricultural Technical Engineering, Aburaihan Campus, University of Tehran, P.O. Box 11365-4117, Tehran, Iran), *J Food Eng*, 2009, **91**(1), 99-108]

NPARR 1(1), 2010-120, Effect of UV-C radiation on quality of minimally processed spinach leaves

The fresh-cut vegetable industry commonly uses sodium hypochlorite (NaOCl) for disinfection. However, certain problems with NaOCl usage have led to the investigation of alternative sanitization treatments. In this respect, UV-C radiation could be of interest.

The effect of four pre-packaging UV-C radiation doses (0, 4.54, 7.94 and 11.35 kJm⁻²) and two storage temperatures (5 and 8°C) on the quality of minimally processed spinach (*Spinacia oleracea* Linn.) leaves was studied over a period of 13 days. UV-C radiation decreased mesophilic and psychophilic counts just after its application compared with conventional sanitization washing (150mg/l NaOCl). However, UV-C had no

residual effect on microbial growth from 6 to 13 days at 5 and 8°C. During shelf-life a slight loss of lightness was found, probably related to superficial tissue damage induced particularly in higher-UV-C treated leaves. Total antioxidant activity and polyphenol content decreased gradually throughout storage, being more evident in higher-UV-C treated leaves stored at 8°C. The general trend was to maintain the initial chlorophyll content during shelf-life. Low to moderate UV-C radiation can be an effective alternative to chlorine for sanitizing minimally processed spinach leaves and preserving their quality [Francisco Artés-Hernández^a, Víctor Hugo Escalona, Pedro Antonio Robles, Ginés Benito Martínez-Hernández and Francisco Artés (^aPostharvest and Refrigeration Group, Department of Food Engineering, Technical University of Cartagena, Paseo Alfonso XIII, 48, E-30203 Cartagena, Murcia, Spain), *J Sci Food Agric*, 2009, **89**(3), 414-421].

NPARR 1(1), 2010-121 Impact of hot water treatment on sprouting, membrane permeability, sugar content and chip colour of reconditioned potato tubers following long-term cold storage

The efficacy of hot water treatment in facilitating successful reconditioning of processing potato (*Solanum tuberosum* Linn.) cultivar Hermes following 6 months cold storage at 4.5°C was examined. Tubers were subjected to hot water treatments (HWTs) at 52.5, 55.0, 57.5 and 60.0°C for 0-60, 0-50, 0-40 and 0-20 min, respectively and then reconditioned for 20 days at 16°C before evaluated for sprouting, fresh weight loss, membrane permeability, sugar content and processing quality. The study demonstrates that in order to achieve complete inhibition of sprouting during potato reconditioning HWTs must exceed the thermal tolerance threshold of the tubers. Short-duration HWT was effective in retarding sprout growth and tuber dehydration without significantly affecting storage parenchyma membrane permeability, tuber sugar content or processing quality. On the contrary, prolonged HWT caused extensive heat damage, loss of membrane integrity and induced an increase in tuber sucrose and reducing sugar content resulting in deterioration of chip colour in proportion to treatment duration. Although HWT at 52.5-60°C following long-term cold storage

did not improve the processing quality of potato tubers after 20 days of reconditioning, future work is needed to evaluate the effect of short-duration HWT on the permissible extent of reconditioning and subsequent processing quality [Marios C Kyriacou^a, Dimitrios Gerasopoulos, Anastasios S Siomos and Ioannis M Ioannides (^aAgricultural Research Institute, P.O. Box 22016, 1516 Nicosia, Cyprus), *J Sci Food Agric*, 2009, **88**(15), 2682-2687].

NPARR 1(1), 2010-122, Antioxidant properties and shelf-life extension of fresh-cut tomatoes stored at different temperatures

The feasibility of using modified atmosphere packaging (5 kPa O₂ + 5 kPa CO₂) to maintain the antioxidant properties of fresh-cut tomatoes during shelf-life was assessed through storage at different temperatures (5, 10, 15 and 20°C). Health-related compounds, antioxidant capacity, microbiological counts, physico-chemical parameters and in-package atmosphere of tomato slices were determined. Initial lycopene, vitamin C and phenolic contents and physico-chemical parameters of tomato slices were well maintained for 14 days at 5°C. Lycopene and total phenolic contents were enhanced over time in tomato slices stored at 15 and 20°C. However, this increase in antioxidant compounds of fresh-cut tomatoes during storage may be associated with excessive amounts of CO₂ ($R^2=0.5679-0.7328$) in the packages due to microbial growth. Although keeping tomato slices at temperatures above 10°C increased their antioxidant content, the shelf-life of the product was reduced by up to 4 days. A storage temperature of 5°C is appropriate for maintaining the microbiological shelf-life of fresh-cut tomatoes for up to 14 days and also allows the antioxidant properties of tomato slices to be retained over this period, thus reducing wounding stress and deteriorative changes [Isabel Odriozola-Serrano, Robert Soliva-Fortuny, Olga Martín-Belloso^a (^aDepartment of Food Technology, UTPV-CeRTA, University of Lleida, Rovira Roure 191, E-25198 Lleida, Spain), *J Sci Food Agric*, 2009, **88**(15), 2606-2614].

NPARR 1(1), 2010-123 Extraction and characterization of pectin methylesterase from

black carrot (*Daucus carota* Linn.)

This study was carried out to determine some of the biochemical properties of pectin methylesterase (PME) from black carrot. The enzyme showed very high activity in a broad pH range of 6.5-8.5, with the optimum pH occurring at 7.5. The optimum temperature for maximal PME activity was found to be 55°C. NaCl enhanced PME activity, particularly at 0.2M. K_m and V_{max} values for black carrot PME using apple pectin as substrate were found to be 2.14mg/ml ($r^2=0.988$) and 3.75units/ml, respectively. The enzyme was stable between the temperatures of 30-50°C/5min whereas it lost nearly all of its activity at 70°C/5min. E_a and Z values were found to be 196.8kJmol⁻¹ ($r^2=0.996$) and 2.16°C ($r^2=0.995$), respectively [M. Ümit Ünal^a and Ender Bellur (^aUniversity of Cukurova, Faculty of Agriculture, Department of Food Engineering, Balcali, 01330 Adana, Turke), *Food Chem*, 2009, **116**(4), 836-840].

NPARR 1(1), 2010-124, Extension of green bell pepper shelf life using oilseed-derived lipid films from soapstock

Edible films have been used for decades on fresh produce to create a semi-permeable membrane on the surface to suppress respiration, control moisture loss and more recently to provide a delivery mechanism for the inclusion of functional components. Scientists at the Southern Regional Research Center (SRRC) have previously demonstrated that a thin biodegradable film can be produced from soapstock, an underused byproduct from the vegetable oil industry. After physical and chemical treatments, a thin film was produced from various soapstocks (cottonseed and safflower). Different hydration ratios were tested since the initial soapstock solutions were rather viscous. To examine the potential use of an oilseed-derived lipid film for the extension of shelf life, different types of the oilseed-derived soapstocks were utilized to produce lipid films with different hydration ratios and containing 0, 5, and 10% of paraffin wax for application on 'Camelot' bell peppers. Control bell peppers lost almost 25% weight per unit surface area (SA) in 78h when stored under ambient conditions. Cottonseed film-coated peppers, hydrated at 1:4, lost only about 5% moisture per unit SA after 78h and minimized weight loss by up to 79%

compared to the control. However, since a 1:4 hydration ratio remained rather viscous, 1:8 was preferred and these cottonseed films reduced weight loss per unit SA by up to 48% during storage. Safflower-derived soapstock film resulted in the least effective water retention of the films and ratios tested, with roughly 21-25% reduction in weight loss per SA compared to controls. Safflower-derived soapstock was higher in unsaturated fatty acids, which are less efficient to control moisture migration because they are more polar than saturated lipid materials, as contained in cottonseed-derived materials. Addition of wax to the cottonseed-derived films decreased water loss slightly, similar to previous reports in the literature. An ANOVA supported the conclusion that the oilseed-derived lipid films significantly reduced moisture loss across the produce epidermis. To avoid potential allergenicity concerns in cottonseed soapstock, additional cleanup steps and tests with commonly used edible coating additives would be required before attaining food grade status [J.C. Beaulieu^a, H.S. Park, A.G. Ballew Mims and M.S. Kuk (^aUnited States Department of Agriculture, Agricultural Research Service, Southern Regional Research Center, Food Processing and Sensory Quality Unit, 1100 Robert E. Lee Boulevard, New Orleans, LA 70124, United States), *Industr Crops Prod*, 2009, **30**(2), 271-275].

NPARR 1(1), 2010,125, Effect of UV-A and UV-B irradiation on broccoli (*Brassica oleracea* Linn. Italica Group) floret yellowing during storage

UV-A or UV-B irradiation was applied to broccoli florets to investigate the effect on floret yellowing. Florets were irradiated with two UV-A doses (4.5 and 9.0kJm⁻²) and five UV-B doses (4.4, 8.8, 13.1, 17.5, and 26.3kJm⁻²) and then kept in darkness at 15°C. In general, broccoli florets retained more color after UV-B irradiation than after UV-A. UV-B doses of at least 8.8kJm⁻² resulted in surface color with a higher hue angle, as compared to those treated with 4.4kJm⁻² UV-B or without UV-B. Therefore a UV-B dose of 8.8kJm⁻² for application to different broccoli cultivars ('Pixel' and 'Sawayutaka'), harvested during the winter and early summer seasons were selected. During storage, the 'Sawayutaka' cultivar exhibited a slower decrease in

green color of florets, when compared to the 'Pixel' cultivar. UV-B treatment delayed floret yellowing and chlorophyll degradation. Broccoli harvested in winter or early summer and irradiated with UV-B during storage at 15°C had higher a chlorophyll content and hue angle value than broccoli without UV-B treatment. These results suggest that UV-B irradiation is effective in retaining the green color of florets during storage [Sukanya Aiama-or, Naoki Yamauchi^a, Susumu Takino and Masayoshi Shigyo (^aThe United Graduate School of Agricultural Science, Tottori University, Koyama-Minami, Tottori 680-8553, Japan), *Postharvest Biol Technol*, 2009, **54**(3), 177-179].

NPARR 1(1), 2010-126, Effects of harvest time and low temperature storage on the texture of cabbage leaves

Leaf textures of four cabbage cultivars (T-520, Fuyu-nobori, Satsuki-ou, and Kinkei-201) harvested in winter and spring were evaluated. Acoustic vibration signals generated during penetration of four stacked cabbage leaves were measured using a novel texture measurement system. Texture was quantified using a texture index (TI). The TI of T-520 was higher than that of Fuyu-nobori and continually declined during the entire investigation period (between February and May). However, Fuyu-nobori's TI persisted after early April. This implied that Fuyu-nobori was superior to T-520 in terms of preservation of quality. Satsuki-ou showed either an equivalent or higher TI than T-520 in May. Kinkei-201 had a much lower TI than the other cultivars. TIs of T-520 and Fuyu-nobori stored at a 5°C for 4 weeks were lower than those of samples without storage. This implied that low temperature storage did not effectively retain the texture quality of the cabbages [Mitsuru Taniwaki^a, Masahiro Takahashi, Naoki Sakurai, Atsushi Takada and Masayasu Nagata (^aCollaborative Research Center, Hiroshima University, Higashi-Hiroshima 739-8527, Japan), *Postharvest Biol Technol*, 2009, **54**(2), 106-110].

WOOD

NPARR 1(1), 2010-127, Cornstarch and tannin in phenol-formaldehyde resins for plywood production

The performances of cornstarch-quebracho tannin-based resins designed as adhesive in the plywood production is demonstrated in this study. In this way, the cornstarch and quebracho tannin was introduced in the classic adhesive formulation in order to supply a part of phenol-formaldehyde (PF). The physical properties (rheological characterization, thermogravimetric analysis and solid phase ^{13}C NMR analysis) of the formulated resins were measured. In order to evaluate the mechanical performances of optimal cornstarch-quebracho tannin-based resins, plywood panels were produced and mechanical properties were investigated. These mechanical properties included tensile strength, wood failure and 3-point bending strength. The performance of these panels is comparable to those of plywood panels commercial PF made. The results showed that plywood panels bonded with cornstarch-quebracho tannin-PF resins (15:5:80, w/w/w) exhibited better mechanical properties than plywood panels commercial PF made. The introduction of small proportions of cornstarch and quebracho tannin in PF resins contributes to the improvement of the boiling water performance of these adhesives. The formaldehyde emission levels obtained from panels bonded with cornstarch-quebracho tannin-PF were lower to those obtained from panels bonded with control PF. Solid state CPMAS NMR spectra indicates that no reaction at all between PF resins and cornstarch and quebracho tannin. Even when reaction does evidently not occur, the addition of cornstarch and quebracho tannin improves markedly the water resistance of PF resins [Amine Moubarik^a, Antonio Pizzi, Ahmed Allal, Fatima Charrier and Bertrand Charrier, (^aSylvadour, IUT des Pays de l'Adour, Mont de Marsan, France), *Industr Crops Prod*, 2009, **30**(2), 188-193].

NPARR 1(1), 2010-128, **Manufacture of plywood bonded with kenaf core powder**

Kenaf (*Hibiscus cannabinus* Linn.) core powder was used as a binder to manufacture three-ply plywoods of sugi (*Cryptomeria japonica* D. Don) by conventional hot pressing under various manufacturing conditions: hot-pressing conditions (pressure, temperature and time) and powder conditions (grain size, spread volume, and moisture content). The adhesive shear strength and

wood failure of plywoods were measured in accordance with the Japanese Agricultural Standard (JAS) for plywood. The result showed that fine kenaf core powder played a role as an effective binder when plywoods were pressed at high pressure, which caused extreme compression of veneer cells. In addition, the adhesive shear strength of plywoods in dry conditions was high regardless of pressing temperature and time, but it was sensitive to pressing temperature and time in wet conditions. The highest adhesive shear strength was obtained from plywoods manufactured with kenaf core powder (grain size 10 μm , spread volume 200 g/m^2 , moisture content 8.6%) under hot-pressing conditions (pressure 5.0 MPa using distance bars 4 mm thick, temperature 200°C, time 20-30 min). However, the plywood could not meet the requirement for the second grade of plywood by JAS because of its low water-resistance properties [Motoe Ando^a and Masatoshi Sato [^aDepartment of Global Agricultural Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan), *J Wood Sci*, 2009, **55**(4), 283-288].

NPARR 1(1), 2010-129,, **Intercalation of wood charcoal with sulfuric acid**

Intercalation of wood charcoal with sulfuric acid (H_2SO_4) was investigated. Carbonized sugi (Japanese cedar) samples were prepared by heating at various temperatures in the range 1700-2700°C. Electrochemical oxidization was carried out in H_2SO_4 and the feasibility of intercalation was determined. In potentiometric analysis, plateaus appeared for samples carbonized at temperatures above 2300°C. In their X-ray diffraction profiles, the peak at around 26 was shifted to a smaller angle of about 22.4. These results can be considered as signs of intercalation with acid molecules. Fourier transform infrared analysis of charcoal heated at 2700°C, following washing with water and drying of the sample, showed a band at 1220/cm that was assigned to a sulfonate group. This band was not observed for samples heated at 1900°C. These observations suggest the occurrence of intercalation in the former charcoal, but not in the latter. It is concluded that wood charcoal can undergo intercalation when it has ordered stacking

of hexagonal carbon layers [Kodai Kuwata, Yukie Saito^a, Satoshi Shida and Masamitsu Ohta (^aGraduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan), *J Wood Sci*, 2009, **55**(2), 154-158].

NPARR 1(1), 2010-130, Evaluation on the suitability of some adhesives for laminated veneer lumber from oil palm trunks

Laminated veneer lumbers from oil palm trunk were manufactured using urea formaldehyde, phenol formaldehyde, melamine urea formaldehyde and phenol resorcinol formaldehyde adhesives. The density of the oil palm laminated veneer lumber was slightly higher than the solid oil palm trunk. The thickness swelling and water absorption of laminated veneer lumber of oil palm were higher than those made from rubberwood. Laminated veneer lumber bonded with phenol resorcinol formaldehyde showed higher shear strength compared to other adhesives. The contact angle on the loose surface was lower than on the tight surface. Phenol formaldehyde adhesive has a higher contact angle compared to the other adhesives [O. Sulaiman^a, N. Salim, R. Hashim, L.H.M. Yusof, W. Razak, N.Y.M. Yunus, W.S. Hashim and M.H. Azmy (^aDivision of Bio-resource, Paper and Coatings Technology, School of Industrial Technology, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia), *Mat Design*, 2009, **30**(9), 3572-3580].

NPARR 1(1), 2010-131, Ozone removal by green building materials

There is a rapidly expanding market for green building materials. Such materials are intended to be environmentally friendly, with such characteristics as low toxicity, minimal chemical emissions, ability to be recycled and durability. In addition, green materials often contain recycled and/or bio-based contents. Consequently, some green materials may undergo significant oxidation with potential for reduction of indoor ozone. In this study, 48-L electro-polished stainless steel chambers were used to study the reactive consumption of ozone by ten common green wall, flooring, ceiling and cabinetry materials (perlite-based ceiling tile, unglazed ceramic tile, natural cork wall-covering,

aluminum tinted cork wall-paper, bamboo, UV-coated bamboo, wheat board, UV-coated wheat board, sunflower board and UV-coated sunflower board). Ozone removal was quantified in terms of deposition velocity and reaction probability. Ozone removal decreased with time after initial exposure, but for several materials the ability to react with ozone was regenerated after a period of zero ozone exposure. Test materials found to have the highest ozone reaction probabilities were a perlite-based ceiling tile, natural cork wall-covering and wheat board [Chi P. Hoang, Kerry A. Kinney and Richard L. Corsi^a (Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin, 1 University Station (C1786), Austin, TX 78712, USA), *Build Envir*, 2009, **44**(8), 1627-1633].

NPARR 1(1), 2010-132, Advantages of depositing multilayer coatings for cutting wood-based products

An effective coating for cutting wood-based products, especially during interrupted cutting operations, must have excellent impact resistance, associated with excellent adhesion to the substrate, high hardness and corrosion resistance. At the beginning of the cutting operations, the impact has significant effects on the substrate, leading to variable material loss at the cutting edge. In order to improve the impact resistance of coated tools an optimized long period-multilayer coating was deposited on a cemented carbide substrate. These coatings are based on an alternate sequence of hard layers with softer monolayers, which work like a fuse in an electric circuit; when subjected to high impact stress crack propagation induces the delamination of hard layers, thereby avoiding the collapse of the entire coating, as in bulk laminated macrocomposites. From cutting tests of wood-based products, which used cutting tools coated with multilayer coatings based on Ti-W-N/Ti-W or Cr-W-N/Cr-W with different periods, the best result was achieved by the deposition of the multilayer coatings Cr-W-N/Cr-W (3 layers). This solution increases by 500% the ability to cut through wood-based products. In spite of this, the Ti-W-N (HV=51GPa; $Lc_2 > 80N$) has a slightly superior cutting performance to the Cr-W-N (HV=43GPa; $Lc_2 > 80N$).

This study based on real cutting tests and applied using identical cutting parameters to those used in the industry, shows new solutions that can be implemented with success in the industries involved in cutting wood-based products [D. Pinheiro^a, M.T. Vieira and M.-A. Djouadi (^aICEMS-Grupo de Materiais, Departamento de Engenharia Mecânica, Faculdade de Ciências e Tecnologia da Universidade de Coimbra, 3030-201 Coimbra, Portugal), *Surface Coat Technol*, 2009, **203**(20-21), 3197-3205].

OTHERS

(incl. New technologies/S&T Know-how developed, Book reviews, Forthcoming events, etc.)

New Technologies/S&T Know-how developed

Following new technologies/know how related to natural products and resources have been developed by respective institutes and universities in the recent past.

NPARR 1(1), 2010-133, **High pressure technology as a tool to obtain high quality *carpaccio* and *carpaccio*-like products from fish**

Nowadays, there is a growing interest in consuming raw or minimally processed foods and among fishery products, *carpaccio* are becoming increasingly popular. This work evaluates the physico-chemical and sensorial qualities of salmon, tuna and desalted 'bacalao, thinly sliced as *carpaccios*, and subjected to 15-min of continuous pressure and pulsed pressure in three 5-min steps (200-300MPa at 7 °C). Pressurization of salmon and tuna gave rise to an increase in the shear strength of *carpaccios*, a reduction of the water and lipid binding properties and an increase in the total colour difference. Though these changes were also detected by the sensory panel, the resulting pressurized products obtained high scores for acceptability. Desalted 'bacalao' *carpaccio* was more stable under high pressure and sensory analysis revealed that in most treatments the raw attributes had been retained. The results obtained by applying pressure in one or three consecutive cycles were, in general, the same. High-pressure treatment was shown to be an adequate tool for obtaining high-quality

desalted 'bacalao' *carpaccio*, whereas salmon and tuna suffered a loss of raw attributes. However, the resulting products acquired new sensory features which were highly accepted by the sensory panel.

From the industry viewpoint the application of high pressure to fish *carpaccios* may be appealing in a two way: firstly, the resulting *carpaccio* are presumably free of parasites and present a better microbiological quality, thereby increasing the shelf-life. Secondly, products may acquire new sensory attributes that can be very appreciated by consumers [J. Gómez-Estaca, M.E. López-Caballero^a, M.C. Gómez-Guillén, A. López de Lacey and P. Montero (^aInstituto del Frío (CSIC), José Antonio Novais 10, 28040 Madrid, Spain), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 148-154].

NPARR 1(1), 2010-134, **Production of coumaric acid from sugarcane bagasse**

This research presents a technology to produce coumaric acids from sugarcane bagasse. This research presents a technology to produce coumaric acids from sugarcane bagasse. The third step is to purify coumaric acid from the permeate of ultrafiltration by anion chromatography, and the alkaline could be reused to hydrolyze the bagasse. Phenolic acids were released from sugarcane bagasse by alkaline hydrolysis at 30°C for 4h. The alkaline hydrolysates were ultrafiltered, the permeates purified with anion exchange resin. The phenolic acids bound by the resin were desorbed by a mixture of water-ethanol-HCl solution (36: 60: 4) after washing the resin with water, ethanol and dilute HCl, respectively. The combined eluents were concentrated for crystallization and the crystals filtered and washed using 1% (v/v) HCl. After this purification process, the purity of products reached 89.7% based on coumaric acid. Results of HPLC/MS, HPLC using standard coumaric acid and ferulic acid showed that the main component of the purified bagasse hydrolysate was *p*-coumaric acid rather than ferulic acid. The purified products showed the same antioxidant activity, reducing power and free radical scavenging capacity as the standard *p*-coumaric acid. The technology could be applied on industrial scale [S. Y. Ou^a, Y.L. Luo, C.H. Huang and M. Jackson (^aDepartment of Food Science

and Engineering, Jinan University, Guangzhou 510632, China), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 253-259].

NPARR 1(1), 2010-135, Value addition to spent osmotic sugar solution (SOS) by enzymatic conversion to fructooligosaccharides (FOS), a low calorie prebiotic

Value addition of spent osmotic sugar solution (SOS) obtained after the osmotic dehydration of carrot cubes using 60°Bx sucrose solution has been studied. Two sets of experiments, one with the use of fresh carrots in every cycle of osmotic dehydration (3h) and in the other set, carrots of previous cycle were reused in successive cycles, were carried out. The SOS obtained in each cycle was concentrated to 60° Bx and used in successive cycles. FOS was produced from SOS (with or without concentration) by transfructosylation reaction of fructosyl transferase enzyme produced by *Aspergillus oryzae* MTCC 5154 under submerged fermentation condition. An FOS yield of 50.63±0.94 to 57.86±0.18% was obtained in both cases, which is comparable with the literature reports. FOS produced from SOS gets enriched with leached out bioactive components of fruits and vegetables used. The β-carotene concentration was in the range of 1300.9±25.1 to 2800±68.3µg/100ml of FOS. The colour of the FOS produced was golden brown and was much more appealing than FOS produced from sucrose.

The present investigation offers a better alternative for the use of SOS for developing a technologically viable process for the production of FOS. The resulting FOS is a highly valued low calorie, non-cariogenic prebiotic with high market demand in nutraceutical food sector [Ayyappan Appukuttan Aachary and Siddalingaiya Gurudutt Prapulla^a (^aFermentation Technology and Bioengineering Department, Central Food Technological Research Institute, Mysore-570 020, Karnataka, India), *Innov Food Sci Emerg Technol*, 2009, **10**(2), 284-288].

NPARR 1(1), 2010-136, New strategies for minimally processed cactus pear packaging

The market of ready-to-eat fruit has grown rapidly in recent years. As a consequence, there is an emergent

call for finding new preservation strategies to prolong the shelf life of minimally processed food, without compromising human and environmental safety. This work presents a preliminary study on the packaging procedures to prolong the shelf life of minimally processed cactus pears. In particular, different packaging strategies were tested by combining coating and hydrogels to different polymeric materials. Monitoring headspace gas concentrations, viable cell load of main spoilage microorganisms, sensory characteristics and weight loss, the quality decay in each packaging system was assessed. Results showed that the immersion of fresh-cut fruit into both hydro-gels strongly reduced the shelf life, most probably due to water migration from the surrounding hydro-gel to the crop. On the contrary, the coating prolonged the shelf life of the minimally processed fruit to about 13days, corresponding to an increase of about 40%, compared to the control sample. Results also suggested that the barrier properties of the selected films did not affect greatly the quality of the coated fresh-cut produce.

The technology has potential industrial applications. In fact, this paper combined the effectiveness of a natural coating applied to fresh-cut fruit to the performance of a bio-based polymeric packaging film [M.A. Del Nobile^a, A. Conte, C. Scrocco and I. Brescia (^aIstituto per la Ricerca e le Applicazioni Biotecnologiche per la Sicurezza e la Valorizzazione dei Prodotti Tipici e di Qualità, BIOAGROMED-Via Napoli, 52-71100 Foggia, Italy), *Innov Food Sci Emerg Technol*, 2009, **10**(3), 356-362].

NPARR 1(1), 2010-137, A new process for extraction of essential oil from Citrus peels: Microwave hydrodiffusion and gravity

Attention is drawn to the development of a new and green alternative technique for the extraction of essential oil from citrus peels. The process uses the hydro-diffusion phenomenon generated by microwaves to extract essential oil from the inside to the outside of the biological material and gravity to collect and separate them. The present apparatus permits fast and efficient extraction, reduces waste, avoids water and solvent consumption, and allows substantial energy savings [Nabil Bousbia, Maryline Abert Vian, Mohamed A. Ferhat, Brahim Y.

Meklati and Farid Chemat^a (^aUMR A 408, Sécurité et Qualité des Produits d'Origine Végétale, INRA, Université d'Avignon et des Pays de Vaucluse, 84000 Avignon, France), *J Food Eng*, 2009, **90**(3), 409-413].

NPARR 1(1), 2010-138, Automated cutting system to obtain the stigmas of the saffron flower

This work presents a new system or machine for automated cutting of saffron flowers in order to obtain their stigmas. The conceptual design of this machine together with an efficient implementation is described. The key point of the invention is the use of a vision system to obtain, using image analysis, the optimal cutting point. An effective and flexible computer program processes the flower image and sends the computed value to a driver that positions a simple mechanical cutting system to make a clean cut of the saffron flower. A prototype machine is used for experimentation in order to validate the proposed approach. In particular, the tests show that the method was robust with a high percentage success in flower cutting regardless of the shape and size of the flower, the flower transporter velocity, the flower orientation (upward/downward), etc. An important benefit of the proposed automated cutting system is that the flower cutting rate is increased approximately eight times over that obtained with the traditional hand method [Luis Gracia^a, Carlos Perez-Vidal and Carlos Gracia-López (^aInstituto IDF, Universidad Politécnica de Valencia, Camino de Vera s/n, 46022 Valencia, Spain), *Biosyst Eng*, 2009, **104**(1), 8-17].

NPARR 1(1), 2010-139, Response surface methodological approach for the decolorization of simulated dye effluent using *Aspergillus fumigatus fresenius*

The aim of our research was to study, effect of temperature, pH and initial dye concentration on decolorization of diazo dye Acid Red 151 (AR 151) from simulated dye solution using a fungal isolate *Aspergillus fumigatus fresenius* have been investigated. The central composite design matrix and response surface methodology (RSM) have been applied to design the experiments to evaluate the interactive effects of three most important operating variables: temperature (25-35°C),

pH (4.0-7.0), and initial dye concentration (100-200mg/l) on the biodegradation of AR 151. The total 20 experiments were conducted in the present study towards the construction of a quadratic model. Very high regression coefficient between the variables and the response ($R^2=0.9934$) indicated excellent evaluation of experimental data by second-order polynomial regression model. The RSM indicated that initial dye concentration of 150mg/L, pH 5.5 and a temperature of 30°C were optimal for maximum % decolorization of AR 151 in simulated dye solution, and 84.8% decolorization of AR 151 was observed at optimum growth conditions [Praveen Sharma, Lakhvinder Singh^a and Neeraj Dilbaghi (^aDepartment of Environmental Science & Engineering, Guru Jambheshwar University of Science & Technology, Hisar, Haryana-125001, India), *J Hazard Mat*, 2009, **161**(2-3), 1081-1086].

NPARR 1(1), 2010-140, Improved methods for extraction and quantification of resin and rubber from guayule

Guayule, a shrub native to the Chihuahuan desert, is a natural source of high quality, hypoallergenic rubber. Unlike rubber trees that produce rubber in laticifers, the rubber in guayule is produced in parenchyma cells of the bark tissue of stems and roots. Consequently, guayule tissue must be mechanically broken before the rubber can be extracted and analyzed. Since rubber extraction and analysis is time-consuming, progress towards increasing the rubber content of guayule through breeding or better cultivation practices has been limited by the slow rate of sample processing. To address the need for faster and more efficient sample throughput, conditions were optimized for automated extraction of dried guayule tissue using accelerated solvent extraction (ASE) and rapid methods were developed to replace gravimetric determination of resin and rubber content. For resin analysis, ultraviolet absorbance was used to determine resin concentration after ASE of the tissue with acetone or acetonitrile. For rubber analysis, evaporative light scattering (ELS) was used to determine the amount of rubber recovered after ASE of the tissue with cyclohexane. Extraction of guayule tissue with high latex rubber content verified that the amounts of resin and rubber determined by these methods were similar

to the amounts determined gravimetrically. Since these methods automate extraction and increase the speed of resin and rubber quantification, they could be used in combination with ASE to increase the throughput and efficiency of guayule evaluation in germplasm enhancement and agronomic improvement programs [Michael E. Salvucci^a, Terry A. Coffelt and Katrina Cornish (^aUS Department of Agriculture, Agricultural Research Service, Arid-Land Agricultural Research Center, 21881 N. Cardon Lane, Maricopa, AZ 85238, United States), *Industr Crops Prod*, 2009, **30**(1), 9-16].

NPARR 1(1), 2010-141, Development of a machine for the automatic sorting of pomegranate (*Punica granatum*) arils based on computer vision

The pomegranate is a fruit with excellent organoleptic and nutritional properties, but the fact that it is difficult to peel affects its commercialization and decreases its potential consumption. One solution is to market the arils of pomegranate in a ready-to-eat form. However, after the peeling process, unwanted material, such as internal membranes and defective arils, is extracted together with good arils and must be removed on the packing line because the presence of such material shortens the shelf life of the product or deteriorates its appearance. For different reasons, the commercial sorting machines that are currently available for similar commodities (cherries, nuts, rice, etc.) are not capable of handling and sorting pomegranate arils, thus making it necessary to build specific equipment. This work describes the development of a computer vision-based machine to inspect the raw material coming from the extraction process and classify it in four categories. The machine is capable of detecting and removing unwanted material and sorting the arils by colour. The prototype is composed of three units, which are designed to singulate the objects to allow them be inspected individually and sorted. The inspection unit relies on a computer vision system. Two image segmentation methods were tested: one uses a threshold on the R/G ratio and the other is a more complex approach based on Bayesian Linear Discriminant Analysis (LDA) in the RGB space. Both methods offered an average success rate of 90% on a validation set, the former being more intuitive for the operators, as well as faster and easier to

implement, and for these reasons it was included in the prototype. Subsequently, the complete machine was tested in industry by working in real conditions throughout a whole pomegranate season, in which it automatically sorted more than nine tons of arils [J. Blasco^a, S. Cubero, J. Gómez-Sanchís, P. Mira and E. Moltó (^aCentro de Agroingeniería, Instituto Valenciano de Investigaciones Agrarias, IVIA, Cra. Moncada-Náquera, Km 5, 46113 Moncada, Valencia, Spain), *J Food Eng*, 2009, **90**(1), 27-34].

NPARR 1(1), 2010-142, Coir-Cement Board

Panels of coir and cement conforming to BS: 5669 (Part 4) - 1989 and ISO: 8335 -1987. Low thermal conductivity, better sound insulation and fire resistance ; Capable of being painted and laminated ;Cost-effective alternative to timber, particle boards and fibre boards ; Suitable for walling, door paneling, windows, partitions and false ceiling (Central Building Research Institute, Roorkee - 247 667, Uttarakhand, India, Phone: +91-1332-272243; Fax: +91-1332-272272; Website: <http://www.cbri.org.in/index1.htm>).

NPARR 1(1), 2010-143, Sisalana Panels

Raw materials: Sisal fiber and polyester resin; Alternative to single walled press boards; Light weight, rigid and weather resistant; Screw-able and nail-able; Adequate thermal insulation and sound absorption; Panel meets IS: 12406-88 requirements; Suitable for walling, door paneling and roofing applications (Central Building Research Institute, Roorkee - 247 667, Uttarakhand, India, Phone: +91-1332-272243; Fax: +91-1332-272272; Website: <http://www.cbri.org.in/index1.htm>).

NPARR 1(1), 2010-144, Termite Control

Unique facilities for culturing termites in the lab; Evaluation of pesticides for soil treatment; Experimental stations in Dehradun, Jorhat, Hyderabad and Bangalore; Development of herbal termite-repellent coatings; Physical barriers to prevent termite entry into buildings; Effectiveness of pesticides as wood preservatives ;Studies on bio-pesticides ;Testing of termite resistance of building materials (Central Building Research Institute, Roorkee - 247 667, Uttarakhand, India, Phone: +91-

1332-272243; Fax: +91-1332-272272; Website: <http://www.cbri.org.in/index1.htm>).

NPARR 1(1), 2010-145, **Building Pests Control**

Culturing of termites and cockroaches and breeding of rats ; Development of herbal pesticidal formulations; Evaluation of pesticides; Determination of residual toxicity in soil and environment; Chemical structure elucidation of herbal pesticides; Chemical structure elucidation of herbal pesticides; Development of physical barriers to check entry of pests in buildings; Studies on integrated growth regulators; Studies on biological control (Central Building Research Institute, Roorkee-247 667, Uttarakhand, India, Phone: +91-1332-272243; Fax: +91-1332-272272; Website: <http://www.cbri.org.in/index1.htm>).

NPARR 1(1), 2010-146, **Industrial wastes - Jute reinforced polymer composites (wood substitutes)**

Some of the so-called wastes are found resourceful materials and can be used in number of applications. In order to meet the need and demand of timber products in the society and as a consequence of National Forest Policy, Timber substitute - jute reinforced polymer composites products were developed using industrial wastes such as Red mud or Fly ash in which natural fibre was used as a reinforcement materials and polymer was used a binder. The R-Wood is the result of an extensive R&D carried out by Advanced Materials and Processes Research Institute, Bhopal (formerly known as Regional Research Laboratory, CSIR in association with Building Materials and Technology Promotion Council (BMTPC), New Delhi. The wood substitute product has been approved by Central Public Works Department, Ministry of Urban Development, Govt. of India for use in all types of buildings.

In this process, processed industrial wastes (red mud or fly ash), polymer and fire retardant jute fibre are thoroughly mixed with catalyst and synthesized in moulds of required length and width. The composites matrices were fabricated with requisite pressure and cured at room temperature. Various products like full size door shutters, panels to use as partition wall, roofing sheets,

flooring tiles, and as substitute for wood in many applications (furniture, electrical board, interior decoration etc.,) can be fabricated and designed according to the requirement .

This process/technology and product is three times stronger than wood, weather resistant and durable, corrosion resistant, termite fungus, rot and rodent resistant, fire retardant, self-extinguishing nature, exempted from excise duty and cost effective [Advanced Materials and Processes Research Institute (AMPRI), Bhopal (Near Habibganj Naka, Hoshangabad Road), Bhopal-462026, India; Phone: EPBX:+91-755-2457244, 2455339; Fax:+91-755- 2457042; E-mail: ampriinfo@ampri.res.in; Website:<http://www.ampri.res.in/buildmaterialsdevnew1.htm>].

NPARR 1(1), 2010-147, **Sisal fibre reinforced - fly ash cement roofing sheet**

Asbestos fibre presently used in cement matrix for the production of asbestos sheets is imported and its use also leads to serious health hazards. AMPRI, Bhopal has conducted several experiments to effectively utilize fly ash alongwith organic fibres for the production of corrugated roofing sheets. In this process the other raw materials used are Portland cement, wire mesh and sand.

This product is an alternate of carcinogenic asbestos cement sheets. Its strength is comparable with asbestos cement sheets. It is repairable and economical. It can be made manually or mechanically and thus have great potential for use in rural areas. These products can be used in roofing, partitions etc. [Advanced Materials and Processes Research Institute (AMPRI), Bhopal (Near Habibganj Naka, Hoshangabad Road), Bhopal-462026, India; Phone: EPBX:+91-755-2457244, 2455339; Fax:+91-755- 2457042; E-mail: ampriinfo@ampri.res.in; Website:<http://www.ampri.res.in/buildmaterialsdevnew6.htm>].

NPARR 1(1), 2010-148, **Industrial/Agro waste based coating/ paint and pigment**

Cost effective and better quality paints have been developed using fly ash/blue dust/copper tailing as an extender. This process and technology opens a new avenue for industrial waste utilization leading to partial

replacement of conventional extenders. Incorporation of industrial wastes does not affect film properties like brushability, drying time and gloss. This paint can be used in industrial maintenance coatings on metallic structures for corrosion protection in moderate to severe corrosive environments, as anti-abrasive coatings, as marine coatings. The salient features of these paints are: chemical inertness, low oil absorption (18%), low

specific gravity (2.15), improved abrasion resistance, good protection against corrosion [Advanced Materials and Processes Research Institute(AMPRI), Bhopal (Near Habibganj Naka, Hoshangabad Road), Bhopal-462026, India; Phone: EPBX:+91-755-2457244, 2455339; Fax:+91-755- 2457042; E-mail: ampriinfo@ampri.res.in; Website:<http://www.ampri.res.in/buildmaterialsdevnew6.htm>].

Book Review

Plants Affecting Human Mind: Psychoactive Plants by Dr. S K Jain, Deep Publications, B-1/118, 2nd Floor, Paschim Vihar, New Delhi- 110063, India, 2009, Hardbound, ISBN: 81-85622-19-1, Price: Rs. 700, pp. 209+xi.

Plants which alter the state of mind or influence the functioning of central nervous system (CNS) are called psychoactive plants. They may be employed in many domains of medicine and psychiatry. Such plants occur naturally in the wild and are also grown. The literature on these plants is vast and scattered in the form of research and review papers. The present book is the first consolidated yet brief compilation on plants having biological activities that are grouped under the general term psychoactive. The plants which are used by tribals and other rural folk for various conditions of mind and nervous system have also been included in this book to facilitate further investigations.

The book deals with about three hundred plants, most of which occur in the wild, indigenous or naturalized in India. A brief introductory background is given in Chapter I. Chapter 2 lists the scientific or the botanical Latin name, plant family, some local and English names, habit and habitat and psychoactive property. Chemistry of most of species is briefly described in a separate section. Indices of local and English names and psychoactive properties are appended. The book is illustrated with over 100 line-drawings, halftones and number of colour plates. Important chemicals obtained from different parts of various plants are described in Chapter 3. Plants having specific psychoactive activities like, anesthetic, analgesic, antihallucination or stimulant, etc are listed in Chapter 4. In chapter 5 family wise list of plants has been provided.

Though the author of this book has mentioned that it is a result of more than ten years devotion to the subject and while preparing manuscript plant taxonomists, chemists, medical officers (for discussion over medical terms) and information scientists were consulted to present the information in correct and useful manner, the psychoactive plants are less understood. Hence it is not a book of prescription for attempting treatment of any medical conditions. There has been notable interest in research on psychoactive plants in the last half century. There is still much to be investigated on pharmacological properties of plants reported in ancient literature as well as new additions based on ethnobotanical data.

Dr Jain, being an eminent taxonomist and ethnobotanist has done critical evaluation of literature and prepared the book for researchers in botany, chemistry, psychiatry and other medical scientists who believe in efficacy of natural or herbal medicine in crude form or active constituents extracted from them. The usefulness of this big compilation is beyond doubt as far as identification of the plants shown through good quality coloured pictures and line drawings given in this book. The common names index vs botanical names appended in Chapter 6 will be highly useful for ethnobotanists and plant taxonomists both. The detailed bibliography provided at the end of the book is a bonus to its readers. Dr Jain and his team deserve appreciation for this error free, handy compilation wrapped in beautiful green cover.

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Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. **7th International Biofuels Conference: Converting Vision into an Action Plan, 11-12 February 2010, New Delhi, Delhi, India;** Website: <http://www.winrockindia.org/>
2. **International Conference on Biotechnology and Food Science (ICBFS 2010), 12-13 February 2010, Bangalore, India,** E-mail: icbfs@vip.163.com; Website: <http://www.iacsit.org/icbfs/>
3. **4th International Conference on Nano Science and Technology, Mumbai, India, 17-20 February 2010, Mumbai, Maharashtra, India;** Website: <http://www.iconsat2010.in>.
4. **18th International Conference on Alternative Medicines, 21 February 2010, Kolkata, West Bengal, India,** Dr. Suresh Kumar Agarwal, Indian Board of Alternative Medicines, 80, Chowringhee Road, Kolkata-700020, India, Fax: 0091-33-24853845 or by E-mail: ibam@vsnl.com; Website: <http://www.altmedworld.net/conference.htm>
5. **International Symposium on Aromatic and Medicinal plants (AROMED), 21-24, February 2010, Lucknow,** AROMED Secretariat, Central Institute of Medicinal and Aromatic Plants, PO: CIMAP, Kukrail Picnic Spot Road, Lucknow-226 015, India; Tel: +91-522-2716141 (Secretariat), 2359623 (Director); Fax: +91-522-2342666; E-mail: aromed@cimap.res.in; Website: <http://aromed.cimap.res.in>
6. **National Seminar on Post Harvest Management of Seed for Quality Assurance & Farmer's Prosperity, 26-27 February, 2010-Karnal, India,** Dr J. P. Sinha, IARI Regional Station, Karnal-132001; Tel. 09354176087; E-mail: jpsinha@gmail.com
7. **The 2010 International Conference on Agricultural and Animal Science (CAAS 2010), February 26-28, 2010-Singapore, 9 Jurong Town Hall Road iHUB, Singapore 609431;** Tel. +86-400-6999-648; E-mail: caas@vip.163.com; Website: <http://www.iacsit.org/caas/index.htm>.
8. **18th International Symposium on Alcohol and Biofuels Fuels (ISAF XVIII), 9-12 March 2010-AIDA, Delhi, India,** Mr. Pramod Sharma Aida, All India Distillers' Association 805, Siddharth, 96, Nehru Place, New Delhi-110019; Tel: +91 11 26432743, 26444974, 26476629 ; Fax: +91 11 26476628, E-mail: io@aidaindia.orgdistiler@vsnl.net; Website: http://www.technicalsymposium.com/International_Conference_2010_india_on_ISAF_XVIII.html
9. **International Congress of Antibodies (ICA), 24-26 March 2010-Beijing, China;** Website: <http://www.bitlifesciences.com/ica2010>.
10. **Algae Biofuel Workshop 2010-12-13 April 2010-Delhi, India;** Website: <http://www.algaebiofuelsummit.com>
11. **International Congress of Ethnobiology, 9-14 May, 2010-Tofino, British Columbia, Canada (CAN),** Website: <http://www.tbgf.org/ice/home>
12. **Innovation and Sustainable Development in Agriculture and Food, 28 June – 1st July 2010-Montpellier, France (FRA);** Website: <http://www.isda2010.net/>
13. **Global Ayurveda Meet 2010-9 July 2010-Coimbatore, Tamil Nadu, India;** Website: <http://www.ayurvedaconvention.com>.

Announcement

Original research Papers and Reviews on subjects 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