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Natural Products and Resources Repository

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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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Compilation/Editor: Dr (Mrs) Sunita Garg

Director
Dr Gangan Prathap
(*ex-officio*)

National Institute of Science Communication and Information Resources (NISCAIR), CSIR
Dr K. S. Krishnan Marg, New Delhi-110012, INDIA
Phone: 91-011-25846301 ext 258, 25846001; Fax: 91-011 2584 7062
Website: <http://nopr.niscair.res.in>
E-mail: sunitag@niscair.res.in; sunita.niscair@gmail.com; nparr@niscair.res.in; sanjayburde@niscair.res.in

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

NPARR* 2(2), 2011-0133, **Tea prepared from *Anastatica hirerochuntica* seeds contains a diversity of antioxidant flavonoids, chlorogenic acids and phenolic compounds*

HPLC–PDA–MS² was used to identify phenolic and polyphenolic compounds in an herbal tea made from seeds of *Anastatica hirerochuntica*, a plant found in the Sahara–Arabian deserts and used to treat a variety of ailments. Twenty compounds comprising a series of flavone C- and O-linked glycosides, phenolic acids, chlorogenic acids and flavonols were identified or partially identified on the basis of co-chromatography with reference compounds and MS² and MS³ fragmentation patterns. The flavones were the principal components, occurring as luteolin, apigenin and diosmetin conjugates. The antioxidant potential of individual compounds in *Anastatica* was assessed using HPLC with an on-line ABTS^{•+} detection system. This revealed that 14 compounds exhibited antioxidant activity. The highest contribution to the antioxidant capacity of the tea, 56%, came from 3,4-dihydroxybenzoic acid and caffeoyl- and dicaffeoylquinic acids while 6-C-glucosides of luteolin and apigenin contributed 41% [Noura AlGamdi, William Mullen and Alan Crozier* (College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow G12 8QQ, UK), *Phytochemistry*, 2011, 72(2-3 248-254)].

NPARR* 2(2), 2011-0134, **Impact of apple processing modes on extracted juice quality: Pressing assisted by pulsed electric fields*

The purpose of this study was to compare the effects of pulsed electric field (PEF) on apple juice characteristics (turbidity, polyphenolic content and antioxidant capacities). The pressing was used as a standard method for juice extraction. Experiments were carried out at a constant pressure ($P=3\text{bar}$) using a laboratory press cell. Two different methods for PEF application at 400V/cm were investigated (PEF

treatment of whole samples before cutting and PEF treatment of apple slices after cutting). PEF treatment resulted in increase of the juice yield from 44g/100g apple (untreated samples) to 58g/100g apple (treatment of whole apples) and 64g/100g apple (treatment of slices) after 30 min of pressing. The analysis of pH and conductivity showed no significant difference between untreated and PEF-treated samples. However, the total soluble matter content of juice increased after PEF treatment. The obtained turbidity and transmittance data evidence a noticeable improvement of juice clarity for PEF-treated samples. The PEF pre-treatment was accompanied by an increase of the content of polyphenols and intensification of the antioxidant capacities of juice. Most of these effects (juice clarity and content of antioxidants) were more pronounced for the whole treated apples as compared to untreated apples and PEF-treated apple slices. The evolution of apple browning before and after PEF treatment was more pronounced for whole samples. PEF treatment accelerates browning. The obtained data can contribute to the determination of an optimum time for PEF application. The results evidence that PEF-enhanced expression is promising for production of higher quality juices. PEF treatment of whole apples reduces the energy consumption and is advantageous for industrial applications as compared to the treatment of apple slices. PEF combined with pressing can become a good alternative to traditional process [Nabil Grimi*, Fatine Mamouni, Nikolai Lebovka, Eugène Vorobiev and Jean Vaxelaire (Université de Technologie de Compiègne, Département de Génie Chimique, Unité Transformations Intégrées de la Matière Renouvelable, Centre de Recherche de Royallieu, B.P. 20529-60205, Compiègne Cedex, France), *Journal of Food Engineering*, 2011, 103(1), 52-61].

NPARR* 2(2), 2011-0135, **How trigeminal, taste and aroma perceptions are affected in mint-flavored carbonated beverages*

The integration of olfactory, taste and trigeminal perceptions must be taken into account to better understand the perception of beverages. To do this,

seven beverages were formulated to investigate the role of ingredients on trigeminal perception. All mutual interactions between olfactory, gustatory and trigeminal perceptions were studied. Instrumental measurements and sensory evaluation were used to elucidate both physicochemical and sensory interactions. Sensory profiling was conducted according to monadic product presentation, and *in vivo* aroma release was assessed in the nasal cavities of subjects during beverage consumption.

This study further revealed the influence of trigeminal perception on taste and aroma in complex beverages. The addition of CO₂ in beverages induced a decrease in sweetness perception, an increase in sourness perception and an enhancement of aroma perception. Physicochemical and/or physical mechanisms (pH, aroma stripping effect) were assumed to be at the origin of these gustatory and olfactory interactions. Furthermore, the addition of mint flavoring enhanced tingling and freshness perceptions, highlighting perceptual interactions. The presence of sugar was shown to decrease the freshness perception but not the tingling perception [A. Saint-Eve*, I. Délérís, G. Feron, D. Ibarra, E. Guichard and I. Souchon (AgroParisTech, UMR 782 GMPA, 78850 Thiverval-Grignon, France), *Food Quality and Preference*, 2010, 21(8), 1026-1033].

NPARR 2(2), 2011-0136, Fingerprint of volatile flavour constituents and antioxidant activities of teas from Thailand

The volatile flavour components of different teas growing in Thailand were extracted using the simultaneous distillation and extraction (SDE) technique. These volatiles were investigated by GC-MS. At least 54 components representing 76.51–83.32% of all samples were identified. Hotrienol, geraniol and linalool were found to be the major components in Green Oolong tea. Green Assam tea contained linalool, geraniol and α -terpineol as the key flavour constituents. Chin Shin Oolong tea was dominated by linalool, indole and *cis*-jasmone whilst the major flavour volatiles of Chin Hsuan Oolong tea were *trans*-nerolidol, *cis*-jasmone and geraniol. Indole, geraniol and *cis*-jasmone were detected as the main constituents in Four Season tea. Change of quality and quantity of volatile flavour components was related to fermentation methods that increased

volatiles were illustrated by the semi-fermented tea processing method. Green Assam tea infusion extract was evaluated to have the strongest antioxidant activities with the highest amount of phenol content followed by Four Season tea, Chin Shin Oolong tea, Chin Hsuan Oolong tea and Green Oolong tea, respectively [Patcharee Pripdeevech* and Theeraphan Machan, (Program of Applied Chemistry, School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand), *Food Chemistry*, 2011, 125(2), 797-802].

NPARR 2(2), 2011-0137, How much theanine in a cup of tea? Effects of tea type and method of preparation

Recent interest into the possible benefits of l-theanine found in tea has raised the issue that there are few data available on amounts of l-theanine contained in cups of commercially-available teas, prepared by a standard method. HPLC along with a standard method of preparing tea was employed here to determine amounts of l-theanine in cups of tea and the effects that various preparation factors have on amounts of l-theanine extracted. Brewing time was found to be a major determinant of the amount of l-theanine extracted, while the addition of small amounts of milk and sugar made no significant difference. High levels of milk resulted in a marked lowering of the level of detectable l-theanine. Contrary to previous research, a standard (200 ml) cup of black tea was found to contain the most l-theanine (24.2±5.7mg) while a cup of green tea contained the least (7.9±3.8 mg) [Emma K. Keenan*, Mike D.A. Finnie, Paul S. Jones, Peter J. Rogers and Caroline M. Priestley (Department of Experimental Psychology, University of Bristol, 12A Priory Road, Bristol BS8 1TU, UK), *Food Chemistry*, 2011, 125(2), 588-594].

NPARR 2(2), 2011-0138, Clarifying agents effect on the nitrogen composition in must and wine during fermentation

The effect of static sedimentation with and without clarifying agents (silica sol and gelatine) upon the nitrogenous fraction of musts and wines was studied. Four vinifications were carried out using a *Vitis vinifera* cv. Cayetana white grape must. Static sedimentation reduced less than other techniques the

assimilable nitrogen (FAN), however the employment of fining agents promoted a net decrease. The changes in the amino acids during fermentation were similar in all the experiments carried out. In general, during the first days there was a fast decrease followed by a slight increment and then stabilisation. This decrease fitted, in most of the cases, with first order kinetics. For most of the amino acids, the percent consumption was higher in the must settled with clarifying agents. The clarifying agent's addition did not have the same effect on the amino acid concentration in the final wines [E. Valdés*, M. Vilanova, E. Sabio and M.J. Benalte (Instituto Tecnológico Agroalimentario (INTAEX), Carretera San Vicente, s/n, 06071 Badajoz, Spain), *Food Chemistry*, 2011, 125(2), 430-437].

NPARR 2(2), 2011-0139, Variation in antioxidant potential and total polyphenol content of fresh and fully-fermented Sri Lankan tea

Tea polyphenols possess antioxidant properties and have been shown to have a protective effect against several degenerative diseases. The study aimed to determine the amounts of polyphenols and antioxidant properties for teas grown in Sri Lanka, over a period of 10 months. Water extracts of freeze-dried fresh (unfermented) and fully-fermented tea leaves were made for a structured set of samples (fermented and unfermented teas from six plantations; teas representing two harvesting seasons from four plantations) collected from the main tea growing regions in Sri Lanka. Total phenolic content (TPC), the ferric reducing antioxidant power (FRAP) and the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging activity were determined for each sample. The results highlight significant ($P < 0.05$) variations in antioxidant activity across the six plantations. FRAP and DPPH for both fermented and unfermented teas from the four highland plantations showed a significant ($P < 0.05$) interaction between season and plantation. A similar interaction between season and plantation was observed for total phenolics in unfermented teas from the four highland plantations. The variability of the total phenolics for fermented teas, however, was independent of seasonal variations. A significant correlation ($r = 0.5$, $P < 0.05$) was observed between FRAP and total phenolics [S. Jayasekera, A.L. Molan, M. Garg and P.J. Moughan*(Riddet Institute, Massey University,

Palmerston North, New Zealand), *Food Chemistry*, 2011, 125(2), 536-541].

NPARR 2(2), 2011-0140, Antioxidant compounds from a South Asian beverage and medicinal plant, *Cassia auriculata*

Cassia auriculata (Caesalpiniaceae) is a common South Asian beverage and medicinal plant widely used in tradition medicine for treating diabetes and various other disease conditions. The alcoholic extract of the aerial part of *C. auriculata* displayed potent antioxidant activity when assessed by DPPH radical scavenging, lipid peroxidation and reducing power analysis. Fractionation of the crude extract using solvents of ascending polarity showed that the ethyl acetate fraction is the most active followed by the chloroform fraction while the petroleum ether, *n*-butanol and water fractions were less active than the crude extract. Further activity-guided fractionation studies on the active fractions resulted in the isolation of the major antioxidant constituent kaempferol-3-*O*-rutinoside together with kaempferol, quercetin and luteolin. The identity of the compounds was established based on extensive spectroscopic studies including 2D NMR [Malindra Juan-Badaturuge, Solomon Habtemariam* and Michael J.K. Thomas (Pharmacognosy Research Laboratories, Medway School of Science, The University of Greenwich, Central Avenue, Chatham-Maritime, Kent ME4 4TB, UK), *Food Chemistry*, 2011, 125(1), 221-225].

NPARR 2(2), 2011-0141, Effect of enzymatic debittering on antioxidant capacity and protective role against oxidative stress of grapefruit juice in comparison with adsorption on exchange resin

Antioxidant capacity, radical scavenging activity, as well as protective effect on lipoperoxidation, glutathione oxidation and DNA damage, were evaluated in grapefruit juice subjected to bitterness removal by naringinase or by physical adsorption with Amberlite®IRA-400. The results showed a reduction in naringin content for the naringinase-treated juice (N-PJ) and those processed with the exchange resin (R-PJ), which made both juices acceptable to consumers. Total antioxidant capacity, measured by ABTS and FRAP assays, was lower in R-PJ samples. The highest superoxide and hydroxyl radical scavenger activity was observed in

N-PJ. With regard to inhibitory effect of juice samples on lipoperoxidation, N-PJ also provided the greatest effectiveness. In addition, R-PJ showed the lowest levels of GSH. The results showed a protective effect on DNA oxidative damage for all juice samples tested. In summary, enzymatic technology was more effective than physical adsorption in preserving the antioxidant and biomolecule protection capacity of fresh grapefruit juice [M. Cavia-Saiz, P. Muñiz, N. Ortega and M.D. Busto* (Department of Biotechnology and Food Science, Area of Biochemistry and Molecular Biology, University of Burgos, Plaza Misael Bañuelos, s/n, E-09001 Burgos, Spain), *Food Chemistry*, 2011, 125(1), 158-163].

NPARR 2(2), 2011-0142, Antiglycative and antioxidative properties of coffee fractions

In this work the inhibitory activity of coffee low molecular weight compound (LMWC) and high molecular weight compound (HMWC) fractions against *in vitro* advanced glycation end-products (AGEs) formation was investigated. The HMWC fraction was characterised for its content in total phenolic groups, proteins and carbohydrates. The chlorogenic acids of LMWC fraction were identified by liquid chromatography coupled with tandem mass spectrometry. HMWC inhibited bovine serum albumin glycation by acting as radical scavenger and Fe-chelator in the post-Amadori phase of the reaction and by inhibiting dicarbonyl reactive compounds production during glucose autoxidation. LMWC fraction was able to inhibit protein glycation and dicarbonyl reactive compounds formation more than HMWC fraction. Chlorogenic acids are the main compounds responsible for the antiglycative activity of LMWC fraction.

This study clearly shows that coffee contains molecules with *in vitro* antiglycative activity, in particular chlorogenic acids, are of particular interest for their known bioavailability *in vivo* [E. Verzelloni*, D. Tagliacuzzi, D. Del Rio, L. Calani and A. Conte (Department of Agricultural and Food Sciences, University of Modena and Reggio Emilia, Via Amendola 2, 42100 Reggio Emilia, Italy), *Food Chemistry*, 2011, 124(4), 1430-1435].

NPARR 2(2), 2011-0143, Green tea aqueous extract reduces visceral fat and decreases protein

availability in rats fed with a high-fat diet

Green tea is associated with beneficial health effects mainly because of its body fat-reducing and hypocholesterolemic activities, but an effective dose without pronounced influence on protein availability is unknown. The objective of this study was to examine the hypothesis that green tea aqueous extract (GTAE) depending on dose improves cardiovascular risk indicators such as body weight, visceral fat content, and atherogenic index of plasma and does not have unfavorable effect on protein availability in rats fed with a high-fat diet. The rats fed with a high-fat diet enriched with 1.1 and 2.0% GTAE for 8 weeks had significantly ($P < .05$) lower atherogenic index (in both groups, about 14.3%). Only administration of 2.0% GTAE significantly ($P < .05$) decreased body weight gain (5.6%) and prevented visceral fat accumulation (17.8%) in rats. However, considerably ($P < .05$), reduction in the digestion of protein (but not fat) was observed in both GTAE groups (1.1% GTAE: $82.6\% \pm 1.8\%$; 2.0% GTAE: $84.3\% \pm 0.8\%$) when compared to the control ($93.3\% \pm 1.5\%$). It was concluded that GTAE may have preventive effects on the accumulation of visceral fat but only in higher doses. Although both doses improved cardiovascular risk indicators, they, in addition, significantly inhibited protein digestion [Joanna Bajerska*, Małgorzata Wozniewicz, Jan Jeszka, Sławomira Drzymala-Czyz and Jaroslaw Walkowiak (Department of Human Nutrition and Hygiene, Poznan University of Life Sciences, 60-624 Poznan, Poland), *Nutrition Research*, 2011, 31(2), 157-164].

NPARR 2(2), 2011-0144, Influence of barley variety, timing of nitrogen fertilizations and sunn pest infestation on malting and brewing

This paper presents a multivariate approach to investigate the influence of barley variety, timing of nitrogen fertilisation and sunn pest infestation on malting and brewing. Four spring and two winter barley varieties were grown in one location in southern Europe. Moreover, one of the spring varieties was infested with sunn pest, in order to study the effects of this pest on malting quality, and subjected to different nitrogen fertilisation timing regimes. The samples were micromalted, mashed, brewed and analysed.

The data showed that even though the two winter barleys seemed to be the best regarding their physical appearance (sieving fraction I + II > 82%), this superiority was not confirmed in the malt samples, which showed low values of Hartong extract (27.1%) and high values of pH (6.07–6.11) and β -glucan content (12.5–13.2 g kg⁻¹), resulting in low-quality beers. The barley sample subjected to postponed fertilisation had a total nitrogen content (19.5 g kg⁻¹ dry matter) exceeding the specification for malting barley and gave a beer with a low content of free amino nitrogen (47 mg L⁻¹) and high values of viscosity (1.99 cP) and β -glucan content (533 mg L⁻¹). The beer obtained from the barley sample subjected to pest attack had good quality parameters.

All spring barleys gave well-modified malts and consequently beers of higher quality than the winter barleys. Moreover, postponed fertilisation was negatively related to the quality of the final beer, and sunn pest infestation did not induce important economic losses in the beer production chain. Copyright © 2010 Society of Chemical Industry [[Ombretta Marconi*, Valeria Sileoni, Michele Sensidoni, José Manuel Amigo Rubio, Giuseppe Perretti and Paolo Fantozzi ((Department of Economic and Food Science, University of Perugia, Via San Costanzo, I-06126 Perugia, Italy), *Journal of the Science of Food and Agriculture*, 2011, 91(5), 820-830].

COSMECEUTICALS

NPARR 2(2), 2011-0145, On the effects of a plant extract of *Orthosiphon stamineus* on sebum-related skin imperfections

Overproduction of sebum is very common and results in an undesirable oily, shiny complexion with enlarged pores. Sebum secretion is basically under the control of 5- α reductase, and more particularly under that of type 1 isozyme. But it is also highly sensitive to environmental factors such as temperature, humidity and food. Moreover, in Asia, the edicts of a flawless facial skin turn oily skin into a major concern for Asian women. We identified *Orthosiphon stamineus* leaf extract as an interesting ingredient for reducing the oily appearance of skin thanks to its ability to reduce 5- α reductase type 1 expression in normal human epidermal keratinocytes *in vitro*. This was confirmed *ex vivo*, where *Orthosiphon stamineus* leaf extract was shown to reduce 5- α reductase activity as well as the production of squalene, one of the main components of sebum that was used as a tracer of sebum. To evaluate the efficacy of *Orthosiphon stamineus* leaf extract at reducing sebum-related skin imperfections *in vivo*, we performed two different clinical studies, one in France on a panel of Caucasian volunteers and the other one in Thailand on a panel of Asian volunteers. Using instrumental techniques as well as clinical evaluation and self-evaluation, we could highlight that an O/W cosmetic formula containing 2% of *Orthosiphon stamineus* leaf extract could visibly reduce the oily appearance of skin as well as the size of pores, thus leading to a significant improvement of complexion evenness and radiance. Overall, the results obtained were better than those observed with the same formula containing 1% of zinc gluconate, an ingredient frequently used in oily skin care products [B. Vogelgesang*, N. Abdul-Malak, C. Reymermier, C. Altobelli and J. Saget (BASF Beauty Care Solutions France SAS, 32 rue Saint-Jean-de-Dieu, 69007 Lyon, France), *International Journal of Cosmetic Science*, 2011, 33, 44–52].

NPARR 2(2), 2011-0146, Lavender, tea tree and lemon oils as antimicrobials in washing liquids and soft body balms

The aim of this study was to evaluate the antimicrobial activity of commercial essential oils: lavender, tea tree and lemon, antimicrobials in washing liquid and O/W soft body balm. The inhibition efficacy of essential oils in washing liquid (1% alone or in mixtures), in soft body balm (0.5% alone), as well as combined with the synthetic preservative DMDM hydantoin and 3-iodo-2-propynyl butyl carbamate mixture (0.1 and 0.3%), was tested against *S. aureus* ATCC 6538, *P. aeruginosa* ATCC 9027, *Candida* sp. ŁOCK 0008 and *A. niger* ATCC 16404 in compliance with the European Pharmacopoeia standards. The components of the system preserving soft body balm were supplemented with a solubilizer. Washing liquids containing only essential oils met Criterion A E.P. only for *S. aureus*, *Candida* sp. and *A. niger*. In soft body balm formulations, oils at a concentration of 0.5% did not reveal any preserving activity. The introduction of a solubilizer to a system containing 0.5% tea tree oil led to a substantial increase in the bacteriostatic activity of the formulation, but did not significantly affect its fungistatic properties. A combination of 0.5% tea tree oil, 5% solubilizer and 0.3% synthetic preservative ensured the microbiological stability of soft body balm in accordance with Criterion A E.P. [A. Kunicka-Styczyńska*, M. Sikora², and D. Kalemba (Institute of Fermentation Technology and Microbiology, Technical University of Lodz, 90-924 Lodz, Wólczańska), *International Journal of Cosmetic Science*, 2011, 33(1), 53–61].

NPARR 2(2), 2011-0147, A new potent natural antioxidant mixture provides global protection against oxidative skin cell damage

Oxidative stress occurs when there is an over production of free radicals and cells are not able to neutralize them by their own antioxidant mechanisms. These excess of free radicals will attack cellular macromolecules leading to cell damage, function impairment or death. Because of that, antioxidant substances have been largely used in products to offer complementary protection. In this study a new mixture of three known antioxidants (cocoa, green tea and alpha-tocopherol) was evaluated and its antioxidant protection was assessed focusing on its capacity to protect main cell macromolecules. Results have shown that it has a high antioxidant capacity by

protecting lipids, DNA and proteins against oxidative damage. The antioxidant effect of the mixture on cells was also investigated and it was able to reduce oxidative stress generated by lipopolisaccharide in human fibroblasts. Finally, as the mixture has proved to be highly antioxidant, its effect on cell senescence was evaluated, and it was demonstrated that fibroblasts in culture had delayed senescence when treated with these actives on a mixture. All results together provide important data about a new antioxidant mixture that uses a small amount of actives and is able to protect cell against oxidative damages in a global way [A. T. S. Jorge*, K. F. Arroteia, J. C. Lago, V. M. de Sá-Rocha, J. Gesztesi and P. L. Moreira (Rodovia Anhanguera, S/N, Km 30,5, Cajamar, SP 07750-000, Brazil), *International Journal of Cosmetic Science*, 2011, 33(2), 113-119].

NPARR 2(2), 2011-0148, The moisturizing effect of a wheat extract food supplement on women's skin: a randomized, double-blind placebo-controlled trial

Ceramides, specific lipid components of the skin, represent 35–40% of the intercellular cement binding cells together and contributing to skin hydration. A wheat extract rich in ceramides and digalactosyl-diglycerides was developed by Hitex in two forms: wheat extract oil (WEO) and wheat extract powder (WEP). *In vitro* tests and two clinical studies demonstrated promising efficacy results with WEP on skin hydration. To confirm these early results, a double-blind, randomized, placebo-controlled study was carried out on 51 women aged 20–63 years with

dry to very dry skin who received either 350 mg of WEO or placebo for 3 months. Evaluation of skin hydration on legs, arms and face, assessed at baseline (D0) and at study end (D84) was performed by the dermatologist using dermatological scores (dryness, roughness, erythema), skin hydration measurement (corneometry) and self-assessment scores (Visual Analogue Scale: VAS). Perceived efficacy was noted by participants throughout the study; tolerability and overall acceptability of the study products were evaluated by the dermatologist and the participants at the end of study. Skin hydration was significantly increased between D0 and D84 on the arms ($P < 0.001$) and legs ($P = 0.012$) in the WEO group compared with placebo. Even if no significant statistical differences between groups were observed for the dermatological evaluation, skin dryness and redness tended to be reduced in the WEO group. Moreover, from D0 to D84, the VAS index had a tendency to increase in favour of WEO for the overall skin hydration ($P = 0.084$) indicating that participants perceived an improvement. The WEO capsules were perceived by participants as being more effective than placebo on all skin dryness signs. In conclusion, WEO capsules were well tolerated and appreciated. After 3 months' treatment, a significant increase in skin hydration and an improvement in associated clinical signs were observed in women with dry skin. [S. Guillou, S. Ghabri, C. Jannot, E. Gaillard*, I. Lamour and S. Boisnic (HITEX, Pentaparc, rue Lefèvre-Utile, BP 33601, 56036 Vannes, France), *International Journal of Cosmetic Science*, 2011, 33(2), 138–143].

DYES (incl. Food colorants)

NPARR 2(2), 2011-0149, Effective natural dye extraction from different plant materials using ultrasound

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

NPARR 2(2), 2011-0150, The dyeing of silk part 2: Aftertreatment with natural and synthetic tanning agents

Moderate/deep shades on silk were produced using three non-metallised and two pre-metallised

acid dyes. Three aftertreatments, namely a syntan, syntan + cation and modified full back tan, improved the fastness of the dyeings to repeated wash testing at 40°C. However, the extent of this improvement varied for the dyes used. For the two pre-metallised acid dyes and one non-metallised acid dye, the modified full backtan gave marginally superior results whereas for the remaining non-metallised acid dyes, there was little difference in the magnitude of the improvement imparted by the three aftertreatments. In terms of the depth of shade obtained at the end of the five wash tests, the modified backtan gave markedly paler dyeings in the case of the three non-metallised dyes used whilst similar depths of shade were obtained in the case of the two pre-metallised acid dyes, irrespective of aftertreatment used. The aftertreatments also varied in terms of their effects on the hue and chroma of the dyeings, with the modified full backtan generally imparting greatest colour change [S.M. Burkinshaw* and M. Paraskevas (University of Leeds, Leeds, LS2 9JT, UK), *Dyes and Pigments*, 2011, 88(2), 156-165].

NPARR 2(2), 2011-0151, Anthocyanin composition and content of the *Vaccinium uliginosum* berry

Anthocyanins are polyphenols that are widely distributed in nature. *Vaccinium uliginosum* a new and excellent source of natural pigments. The pigments were extracted from the *V. uliginosum* berry using 0.5% TFA in ethanol solution, purified by an X-5 resin column and characterised by HPLC-DAD analysis. All of the peak assignments were confirmed by low-resolution electrospray mass spectrometry. The results showed that 11 anthocyanins and 2 flavonols were present in the *V. uliginosum* berry. [Rui Li, Ping Wang, Qing-qi Guo and Zhen-yu Wang (Food Science and Engineering, College of Forestry, Northeast Forestry University, Harbin 150040, China), *Food Chemistry*, 2011, 125(1), 116-120]

ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 2(2), 2011-0152, **Essential Oils as Biopreservatives: Different Methods for the Technological Application in Lettuce Leaves**

Investigations were carried out to assess the efficiency of 3 essential oils, clove, tea tree, and rosemary, as natural preservatives during the postharvest of lettuce leaves. The effect of different concentration (1 and 0.5 MIC) of plant essential oils applied in 3 forms (spray, immersion, and capsules) was studied on lettuce leaves. The evolution of different microbial populations was evaluated during refrigerated storage. The application forms of the biopreservatives were shown to be an important factor in determining the effectiveness of the essential oils. Clove and tea tree essential oils at 1 MIC and applied embedded in lactose capsules presented a significant inhibition on mesophilic, psicrotrophic, and coliforms populations, while rosemary in none of the 3 technological applications forms exerted inhibitory effect on all microbial populations evaluated. Essential oils (at 0.5 MIC) applied by spray, immersion, and embedded in lactose capsules exerted lower inhibitory effects, with respect to 1 MIC, on the different microbial populations present on lettuce leaves. At the end of the storage (7 d), lettuce samples treated with tea tree, clove, and rosemary (at 1 and 0.5 MIC) by spray were the only organoleptically acceptable. It is concluded that clove and tea tree essential oils can control different microbial population present in lettuce [Alejandra Ponce, Sara I. Roura and María del R. Moreira*(Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina), *Journal of Food Science*, 2011, 76(1), M34–M40].

NPARR 2(2), 2011-0153, **Variations in essential oil yield and composition during *Cinnamomum cassia* bark growth**

To extract essential oil for industrial use, the yields and compositions of bark oil during *Cinnamomum cassia* growth (1-3 years old for the branch bark; 5–12 years old for the stem bark) were determined. The branch bark fraction had a higher essential oil yield than the whole branch. The

essential oil yield from branch bark varied within 2.70–3.11% (w/w), while that from stem bark was 0.41–2.61% (w/w) due to differences in age and segment (top, center and lower) of the tree. There were 41 volatile compounds identified in bark oil, among which the majority presented high fluctuations in percentage of composition both in different growth stages and segments. Variations in oil yields did not present the same pattern as the percentages of trans-cinnamaldehyde. The results suggest that choosing bark according to trees' growth stages and separating stem barks into top, center and lower sections within a tree should significantly improve the extraction efficiency [Shilei Geng*, Zhaoxue Cui, Xinchao Huang, Yufen Chen, Di Xu and Ping Xiong (College of Life Science, South China Agricultural University, Guangzhou Guangdong 510642, China), *Industrial Crops and Products*, 2011, 33(1), 248-252].

NPARR 2(2), 2011-0154, **Volatile compounds and antimicrobial and antioxidant activities of the essential oils of the needles of *Pinus densiflora* and *Pinus thunbergii***

To investigate the volatile compounds and the antibacterial and antioxidant effects of the essential oils of *Pinus densiflora* needles (EPDN) and *Pinus thunbergii* needles (EPTN), the volatile compounds of steam-distilled essential oils were analysed by gas chromatography–mass spectrometry. Antibacterial activities were analysed by performing disc-agar diffusion assay and determining the minimum inhibitory concentrations (MICs) of the essential oils. Antioxidant activities were analysed via radical- and nitrite-scavenging activity assays.

The yields of EPDN and EPTN were 0.304% (v/w) and 0.296% (v/w), respectively. In the antibacterial activity assay, the MICs of EPDN and EPTN for *Klebsiella pneumoniae*, *Shigella flexneri* and *Proteus vulgaris* were < 0.4 mg mL⁻¹. In the antioxidant activity assay, the 50% inhibitory concentrations (IC₅₀) of EPDN and EPTN were 120 and 30 µg mL⁻¹, respectively. At 1680 µg mL⁻¹, both EPDN and EPTN exhibited > 50% nitrite-scavenging activity. EPDN can be used as a natural antimicrobial substance [Ju-Sung Park and Gyu-Hee Lee*(Gyu-Hee Lee, Department of Food Science and Biotechnology, Woosong University, Dong-gu, Daejeon 300-718, Korea), *Journal of the Science of Food and*

Agriculture, 2011, 91(4), 703-709].

NPARR 2(2), 2011-0155, Dry matter content and fruit size affect flavour and texture of novel *Actinidia deliciosa* genotypes

Previous studies with commercial kiwifruit cultivars have demonstrated that the taste of fruit with higher dry matter content (DM) is more liked by consumers. A unique replicated trial of kiwifruit genotypes (10 high/low DM × small/large-fruited genotypes) has provided an opportunity to consider how the genetic propensity for a kiwifruit to accumulate DM affects fruit flavour and texture. In the present study, eating-ripe fruit from each of the genotypes were assessed using a trained sensory panel and the relationships between these sensory attributes and fresh weight, DM, flesh firmness and soluble solids content (SSC) were explored.

The genotypes provided a diversity of flavour and texture attributes, each of which varied in perceived intensity of the sensory experience. High-DM genotypes had higher SSC and were perceived as sweeter than low-DM genotypes. Sweet taste was

closely associated with the perception of the tropical flavour and high-DM genotypes were found to have more tropical notes. Fruit size was associated with fruit texture, and small fruit were characterised by a firmer and more fibrous core. Large high-DM fruit were perceived as juicier than those of all other genotypes.

Genotypes were perceived differently from one another, and differences in fruit size and DM content were reflected in fruit sensorial properties. This study is unique in demonstrating interactions between fruit size, DM and sensory properties. These findings could be relevant not only to kiwifruit but to fruiting crop breeders in general, because of the demonstrated potential for effects of fruit size and DM content on sweetness, flavour and fruit texture. Simona Nardoza*, Joanna Gamble, Lauren G Axten, Mark W Wohlers, Michael J Clearwater, Jinquan Feng and F Roger Harker (The New Zealand Institute for Plant & Food Research Limited, Mt Albert Research Centre, Private Bag 92169, Auckland, New Zealand), *Journal of the Science of Food and Agriculture*, 2011, 91(4), 742-748].

FEED/FODDER

NPARR 2(2), 2011-0156, A herb and legume sward mix increased ewe milk production and ewe and lamb live weight gain to weaning compared to a ryegrass dominant sward

This study investigated the potential of a mixed herb sward to improve production of multiple-bearing ewes and their offspring compared to a ryegrass dominant sward. Forty four twin-bearing (twin) and 42 triplet-bearing (triplet) mixed-aged Romney ewes that were a maximum of 140 days pregnant (P140) were randomly allocated to one of two nutritional treatments being: a mix of chicory, plantain, white and red clover (Herb), or a ryegrass dominant sward (Ryegrass) to form the following groups: twin Ryegrass $n = 22$, triplet Ryegrass $n = 20$, twin Herb $n = 22$ and triplet Herb $n = 22$. Ewes and their lambs remained on these herbage treatments until 66 days after the mid-point of lambing (L66). By L66, ewes grazing the Herb treatment compared to ewes on the Ryegrass treatment were heavier ($P < 0.05$; 70.9 ± 1.17 kg versus 66.1 ± 1.15 kg) and had higher ($P < 0.05$) body condition scores (2.8 ± 0.07 versus 2.4 ± 0.07 , respectively). Ewes grazing the Herb treatment produced more milk ($P < 0.05$) at each of the three sampling periods (3137 ± 161.3 versus 2613 ± 148.1 at day 7, 3280 ± 148.8 versus 2483 ± 153.1 at day 14 and 3237 ± 131.8 mL versus 2428 ± 136.2 mL at day 21). Lambs from ewes grazing the Herb treatment were heavier ($P < 0.05$) at L22 (10.36 ± 0.274 kg versus 9.29 ± 0.272 kg) and L66 (20.67 ± 0.490 kg versus 17.55 ± 0.493 kg). The higher live weights (LW) were due to higher ($P < 0.05$) LW gains of Herb lambs between birth and L22 (298 ± 10.8 g/day versus 245 ± 10.7 g/day) and between L39 and L66 (268 ± 16.2 g/day versus 179 ± 15.9 g/day). Herb triplet-bearing ewes produced more ($P < 0.05$) total lamb LW by L66 than Ryegrass triplet-bearing ewes (45.70 ± 3.051 kg versus 28.26 ± 3.203 kg, respectively). Results demonstrate that a herb sward mix can improve multiple ewe and lamb performance compared to a ryegrass dominant sward [P.G. Hutton, P.R. Kenyon*, M.K. Bedi, P.D. Kemp, K.J. Stafford, D.M. West and S.T. Morris (Sheep Research Centre, College of Sciences, Massey University, New Zealand), *Animal Feed Science and Technology*, 2011, 164(1-2), 1-7].

NPARR 2(2), 2011-0157, Effects of different levels of coconut oil supplementation on performance, digestibility, rumen fermentation and carcass traits of Malpura lambs

The influence of coconut oil (CO) supplementation (0, 25, 50 and 75 g/kg of concentrate) upon performance, nutrient utilization, rumen fermentation, blood biochemistry and carcass characteristics were assessed in lambs (4 males and 4 females in each treatment) between 15 d of age and 6 months. Lambs were allowed to suckle twice daily until 90 d of age. Concentrate and forage (*Ailanthus excelsa* leaves) were provided *ad libitum* for the duration of the experiment. Lambs were weighed at weekly intervals, and a metabolism study was conducted on six representative lambs from each group at 120 d of age to determine nutrient utilization and N balance. Blood samples and rumen liquor samples were drawn at 180 d to determine blood biochemical and rumen fermentation characteristics. At 6 months of age all the male lambs were slaughtered and carcass traits were evaluated. Coconut oil intake was 7.1, 13.8 and 18.8 g/d in three treatment groups compared to zero in control. Pre- and post-weaning gain was similar while dry matter intake was higher in both pre-weaning (L: $P < 0.001$; Q: $P < 0.001$) and post-weaning (L: $P = 0.001$; Q: $P = 0.001$) in control. Digestibilities of organic matter ($P = 0.013$) and neutral detergent fiber ($P = 0.062$) decreased and that of ether extract increased ($P = 0.001$) linearly with increased CO supplementation. The N retention decreased linearly ($P = 0.001$) with increasing CO supplementation. Concentration of total N and trichloroacetic acid precipitable N decreased at a decreasing rate (Q: $P = 0.051$ and $P = 0.019$, respectively) whereas ammonia N in rumen liquor decreased at an increasing rate (Q: $P = 0.003$) with increased CO supplementation. Coconut oil supplementation linearly ($P = 0.006$) reduced rumen protozoa population. Though the concentration of serum glucose was similar, serum cholesterol and non-esterified fatty acids increased linearly ($P < 0.05$) with CO supplementation both pre- and post-weaning. Pre-slaughter weight, dressed weight, eye muscle area, and body fat were similar in all the lambs. Coconut oil supplementation up to 50 g/kg is optimum in lamb rations due to improved feed conversion ratio and production of a carcass with acceptable

characteristics. Higher levels of CO supplementation depressed growth and feed conversion due to its suppression of rumen protozoa and reduced fiber digestibility [R.S. Bhatt, N.M. Soren*, M.K. Tripathi and S.A. Karim (Division of Animal Nutrition, Central Sheep and Wool Research Institute, Avikanagar, Via-Jaipur, Rajasthan 304501, India), *Animal Feed Science and Technology*, 2011, 164(1-2), 29-37].

NPARR 2(2), 2011-0158, Effects of sodium bicarbonate on diet selection and rumen digestion by growing lambs individually fed whole barley grain and a protein supplement at their choice

A feeding and digestion study was completed to determine whether sodium bicarbonate supplementation modifies diet selection of whole barley grain and a protein supplement by lambs. The underlying hypothesis was that aversion to barley intake to avoid acidosis might explain overconsumption of protein. Sixty weaned lambs (15.1 ± 0.33 kg live weight (LW)) were allocated to one of three dietary treatments in 2 pens of 5 lambs by sex, according to a 3 treatments \times 2 sex factorial design. Treatments were whole barley grain and a pelleted protein supplement fed at choice either unsupplemented (U) or supplemented with sodium bicarbonate fed by free access on the side (BF) or incorporated into the protein supplement at 15 g/kg dry matter (BI). At the end of the growing period, 7 male lambs from each treatment (24.2 ± 0.13 kg LW) were moved to individual pens and slaughtered after 5 days of individual intake control to characterise rumen fermentation and determine digesta flow and microbial crude protein (CP) contribution to the abomasum, using C₃₁ alkane and purine bases as flow and microbial markers, respectively. Intake of sodium bicarbonate was higher ($P < 0.005$) when provided free access than when incorporated into the protein pellet (13.9 g/d vs. 5.0 g/d for BF and BI) but it did not affect dry matter intake (797 g/d) or average daily gain (328g/d vs. 289g/d for male and female lambs), although barley grain intake tended ($P = 0.052$) to decrease in response to buffer addition. A lower ($P < 0.05$) proportion of organic matter truly digested in the rumen (OMTDR; 0.53 vs. 0.61) and a trend ($P = 0.098$) to increased efficiency of microbial CP synthesis (26.7gN/kg vs. 21.6gN/kg OMTDR) occurred when the buffer was offered free access

compared to incorporation into the protein supplement, respectively. Neither rumen fluid pH nor ammonia concentration differed among treatments, but the total concentration of volatile fatty acids and molar proportion of acetate tended ($P < 0.1$) to increase with buffer supplementation (174mM vs. 200mM and 46.8 mol/100 mol vs. 52.7mol/100mol). Sodium bicarbonate can modify rumen digestion, but failed to buffer rumen fluid pH and reverse the aversion to barley grain [A.R. Askar, J.A. Guada*, J.M. González, A. de Vega and C. Castrillo, (Departamento de Producción Animal y Ciencia de los Alimentos, Universidad de Zaragoza, Miguel Servet 177, 50013 Zaragoza, Spain), *Animal Feed Science and Technology*, 2011, 164(1-2), 45-52].

NPARR 2(2), 2011-0159, Effect of ensiling triticale, barley and wheat grains at different moisture content and addition of *Lactobacillus plantarum* (DSMZ 8866 and 8862) on fermentation characteristics and nutrient digestibility in pigs

The ensiling characteristics of barley, triticale and wheat grains at two different moisture levels, with and without the addition of lactic acid bacteria (LAB, *Lactobacillus plantarum* DSMZ 8862 and 8866) were determined after a 50-day storage period. In addition, the impact of the different ensiling techniques on the nutritional value was determined in pigs. In Experiment (Exp.) 1, mature grains were ground and water was added to adjust the moisture to 250g kg⁻¹ (low moisture content, LMC) or 350 g kg⁻¹ (high moisture content, HMC). Grains were ensiled in laboratory scale silos for 3, 10 and 50 days. In the HMC silos, pH declined within 3 days irrespective of LAB treatment. In the LAB treated LMC, pH declined after 10 days of storage, whereas pH of untreated grains remained unchanged. Lactic acid production was higher ($P < 0.05$) in HMC than in LMC grains, with almost no acid production with the untreated LMC grains. Denaturing gradient gel electrophoresis analysis revealed that the composition of the bacterial communities changed when LAB was added.

Nutrient digestibility of HMC and LMC grains ensiled for 50 days with addition of LAB and untreated dry grains was determined separately for each grain in pigs. Digestibility was increased in LMC (crude fibre, crude protein, phosphorus) and

HMC (ether extract) wheat grains, whereas only ether extract digestibility was improved in HMC triticale and no differences were observed for barley. A higher ($P<0.05$) phosphorus digestibility was observed in LMC triticale and wheat as compared to the dry grains, likely due to reduced phytate-P after ensiling. The results show that cereals with a moisture content of 250 g kg^{-1} can be ensiled successfully provided that LAB is added, and that under these conditions phosphorus availability is increased [R. Pieper*, W. Hackl, U. Korn, A. Zeyner, W.B. Souffrant and B. Pieper (Chair for Nutrition Physiology and Animal Nutrition, Faculty of Agricultural and Environmental Sciences, University of Rostock, Justus-von-Liebig-Weg 8, D-18055 Rostock, Germany), *Animal Feed Science and Technology*, 2011, 164(1-2), 96-105].

NPARR 2(2), 2011-0160, Effect of flavoring a starter in a same manner as a milk replacer on intake and performance of calves

The effects of including the same flavor additive in a milk replacer (MR) and a starter to facilitate a sensorial association between the flavor of starter and that of the MR were explored in an attempt to encouraging calves to increase solid feed consumption around weaning. Twenty-two male Holstein calves (initial body weight= $51.2 \pm 0.82 \text{ kg}$; age= $22 \pm 1.6 \text{ d}$) participated in this study. All calves consumed the same starter during the first 34 d of study and were weaned at 42 d of study (65 d of age). The study finished 14 d after weaning. All calves received the same flavored MR and during the 7 d preceding weaning until the end of the study, half of the calves were fed a pelleted starter with the same flavor as that of the MR around weaning, whereas the remaining calves were offered the same starter without flavor. Starter and MR consumptions were registered daily, and BW recorded weekly. Overall, starter intake was not affected by flavor addition. However, calves with the lowest solid feed consumption before weaning (days 28–34 of study), numerically ($P=0.11$) consumed more starter following weaning when the starter was flavored compared with calves receiving plain starter. These calves also tended ($P=0.06$) to have a greater average daily gain during the 14 d following weaning compared with calves within the same low level of solid feed consumption but that consumed the unflavored starter. Flavoring calf starters in the same

manner as MR might improve solid feed consumption and performance of calves with a low appetite for solid feed before weaning [C. Montoro, I. Ipharraguerre and A. Bach*(Department of Ruminant Production, IRTA (Institut de Recerca i Tecnologia Agroalimentàries), 08140, Caldes de Montbui, Spain), *Animal Feed Science and Technology*, 2011, 164(1-2), 130-134].

NPARR 2(2), 2011-0161, The use of glycerine in rations for light lamb during the fattening period

One hundred and two Ripollesa weaned lambs ($15 \pm 1.7 \text{ kg BW}$; 45 ± 7.9 days of age) from two different lambing periods (Period 1 $n = 39$ and Period 2 $n = 63$) were used to study three different diets that included 0 g/kg, 50 g/kg or 100 g/kg glycerine in the concentrate. Lambs were fed concentrate (180 g/kg CP, 18.7 MJ of GE/kg DM) and barley straw *ad libitum* until the slaughter weight (25 SEM = 1.4 kg BW). Lambs were distributed in 9 pens per period in groups of 4 or 5 lambs (Period 1) and 7 lambs (Period 2) according to their weaning BW and age, and BW and concentrate and straw intakes as well as water consumption were measured weekly. Blood samples to determine glucose and insulin concentrations were obtained at 2 and 4 wk of the study, and carcass weight was recorded at the slaughterhouse. At slaughterhouse a sample of rumen mucosa of the caudal sac of the ventral zone was obtained to determine the number of rumen papillae, and a sample of the *Longissimus dorsi* from ten female lambs per treatment was obtained to analyse fatty acid profile of the meat. None of the parameters measured in lambs were affected by the glycerine content of concentrates. The only differences observed were in meat fatty acid composition. The C12 ($P=0.08$) and C17 ($P=0.06$) tended to be greater in lambs fed concentrates with glycerine than without glycerine. In contrast, total amount of C18:1 *cis* in muscle tended ($P=0.10$) to be greater in lambs consuming a concentrate without glycerine than in lambs receiving concentrates with glycerine. Glycerine can be included as an ingredient in lamb diets during their fattening period without impairing the growth of lambs, without reducing concentrate or straw intake, and without affecting blood metabolites, rumen papillae development, and the main fatty acids of *L. dorsi* muscle [M. Terré*, A. Nudda, P. Casado and A. Bach (Department of Ruminant Production, IRTA

(Institut de Recerca i Tecnologia Agroalimentàries), *Animal Feed Science and Technology*, 2011, 164(3-4), 262-267].
Torre Marimón, 08140 Caldes de Montbui, Spain),

FIBRES (incl. Textile and other utility fibres)

NPARR 2(2), 2011-0162, Cotton textiles modified with citric acid as efficient anti-bacterial agent for prevention of nosocomial infections

To study the antimicrobial activity of citric acid (CA) and sodium hypophosphite monohydrate (SHP) against gram-positive and gram-negative bacteria, and to determine the influence of conventional and microwave thermal treatments on the effectiveness of antimicrobial treatment of cotton textiles. Textile material was impregnated with CA and SHP solution and thermally treated by either conventional or microwave drying/curing treatment. Antibacterial effectiveness was tested according to the ISO 20743:2009 standard, using absorption method. The surfaces were morphologically observed by scanning electron microscopy, while physical characteristics were determined by wrinkle recovery angles method (DIN 53 891), tensile strength (DIN 53 837), and whiteness degree method (AATCC 110-2000).

Cotton fabric treated with CA and SHP showed significant antibacterial activity against MRSA (6.38 log₁₀ treated by conventional drying and 6.46 log₁₀ treated by microwave drying before washing, and 6.90 log₁₀ and 7.86 log₁₀, respectively, after 1 cycle of home domestic laundering washing [HDLW]). Antibacterial activity was also remarkable against *S. aureus* (4.25 log₁₀ by conventional drying, 4.58 log₁₀ by microwave drying) and against *P. aeruginosa* (1.93 log₁₀ by conventional and 4.66 log₁₀ by microwave drying). Antibacterial activity against *P. aeruginosa* was higher in samples subjected to microwave drying/curing than in those subjected to conventional drying/curing. As expected, antibacterial activity was reduced after 10 HDLW cycles but the compound was still effective. The surface of the untreated cotton polymer was smooth, while minor erosion stripes appeared on the surfaces treated with antimicrobial agent, and long and deep stripes were found on the surface of the washed sample [Sandra Bischof Vukušić*, Sandra Flinčec Grgac, Ana Budimir, and Smilja Kalenić (Sandra Bischof Vukušić, University of Zagreb, Faculty of Textile Technology, Prilaz baruna Filipovića 28a, 10 000 Zagreb, Croatia), *Croat Med J*, 2011, **52**(1), 68-75]..

NPARR 2(2), 2011-0163, Cotton fabric dyeing with cochineal extract: influence of mordant concentration

Dyeing with cochineal extract has been carried out in Mexico since pre-Hispanic times as a handcraft process. However, this has limited its application on fabrics other than wool. An experiment was designed to study the influence of mordant concentration on colour behaviour in cotton fabric dyed with cochineal extract at the laboratory. At the same time, colour fastness was determined by applying six fastness tests to define the quality of the dyed fabric. It was concluded that, when there was a larger concentration of metallic ions in the mordant, colour fixation in the fabric was better, as there was less lightness in the red hue of the fabric. In addition, the more hydrogen ions present because of acids, the more intense the red hue. A decreasing trend in the colour fastness tests was observed: dry rubbing>artificial light>acids>alkalis>domestic washing > hot water [Gabriela Arroyo-Figueroa*, Graciela M L Ruiz-Aguilar,, German Cuevas-Rodriguez and Guillermo Gonzalez Sanchez (Agroindustrial Engineering Department, Universidad de Guanajuato, Privada de Arteaga s/n, Zona Centro, 38900, Salvatierra, Guanajuato, Mexico), *Coloration Technology*, 2011, **127**(1), 39-46].

NPARR 2(2), 2011-0164, A study of wicking properties of cotton-acrylic yarns and knitted fabrics

This paper investigated wicking properties of cotton-acrylic rotor yarns and knitted fabrics. The effect of yarn wicking on wicking of fabric in both wale and course directions was also discussed. One way ANOVA results of the experimental study suggested that wicking abilities of yarns and fabrics increased with the increase in acrylic content in the blends and with the use of coarse yarns. Besides, yarn wicking had a significant effect on fabric wicking [Merve Küçükali Öztürk, Banu Nergis*and Cevza Candan (Technical University of Istanbul, Faculty of Textile Technologies and Design, Istanbul), *Textile Research Journal*, 2011, **81**(3), 324-328].

NPARR 2(1), 2011-165, A smart approach for enhancing dyeing and functional finishing properties of cotton cellulose/polyamide-6 fabric

blend

Polyamide-6/cotton fabric blend was modified by chemical treatments using citric acid (30 g/L) as acrosslinker, an acrylate binder (10g/L), Na-hypophosphite (6 g/L) as a catalyst in the presence of basic dye or pigment colorant (15g/L) employing a pad-dry-cure technique (wet-pickup 80%, 80 C/5 min and 180 °C/2 min respectively). Combined modifying and dyeing of the treated fabric samples resulted in a significant improvement in the extent of coloration along with a remarkable improvement in the imparted functional properties namely UV-B protection and

antibacterial function. The change in K/S value as well as in the fastness properties ratings of the obtained dyeings along with variation in their functional properties depend on the ester-crosslinker/catalyst concentration, type and concentration of the coloring agent as well as thermo-fixation temperature. Mode of interaction was reported, and surface modification was also confirmed by SEM analysis [N.A. Ibrahim*, W.M. El-Zairy, M.R. El-Zairy, B.M. Eid and H.A. Ghazal (National Research Centre, Textile Research Division, Dokki, Cairo, Egypt), *Carbohydrate Polymers*, 2011, **83**(3), 1068-1074].

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

NPARR 2(1), 2011-166, Wheat porridge with soy protein isolate and skimmed milk powder: Rheological, pasting and sensory characteristics

Porridges made from raw and roasted wheat grits (*dalia*) with added soy protein isolate (SPI) and skimmed milk powder (SMP) were investigated by employing rheological, pasting and sensory tests in order to develop nutritious products. All porridge samples, irrespective of the presence of SPI/SMP and the application of roasting process, exhibited shear-thinning behaviour, fitted well with Cross equation ($r \geq 0.972$, $p \leq 0.01$) compared to power law and Casson models. The power indices for porridges prepared from raw grits were higher (0.643–0.764) compared to roasted samples (0.582–0.659). Pasting characteristics like peak viscosity, hot paste viscosity, cold paste viscosity, break down viscosity and total set back viscosity decreased due to incorporation of SPI/SMP. Roasted wheat grits exhibited increased pasting temperature but decreased other pasting characteristics. Pasting temperature increased from 64.4 to a maximum of 74.2 °C due to incorporation of SPI/SMP up to 10%. Porridges made from raw grits along with SPI/SMP had excellent sensory characteristics although roasted grit samples were thinner in consistency and had a better flavour [R. Sai Manohar*, G.R. Urmila Devi, Suvendu Bhattacharya and G. Venkateswara Rao, (Flour Milling, Baking and Confectionery Technology Department, Central Food Technological Research Institute (Council of Scientific and Industrial Research), Mysore 570 020, India), *Journal of Food Engineering*, 2011, 103(1), 1-8].

NPARR 2(1), 2011-167, Levels of nutritional constituents and antinutritional factors in black gram (*Vigna mungo* L. Hepper)

A study was conducted on nutritional constituents (total sugars, total proteins, total lipids and starch content) and antinutritional factors such as phenolic compounds, tannins, saponins, phytic acid, trypsin inhibitors and enzymes related to them such as acid- and alkaline phosphatases, α -galactosidase in eleven recommended cultivars and twenty one

advance breeding lines of black gram (*Vigna mungo* L. Hepper) with an aim to identify genotypes containing high nutritional quality and low antinutritional content. The average content of starch, total soluble sugars, proteins and lipids was around 43.5, 4.84, 22.0 and 1.1%, respectively. Seven genotypes had higher levels of bound fructose contributed by sucrose and raffinose series oligosaccharides. A significant positive correlation was observed among total phenols, *o*-dihydroxy phenols and flavonols; and among trypsin inhibitors and saponins. The content of phytic acid and activity of trypsin inhibitors showed significant variation among these genotypes. However, not much variation was observed in the content of tannins and saponins. Activities of α -galactosidase, acid- and alkaline phosphatase were found to be related to the content of bound fructose of raffinose series oligosaccharides and phytic acid respectively. Genotypes having higher activity of these enzymes showed lower content of these antinutritional factors. The results showed that the observed diversity in developed cultivars and advance breeding lines could be further used by plant breeders [Yadhu Suneja, Satvir Kaur, Anil K Gupta and Narinder Kaur* (Department of Biochemistry, Punjab Agricultural University, Ludhiana-141004, India), *Food Research International*, 2011, 44(2), 621-628].

NPARR 2(1), 2011-168, A salt substitute with low sodium content from plant aqueous extracts

The perception of the salty taste, obtained in humans by using sodium chloride (NaCl), is one of the most important attributes of the human sensory system. However, extra intake of sodium present in salt might lead to conditions such as hypertension. To develop a salt substitute with low sodium content, 13 plants were extracted with water, and their sensory perception was analyzed. After the sensory evaluation, 3 plant aqueous extracts (PAEs), representing salty and umami tastes, were selected using principal component analysis (PCA). They were powdered using a spray dryer, mixed, and subsequently referred to as plant salt substitute (PSS). The relative saltiness of PSS to NaCl was shown to be 0.65. When the degree of saltiness between PSS and NaCl is the same, PSS contains 43% less sodium than NaCl. Therefore, PSS can be used in food to reduce an individual's sodium intake while retaining the salty

taste of NaCl [Gyu-Hee Lee* (Department of Food Science and Biotechnology, Woo-song University 17-2, Jayang-dong Dong-ku, Daejeon, 300-718, Republic of Korea), *Food Research International*, 2011, 44(2), 537-543].

NPARR 2(1), 2011-169, Egg-shell like structure in dried milk powders

The development of an egg-shell like structure in skim milk powder has been investigated in a stirred fluidized-bed dryer at various temperatures and humidities. The developed particles have crystalline surfaces and amorphous cores. The SEM analysis shows a thin layer of lactose crystals (at the nano-scale) that is formed on the surface of the powder while the XRD analysis shows that the particle cores are still amorphous (egg-shell form), so the surface properties have improved while the bulk desirable properties (of good solubility) have been retained. The resulting powders show better flowability and stability and less cake formation during storage by retaining good rehydration and dissolution times. The nano-coating of milk powders by crystalline lactose from the powder itself and the improvement in stability and flowability could be a worthwhile solution for dairy industries [Nima Yazdanpanah* and Tim A.G. Langrish (Drying and Process Technology Group, School of Chemical & Biomolecular Engineering, The University of Sydney, NSW 2006, Australia), *Food Research International*, 2011, 44(1), 39-45].

NPARR 2(1), 2011-170, Study of chemical compositions, anti-nutritional contents and digestibility of electron beam irradiated sorghum grains

Effects of electron beam irradiation at doses of 10, 15, 20, 25 and 30 kGy on chemical composition, phytate and tannin contents, and *in vivo* digestibility of sorghum grain were investigated. Irradiation had no effect ($p > 0.05$) on chemical compositions. Tannin content was reduced ($p < 0.05$) by 28%, 30%, 42%, 83% and 86% and phytate content reduced ($p < 0.05$) by 39%, 49%, 66%, 79% and 90% in electron beam irradiated compared to control, respectively. Irradiation improved ($p < 0.05$) *in vivo* digestibilities of dry matter, crude protein, true protein and gross energy. Based upon these results, electron beam

irradiation was judged to be a useful processing method for reducing the anti-nutritional compounds and therefore, improving nutritive value of sorghum grain [P. Shawrang*, A.A. Sadeghi, M. Behgar, H. Zarehshahi and G. Shahhoseini (Agricultural, Medical and Industrial Research School, Nuclear Science and Technology Research Institute, Atomic Energy Organisation of Iran, P.O. Box 31485-498, Karaj, Iran), *Food Chemistry*, 2011, 125(2), 376-379].

NPARR 2(1), 2011-171, Changes in physicochemical properties of organic hulled rice during storage under different conditions

Effects of packaging materials, storage temperatures and time on physicochemical properties of organic hulled red fragrant rice cv. Hom Daeng were investigated. The samples were vacuum-packed in oriented polypropylene/aluminium/linear low-density polyethylene or nylon/linear low-density polyethylene pouches and stored at ambient temperature or 15 °C for up to 12 months. Results from differential scanning calorimetry indicated that onset and peak temperature of gelatinisation of the aged rice samples increased after the 6th month while enthalpy of gelatinisation initially increased and then decreased after the 8th month. Measurements from the Rapid Visco Analyzer revealed that peak viscosity and breakdown of the rice pastes increased within the first 2 months, then decreased after the 6th month, whereas setback gradually increased during storage. Swelling power, at 70 and 90 °C, of the aged samples, tended to decrease after the 4th month. Lower storage temperature retarded those changes while packaging materials did not influence the changes. Changes in thermal and pasting properties of the aged samples were reversed after adding 2-mercaptoethanol. Hence, an increase in disulphide linkages of oryzenin during storage could play a crucial role in altering those properties. Sensory evaluation indicated a significant increase in hardness of the cooked rice prepared from the longer-aged samples ($p \leq 0.05$). However, the cooked rice samples, deriving from the samples stored at ambient temperature for up to 12 months, were still acceptable for Thai consumers [Kanitha Tananuwong* and Yuwares Malila (Department of Food Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand), *Food Chemistry*, 2011, 125(1), 179-185].

NPARR 2(1), 2011-172, Feasibility of use of buckwheat flour as an ingredient in ginger nut biscuit formulation

Ginger nut biscuits are popular traditional biscuits which contain honey. In order to improve their nutritive profile and functionality, standard formulation based on wheat flour was substituted with buckwheat flour at three levels (30%, 40%, 50%). The quality attributes (chemical composition, microelements, bioactive compounds (total polyphenols, rutin, quercetin), antioxidative potential, textural and sensory properties) were compared to control biscuit (based on wheat flour) and biscuits substituted with rye at the same levels, since rye is used as an ingredient which improves the quality of ginger nut biscuits. Substitution with buckwheat flour resulted in a significant increase ($p < 0.05$) in protein, Zn, total polyphenols, antioxidative and chelating activity. Total dietary fibre, Cu, Mn and Fe contents also increased but did not exceed those in rye substituted biscuits. Consumption of 100 g of enriched biscuits could contribute to reaching ≈ 18 –22% (buckwheat) and 16–17% (rye) of the estimated daily average total polyphenols intake, respectively. With the contents of rutin and quercetin at 3.96–6.57 mg/100 g d.b. and 0.087–0.214 mg/100 g d.b., respectively, buckwheat substituted biscuits may significantly contribute to total dietary flavonoid intake and meet the demands of preventive nutrition. Buckwheat enriched biscuits were rated higher regarding sensory attributes, softness and fracturability as compared to control but lower compared to rye supplemented biscuits. [Bojana Filipčev*, Olivera Šimurina, Marijana Sakač, Ivana Sedej, Pavle Jovanov, Mladenka Pestorić and Marija Bodroža-Solarov (Institute for Food Technology, University of Novi Sad, Bul. cara Lazara 1, 21000 Novi Sad, Serbia), *Food Chemistry*, 2011, 125(1), 164–170].

NPARR 2(1), 2011-173, Lipid, fatty acid and carotenoid content of edible egg yolks from avian species: A comparative study

A comparative study has been conducted of the major lipid classes composition, as well as the fatty acid and carotenoid content in the yolk of conventional eggs from five avian species (ostrich, turkey, quail, duck and goose); the nutritional indices

were calculated. The neutral lipids were the major yolk fractions but their proportions varied among species. All yolks and especially ostrich's yolk were found to be an excellent source of dietary lecithin. Quail yolk displayed the lowest fat and cholesterol content and the lowest values for the cholesterol index (CI) and cholesterol-saturated fat index (CSI). It is therefore more appropriate for a healthier diet. Turkey and goose yolks contained significantly ($P < 0.05$) higher ω -3 fatty acid proportion and ω -6/ ω -3 ratio. The turkey yolk was characterised by the lowest AI and TI values, which are recommended for a healthy diet. Quail yolk lipids contained a favourable PUFA/SFA ratio. All the examined yolks contained highly bioavailable functional nutrients, such as lutein and zeaxanthin [Vassilia J. Sinanoglou*, Irini F. Strati and Sofia Miniadis-Meimaroglou (Food Analysis Laboratory, Department of Food Technology, Technological Educational Institution of Athens, Ag. Spyridonos, 12210 Egaleo, Greece), *Food Chemistry*, 2011, 124(3), 971–977].

NPARR 2(1), 2011-174, Yield and fruit quality of four sweet corn hybrids (*Zea mays*) under conventional and integrated fertilization with vermicompost

Vermicompost has been proposed as a valuable fertilizer for sustainable agriculture. The effects of vermicompost on yield and quality of sweet corn were evaluated in this study. In two field trials, sweet corn plants were grown under (i) a conventional fertilization regime with inorganic fertilizer, and integrated fertilization regimes in which 75% of the nutrients were supplied by the inorganic fertilizer and 25% of the nutrients were supplied by either (ii) rabbit manure, or (iii) vermicompost. All three types of fertilization regime were supplied at two doses. Two pairs of nearly isogenic sweet corn hybrids homozygous for *sugary1* and *shrunk2* mutants were included in the trials to explore fertilizer \times genotype interactions. Growth, yield and ear quality of the plants were evaluated in relation to the three fertilization regimes.

In general, the integrated regimes yielded the same productivity levels as the conventional treatment. Moreover, both vermicompost and manure produced significant increases in plant growth and marketable yield, and also affected the chemical

composition and quality of the marketable ear. Nevertheless, most of the observed effects of the organic fertilizers were genotype-dependent.

The results confirm that the use of organic fertilizers such as vermicompost has a positive effect on crop yield and quality. Nevertheless, these effects were not general, indicating the complexity of the organic amendment–plant interactions and the importance of controlling genetic variation when studying the effects of vermicompost on plant growth [Cristina Lazcano*, Pedro Revilla, Rosa Ana Malvar and Jorge Domínguez (Centro Tecnológico del Mar, Fundación CETMAR, C/Eduardo Cabello s/n, Bouzas, Vigo E-36208, Spain), *Journal of the Science of Food and Agriculture*, 2011, 91(7), 1244–1253].

NPARR 2(1), 2011-175, Physicochemical, thermal and functional characterisation of protein isolates from Kabuli and Desi chickpea (*Cicer arietinum* L.): a comparative study with soy (*Glycine max*) and pea (*Pisum sativum* L.)

Chickpea (*Cicer arietinum* L.) seeds are a good source of protein that has potential applications in new product formulation and fortification. The main objectives of this study were to analyse the physicochemical, thermal and functional properties of chickpea protein isolates (CPIs) and compare them with those of soy (SPI) and pea (PPI) protein isolates.

Extracted CPIs had mean protein contents of 728–853 g kg⁻¹ (dry weight basis). Analysis of their deconvoluted Fourier transform infrared spectra gave secondary structure estimates of 25.6–32.7% α -helices, 32.5–40.4% β -sheets, 13.8–18.9% turns and 16.3–19.2% disordered structures. CPIs from CDC Xena, among Kabuli varieties, and Myles, among Desi varieties, as well as SPI had the highest water-holding and oil absorption capacities. The emulsifying properties of Kabuli CPIs were superior to those of PPI and Desi CPIs and as good as those of SPI. The heat-induced gelation properties of CPIs showed a minimum protein concentration required to form a gel structure ranging from 100 to 140 g L⁻¹. Denaturation temperatures and enthalpies of CPIs ranged from 89.0 to 92.0 °C and from 2.4 to 4.0 J g⁻¹ respectively.

The results suggest that most physicochemical, thermal and functional properties of CPIs compare favourably with those of SPI and are better than those

of PPI. Hence CPI may be suitable as a high-quality substitute for SPI in food applications [Thushan S Withana-Gamage, Janitha PD Wanasundara, Zeb Pietrasik, and Phyllis J Shand* (Department of Food & Bioproduct Sciences, University of Saskatchewan, 51 Campus Drive, Saskatoon, Saskatchewan, S7N 5A8, Canada), *Journal of the Science of Food and Agriculture*, 2011, 91(6), 1022-1031].

NPARR 2(1), 2011-176, Antioxidant activity of hard wheat flour, dough and bread prepared using various processes with the addition of different phenolic acids

The purpose of this study was to evaluate the effect of baking process on the antioxidant activity of different phenolic acids. Antioxidant potential was determined using the β -carotene-bleaching activity assay, and free phenolic acid levels were determined by high-performance liquid chromatography. Four phenolic acids, caffeic acid, ferulic acid, syringic acid and gallic acid, were mixed with wheat flour at a concentration of 4.44 μ mol/g of flour.

Type of phenolic acid and processing affected antioxidant activity. Of the phenolic acids, caffeic acid had the most pronounced antioxidant effect. The ranking of phenolic acids in terms of their antioxidant activity in fermented dough and bread was similar to that before processing, i.e. syringic acid < gallic acid < ferulic acid < caffeic acid. The content of ferulic acid was greater than that of the other phenolic acids after baking. Antioxidant activity and free phenolic acid content were reduced by mixing but recovered after fermentation and baking. Phenolic acid recovery after baking was 74–80%.

Phenolic acids retain their antioxidant activity after the baking process, which has potential health benefits for consumers. Elucidation of interactions between the baking process and phenolic acids is important for the development of functional foods [Hye-Min Han and Bong-Kyung Koh* (Department of Food and Nutrition, Keimyung University, 1000 Sin-dang Dong, Dal-suh Gu, Dae-gu 704-701, Korea), *Journal of the Science of Food and Agriculture*, 2011, 91(4), 604–608].

NPARR 2(1), 2011-177, Effect of irradiation, active and modified atmosphere packaging, container

oxygen barrier and storage conditions on the physicochemical and sensory properties of raw unpeeled almond kernels (*Prunus dulcis*)

The present study investigated the effect of irradiation, active and modified atmosphere packaging, and storage conditions on quality retention of raw, whole, unpeeled almonds. Almond kernels were packaged in barrier and high-barrier pouches, under N₂ or with an O₂ absorber and stored either under fluorescent lighting or in the dark at 20 °C for 12 months. Quality parameters monitored were peroxide value, hexanal content, colour, fatty acid composition and volatile compounds. Of the sensory attributes colour, texture, odour and taste were evaluated.

Peroxide value and hexanal increased with dose of irradiation and storage time. Irradiation resulted in a decrease of polyunsaturated and monounsaturated fatty acids during storage with a parallel increase of saturated fatty acids. Volatile compounds were not affected by irradiation but increased with storage time

indicating enhanced lipid oxidation. Colour parameters of samples remained unaffected immediately after irradiation. For samples packaged under a N₂ atmosphere L^* and b^* values decreased during storage with a parallel increase of value a^* resulting to gradual product darkening especially in irradiated samples.

Non-irradiated almonds retained acceptable quality for ca. 12 months stored at 20 °C with the O₂ absorber irrespective of lighting conditions and packaging material oxygen barrier. The respective shelf life for samples irradiated at 1.0 kGy was 12 months packaged in PET-SiOx//LDPE irrespective of lighting conditions and 12 months for samples irradiated at 3 kGy packaged in PET-SiOx//LDPE stored in the dark [Stamatios F Mexis, Kyriakos A Riganakos and Michael G Kontominas* (Laboratory of Food Chemistry and Technology, Department of Chemistry, University of Ioannina, Ioannina 45110, Greece), *Journal of the Science of Food and Agriculture*, 2011, 91, 634–649].

FRUITS

NPARR 2(2), 2011-178, Roasting Affects Phenolic Composition and Antioxidative Activity of Hazelnuts (*Corylus avellana* L.)

The potential effect of skin removal and roasting on individual and total phenolic content, and on antioxidative potential of 6 hazelnut cultivars were investigated. HPLC-MS identification of individual phenolics confirmed the presence of 7 flavan-3-ols (catechin, epicatechin, 2 procyanidin dimers, and 3 procyanidin trimers), 3 flavonols (quercetin pentoside, quercetin-3-*O*-rhamnoside, and myricetin-3-*O*-rhamnoside), 2 hydrobenzoic acids (gallic acid, protocatechulic acid), and 1 dihydrochalcone (phloretin-2'-*O*-glucoside). Flavonols were only detected in whole hazelnut kernels. The content of individual phenolics, with the exception of gallic acid, was always highest in whole unroasted hazelnuts and was significantly reduced after skin removal. Similarly, total phenolic content and antioxidative potential decreased when skin was removed. Roasting had a significant negative effect on individual phenolics but not on the total phenolic content and antioxidative potential of kernels. From a health promoting phytochemical composition of hazelnuts the consumption of whole unroasted kernels with skins should be preferential to peeled kernels either roasted or unroasted.

A significant reduction in the antioxidative potential and total phenolic content is detected after hazelnut skin removal but not after roasting, suggesting that hazelnut kernels should be consumed whole. In hazelnut skin, many phenolic compounds are located, which are not present in flesh and, therefore, the health properties of hazelnuts are strongly affected by skin removal. Thermal processing and roasting conditions used in this study had a lesser effect on the individual phenolic composition of the kernel and thus roasted and unroasted hazelnuts without skin contain comparable amounts of health promoting compounds [Valentina Schmitzer*, Ana Slatnar, Robert Veberic, Franci Stampar and Anita Solar (Univ. of Ljubljana, Biotechnical Faculty, Dept. of Agronomy, Jamnikarjeva 101, SI-1000 Ljubljana, Slovenia), *Journal of Food Science*, 2011, 76(1), S14–S19].

NPARR 2(2), 2011-179, Antioxidant properties of polymeric proanthocyanidins from fruit stones and pericarps of *Litchi chinensis* Sonn

Fruit stones and pericarps of *Litchi chinensis*, waste products of the food, were studied as a source of polymeric proanthocyanidins. The structures of the polymeric proanthocyanidins isolated from *Litchi chinensis* were characterized by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) coupled with high performance liquid chromatography electrospray ionization mass spectrometry (HPLC-ESI-MS) analysis. The spectra obtained through MALDI-TOF MS analysis revealed that the dominant A-type procyanidin polymers occurred in each polymer length with one or more A-type linkages. The polymeric proanthocyanidins of litchi fruit stones exhibited longer polymer length than those of fruit pericarps, with polymerization degrees up to 20 and 11 for fruit stones and pericarps, respectively. After depolymerization with toluene- α -thiol, HPLC-ESI-MS analysis showed that epicatechin and A-type dimer were the major constituent units, and the mean polymerization degrees were 15.4 and 5.8 for polymeric proanthocyanidins of fruit stones and pericarps, respectively. The antioxidant properties investigated using DPPH, ABTS and FRAP methods showed that the higher polymerization degree of polymeric proanthocyanidins from litchi fruit stones exhibited higher antioxidant activities than those from litchi pericarps [Hai-Chao Zhou, Yi-Ming Lin*, Yuan-Yue Li, Min Li, Shu-Dong Wei, Wei-Ming Chai and Nora Fung-ye Tam (Key Laboratory of the Ministry of Education for Coastal and Wetland Ecosystems, School of Life Sciences, Xiamen University, Xiamen 361005, China), *Food Research International*, 2011, 44(2), 613-620].

NPARR 2(2), 2011-180, Influence of environmental and genetic factors on health-related compounds in strawberry

Strawberry (*Fragaria × ananassa*, Duch.) represents a relevant source of micronutrients and phenolic substances, most of which are natural antioxidants and contribute to the high nutritional quality (NQ) of the fruit. Despite its proven health benefits, strawberries also contain allergenic compounds. In particular protein Fra a 1 is considered

the main cause of allergic reactions after consumption of these fruits. However, there is a dearth of literature data on the genetic and seasonal influences on the Fra a 1 accumulation in strawberries, and on the quantitative variation of this allergen during fruit ripening.

The aim of the present study was to evaluate and compare the total antioxidant capacity and vitamin C, phenolic, protein and allergen contents of four strawberry genotypes. Two commercial varieties, "Adria" and "Sveva", and two advanced selections originating from the Marche Polytechnic University strawberry breeding program, "AN94.414.52" and "AN00.239.55", were selected for this study. To assess the genotype and seasonal influence on the strawberry nutritional and non-nutritional traits, strawberries in three different ripening stages were analysed during the fruiting seasons 2007 and 2008. In the 2-year evaluation, the ripe red fruits of the cultivar "Sveva" showed the highest TAC, phenolic and flavonoid contents and interestingly the lowest allergen content. However, the variety "Sveva", together with the F2 selection "AN00.239.55", were the most affected by the year-to-year variability of temperature observed in the nutritional and non-nutritional aspects of the fruits. These findings confirmed a relevant genotype-dependent response to environmental stress conditions, which may in part explain the changes in the antioxidant, phenolic and allergenic properties of strawberry fruits in different years [Sara Tulipani, Gorji Marzban, Anita Herndl, Margit Laimer, Bruno Mezzetti^c and Maurizio Battino* (Institute of Biochemistry, Biology & Genetics, Faculty of Medicine, Marche Polytechnic University, Ancona, Italy), *Food Chemistry*, 2011, 124(3), 906-913].

NPARR 2(2), 2011-181, Antioxidative and anti-inflammatory properties of *Citrus sulcata* extracts

Citrus sulcata was subjected to ultrasound, high-pressure, and Soxhlet extractions. The antioxidant and anti-inflammatory activities of the extracts were evaluated qualitatively and quantitatively. The antioxidant content of the peel extract was twice that of the fruit extract. The quantitative analysis showed that the narirutin and hesperidin contents in the peel extracts were 8.8 and 7.5 mg/100 g, respectively. These extracts had a total phenolic content of 112.22

± 2.89 gallic acid equivalent (GAE) mg/100 g, a total flavonoid content of 54.09 ± 1.01 rutin equivalent (RE) mg/100 g, DPPH radical scavenging activity of 46%, and antioxidant activity of 213.25 ± 2.82 μ M of Trolox equivalents (TEAC). *C. sulcata* extracts could prevent hydrogen peroxide (H₂O₂)-induced oxidative stress, reduce expression of the inflammatory markers nuclear Factor kappa B (NF κ B) and phosphorylated I κ B α (p-I κ B α) in A549 human lung carcinoma cells, and inhibit Lipopolysaccharide (LPS)-induced THP-1 monocyte differentiation to an extent of 85% [Ai-Yih Wang*, Ming-Yi Zhou and Wen-Chieh Lin (Department of Radiological Technology, Yuanpei University, Hsinchu City, Taiwan, ROC), *Food Chemistry*, 2011, 124(3), 958-963].

NPARR 2(2), 2011-182, Vapour treatments with methyl salicylate or methyl jasmonate alleviated chilling injury and enhanced antioxidant potential during postharvest storage of pomegranates

Pomegranates were treated after harvest with methyl jasmonate (MeJa) or methyl salicylate (MeSa) at two concentrations (0.01 and 0.1 mM), and then stored under chilling temperature for 84 days. Control fruits exhibited chilling injury (CI) symptoms manifested by pitting and browning, the severity being enhanced as storage time advanced, and accompanied by softening and electrolyte leakage (EL). The CI symptoms were significantly reduced by MeJa or MeSa treatments, without significant differences among treatments or applied dose. In addition, both treatments significantly increased total phenolics and anthocyanins with respect to controls. Hydrophilic (H-TAA) and lipophilic (L-TAA) total antioxidant activity decreased in control arils, but in both MeJa and MeSa treated fruits H-TAA increased while no significant changes occurred for L-TAA. Results would suggest that both MeJa and MeSa have potential postharvest applications in reducing CI, maintaining quality and improving the health benefits of pomegranate fruit consumption by increasing the antioxidant capacity [Mohammad Sayyari, Mesbah Babalar, Siamak Kalantari, Domingo Martínez-Romero, Fabián Guillén, María Serrano and Daniel Valero* (Department of Food Technology, EPSO, University Miguel Hernández, Ctra. Beniel km. 3.2, 03312 Orihuela, Alicante, Spain), *Food Chemistry*, 2011, 124(3), 964-970].

NPARR 2(2), 2011-183, Effect of jam processing and storage on total phenolics, antioxidant activity, and anthocyanins of different fruits

Fruits have been widely recognised as an excellent source of bioactive phenolic compounds. The purpose of this study was to evaluate the effect of jam processing of strawberry, cherry, apricot, fig and orange on the total phenolics, antioxidant activity and anthocyanins during 5 months of storage at 25 °C. Fresh strawberry had the highest contents of total phenolics (8503.1 mg GAE kg⁻¹) followed by cherry, apricot, fig and orange, respectively. Jam processing decreased the total phenolics, antioxidant activity, and anthocyanins of all fruits. Total phenolics of jam during storage decreased only in apricot, fig and orange. Fresh strawberry had the highest antioxidant activity (54.88% inhibition) followed by the other fruits. Antioxidant activity did not change in strawberry during jam storage, while there are reductions in the other fruits were observed. Fresh strawberry had the highest anthocyanins (2323.8 mg cya-3-glu kg⁻¹), followed by cherry and the other fruits, respectively. Results showed only a decrease of anthocyanins and pH in apricot and fig jams during 5 months of storage. Despite the reduction of these compounds in jam processing, it is considered a good method to maintain them during 5 months of storage [Taha M. Rababah*, Majdi A. Al-Mahasneh, Isra Kilani, Wade Yang, Mohammad N. Alhamad, Khalil Ereifej, Muhammad Al-u'datt ((Faculty of Agriculture, Jordan University of Science and Technology, P.O. Box 3030, Irbid, 22110 Jordan), *Journal of the Science of Food and Agriculture*, 2011, 91(6), 1096-1102].

NPARR 2(2), 2011-184, Significance of osmotic

temperature treatment and storage time on physical and chemical properties of a strawberry-gel product

The development of fruit-based foods that maintain the nutritional and sensory properties of fresh fruit may help to stimulate fruit consumption by consumers. The possibility of formulating a fruit-gel product with osmodehydrated fruit and the reused osmotic solution (OS) obtained from the dehydration step has been demonstrated. However, the conditions of the osmotic process can significantly affect the properties of the obtained product. In this work an osmotic process at 22 °C for 6 h and at 30 °C for 3 h was employed to formulate a strawberry-gel product.

Significant losses of ascorbic and citric acids and anthocyanins were observed and some relevant volatile compounds of the strawberry aroma profile were developed during the osmotic process. Changes in all analysed parameters occurred mainly during the first 2 days of storage. The flux of anthocyanins from the fruit to the gel gave an attractive appearance to the formulated product. These changes were more marked for samples obtained at 30 °C.

Osmotic treatment at 30 °C was more suitable for formulation of the product, because the presence of nutritional/functional compounds in the OS, and consequently in the gel matrix, was higher and the aroma and colour were more stable and homogeneous during storage [[Maria Eugenia Martín-Esparza, Isabel Escriche, Lucas Penagos, Nuria Martínez-Navarrete*(Food Technology Department, Food Investigation and Innovation, Universidad Politécnica de Valencia, Camino de Vera s/n, E-46022 Valencia, Spain), *Journal of the Science of Food and Agriculture*, 2011, 91(5), 894-904].

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

NPARR 2(2), 2011-185, Fast biodiesel production from beef tallow with radio frequency heating

Efficient biodiesel production from beef tallow was achieved with radio frequency (RF) heating. A conversion rate of $96.3 \pm 0.5\%$ was obtained with a NaOH concentration of 0.6% (based on tallow), an RF heating for 5 min, and a methanol/tallow molar ratio of 9:1. Response surface methodology was employed to evaluate the influence of NaOH dose, RF heating time, and methanol/tallow ratio. The alkaline concentration showed the largest positive impact on the conversion rate. Similar fast conversion from canola oil to biodiesel was achieved in our previous work, indicating that RF heating, as an accelerating technique for biodiesel production, had a large applying area. Viscosities of biodiesel products from beef tallow and canola oil were measured as 5.23 ± 0.01 and $4.86 \pm 0.01 \text{ mm}^2 \text{ s}^{-1}$, respectively, both meeting the specification in ASTM D6751 ($1.9\text{--}6.0 \text{ mm}^2 \text{ s}^{-1}$) [Shaoyang Liu, Yifen Wang*, Jun-Hyun Oh and Josh L. Herring (Biosystems Engineering Department, Auburn University, 200 Tom E. Corley Building, Auburn, AL 36849-5417, USA) *Renewable Energy*, 2011, 36(3), 1003-1007].

NPARR 2(2), 2011-186, Biomass briquetting and its perspectives in Brazil

A study of the status of biomass briquetting and its perspectives in Brazil was conducted including determination of the availability and characteristics of the agro-residues for briquetting. Wood residues, rice husk and coffee husk were characterized and identified as the more promising agro-residues for briquetting in the short-term in Brazil. A survey was carried out in order to determine the number of briquetting factories in Brazil, and also to determine: used briquetting technologies, briquettes production, briquettes sale prices, the status of biomass briquetting market and its future perspectives [Felix Fonseca Felfli, Juan M. Mesa P, José Dilcio Rocha, Daniele Filippetto, Carlos A. Luengo and Walfrido Alonso Pippo* (Grupo Combustíveis Alternativos/Departamento de Física Aplicada/IFGW/UNICAMP, Caixa Postal 6165,

Barão Geraldo 13083-970, Campinas, SP, Brazil), *Biomass and Bioenergy*, 2011, 35(1), 236-242].

NPARR 2(2), 2011-187, Patterns and drivers of fuelwood collection and tree planting in a Middle Hill watershed of Nepal

The majority of residents in the rural Middle Hills of Nepal use fuelwood from public and private sources as their primary energy source. This study investigated fuelwood availability in accessed forests, amount of fuelwood collected, preferred tree species for fuelwood, contribution of public and private sources to total fuelwood consumption, and investment in tree planting on agricultural land. Fuelwood availability declined in the decades prior to 1990, but stabilized by 1990. Fuelwood from fifty-three species was collected from forests. Median annual *per capita* collection was 683 kg and predicted only by family size. Occupational castes ('low castes') did not show different harvesting rates than non-occupational castes and non-caste ethnic groups. Wealth was not associated with total fuelwood collection, probably because there was no fuelwood market. Most households collected fuelwood from a private source, namely trees planted on sloping, rain-fed agricultural land (*bari*), but this accounted for only a small portion of most households' requirement. *Bari* landholding area and livestock holdings—typical measures of wealth—drove the decision to plant trees on *bari* land, and the number of trees that were planted. *Bari*-poor and landless households were consequently the most vulnerable to forest degradation, so the promotion of private fuelwood planting by large *bari* landholders could reduce pressure on forests and promote greater fuelwood availability for landless households. Support of community forestry emphasizing access for *bari*-poor and landless families could further decrease fuelwood vulnerability of poorer households [Edward L. Webb* and Arun Dhakal (Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore, 117543), *Biomass and Bioenergy*, 2011, 35(1), 121-132].

NPARR 2(2), 2011-188, Enhanced enzymatic conversion with freeze pretreatment of rice straw

Production of bioethanol by the conversion of lignocellulosic waste has attracted much interest in

recent years, because of its low cost and great potential availability. The pretreatment process is important for increasing the enzymatic digestibility of lignocellulosic materials. Enzymatic conversion with freeze pretreatment of rice straw was evaluated in this study. The freeze pretreatment was found to significantly increase the enzyme digestibility of rice straw from 48% to 84%. According to the results, enzymatic hydrolysis of unpretreated rice straw with 150 U cellulase and 100 U xylanase for 48 h yielded 226.77 g kg⁻¹ and 93.84 g kg⁻¹ substrate-reducing sugars respectively. However, the reducing sugar yields from freeze pretreatment under the same conditions were 417.27 g kg⁻¹ and 138.77 g kg⁻¹ substrate, respectively. In addition, hydrolyzates analysis showed that the highest glucose yield obtained during the enzymatic hydrolysis step in the present study was 371.91 g kg⁻¹ of dry rice straw, following pretreatment. Therefore, the enhanced enzymatic conversion with freeze pretreatment of rice straw was observed in this study. This indicated that freeze pretreatment was highly effective for enzymatic hydrolysis and low environmental impact [Ken-Lin Chang, Jitladda Thitikorn-amorn, Jung-Feng Hsieh, Bay-Ming Ou, Shan-He Chen, Khanok Ratanakhanokchai, Po-Jung Huang and Shui-Tein Chen* (Institute of Biological Chemistry & Genomics Research Center Academia Sinica, Nankang, Taipei 115, Taiwan), *Biomass and Bioenergy*, 2011, 35 (1), 90-95].

NPARR 2(2), 2011-189, Bioenergy production potential for aboveground biomass from a subtropical constructed wetland

Wetland biomass has potentials for bioenergy production and carbon sequestration. Planted with multiple species macrophytes to promote biodiversity, the 3.29 ha constructed wetland has been treated 4000 cubic meter per day (CMD) domestic wastewater and urban runoff. This study investigated the seasonal variations of aboveground biomass of the constructed wetland, from March 2007 to March 2008. The overall aboveground biomass was 16,737 kg and total carbon content 6185 kg at the peak of aboveground accumulation for the system emergent macrophyte at September 2007. Typhoon Korsa flood this constructed wetland at October 2007, however, significant recovery for emergent macrophyte was observed without human intervention. Endemic

Ludwigia sp. recovered much faster, compared to previously dominated typha. Self-recovery ability of the macrophyte community after typhoon validated the feasibility of biomass harvesting. Incinerating of 80% biomass harvested of experimental area in a nearby incineration plant could produce 11,846 kWh for one month [Yi-Chung Wang, Chun-Han Ko*, Fang-Chih Chang, Pen-Yuan Chen, Tzu-Fen Liu, Yiong-Shing Sheu, Tzeng-Lien Shih and Chia-Ji Teng (School of Forestry and Resource Conservation, National Taiwan University, Taipei 10617, Taiwan, ROC), *Biomass and Bioenergy*, 2011, 35(1), 50-58].

NPARR 2(2), 2011-190, Anaerobic acidification of sugar-beet processing wastes: Effect of operational parameters

The objective of this study was to maximize the hydrolysis and acidification of sugar-beet processing wastewater and beet pulp for volatile fatty acid (VFA) production through acidogenic anaerobic metabolism. Experiments were conducted to determine the optimum operational conditions (HRT, waste-mixing ratio and pH) for effective acidification in daily-fed, continuously mixed anaerobic reactors. For this purpose, reactors were operated at 35 ± 1 °C with different combinations of HRT (2–4 days), wastewater-pulp mixing ratios (1:0–1:1, in terms of COD) and pH ranges (5.7–7.5). Increased OLRs, resulting from pulp addition, increased the amount of acidification products (VFAs) which led to relatively low operational pH values (5.7–6.8). In this pH range, methanogenic activity was successfully inhibited and the lowest methane percentages (5.6–16.3%) were observed in the produced biogas. The optimum operational conditions were determined to be 2-day HRT and 1:1 waste mixing ratio (in terms of COD) without external alkalinity addition. These operational conditions led to the highest tVFA concentration (3635 ± 209 mg/L as H-Ac) with the acidification degree of 46.9 ± 2.1% [Emrah Alkaya and Göksel N. Demirer* (Department of Environmental Engineering, Middle East Technical University, Inonu Bulvari, 06531 Ankara, Turkey), *Biomass and Bioenergy*, 2011, 35(1), 32-39].

NPARR 2(2), 2011-191, Preliminary assessment of biodiesel generation from meat industry residues in Baja California, Mexico

Oil derived fuels constituted a main energy source during the last fifty years, although their high price limited their accessibility. Prospective studies indicated that economic and environmental problems promoted biodiesel production using biomass and residues like animal fat, along with meat and bones, among others. The regional inventory of the available fat in meat industry, as well as the estimation of the biodiesel potential production demonstrated that the biodiesel generated from animal fat, combined with diesel from oil in a 2% biodiesel blend could power 25% of the trucks and passenger vehicles registered in 2007 in Baja California, Mexico [Lydia Toscano*, Gisela Montero, Margarita Stoytcheva, Héctor Campbell and Alejandro Lambert (Instituto de Ingeniería, Universidad Autónoma de Baja California, Blvd. B. Juárez s/n, 21280 Mexicali, Mexico), *Biomass and Bioenergy*, 2011, 35(1), 26-31].

NPARR 2(2), 2011-192, Hydrothermal pretreatment of switchgrass and corn stover for production of ethanol and carbon microspheres

Pretreatment of biomass is viewed as a critical step to make the cellulose accessible to enzymes and for an adequate yield of fermentable sugars in ethanol production. Recently, hydrothermal pretreatment methods have attracted a great deal of attention because it uses water which is inherently present in green biomass, non-toxic, environmentally benign, and inexpensive medium. Hydrothermal pretreatment of switchgrass and corn stover was conducted in a flow through reactor to enhance and optimize the enzymatic digestibility. More than 80% of glucan digestibility was achieved by pretreatment at 190 °C. Addition of a small amount of K₂CO₃ (0.45–0.9 wt.%) can enhance the pretreatment and allow use of lower temperatures. Switchgrass pretreated at 190 °C only with water had higher internal surface area than that pretreated in the presence of K₂CO₃, but both the substrates showed similar glucan digestibility. In comparison to switchgrass, corn stover required milder pretreatment conditions. The liquid hydrolyzate generated during pretreatment was converted into carbon microspheres by hydrothermal carbonization, providing a value-added byproduct. The carbonization process was further examined by GC–MS analysis to understand the mechanism of microsphere formation [Sandeep Kumar, Urvi Kothari, Lingzhao Kong, Y.Y. Lee and Ram B.

Gupta* (Department of Chemical Engineering, Auburn University, 212 Ross Hall, Auburn, AL 36849-5127, USA), *Biomass and Bioenergy*, 2011, 35(2), 956-968].

NPARR 2(2), 2011-193, A study of bonding and failure mechanisms in fuel pellets from different biomass resources

Pelletization of biomass reduces its handling costs, and results in a fuel with a greater structural homogeneity. The aim of the present work was to study the strength and integrity of pellets and relate them to the quality and mechanisms of inter-particle adhesion bonding. The raw materials used were: beech, spruce and straw, representing the most common biomass types used for fuel pellet production, i.e. hardwoods, softwoods and grasses, respectively. The results showed that the compression strengths of the pellets were in general higher for pellets produced at higher temperatures, and much higher for wood pellets than for straw pellets. Scanning electron microscopy of the beech pellets fracture surfaces, pressed at higher temperatures, showed areas of cohesive failure, indicating high energy failure mechanisms, likely due to lignin flow and inter-diffusion between adjacent wood particles. These were absent in both spruce and straw pellets. Infrared spectroscopy of the fracture surfaces of the straw pellets indicated high concentrations of hydrophobic extractives, that were most likely responsible for their low compression strength, due to presence of a chemical weak boundary layer, limiting the adhesion mechanism to van der Waals forces. Electron micrographs indicating interfacial failure mechanisms support these findings. Infrared spectra of the fracture surface of wood pellets, pressed at elevated temperatures, showed no signs of hydrophobic extractives. It has been shown that both temperature and chemical composition, i.e. the presence of hydrophobic extractives, have a significant influence on the bonding quality between biomass particles during the pelletizing process [Wolfgang Stelte*, Jens K. Holm, Anand R. Sanadi, Søren Barsberg, Jesper Ahrenfeldt and Ulrik B. Henriksen (Biosystems Division, Risø National Laboratory for Sustainable Energy, Technical University of Denmark-DTU, Frederiksborgvej 399, DK 4000, Roskilde, Denmark), *Biomass and Bioenergy*, 2011, 35(2), 910-918].

NPARR 2(2), 2011-194, **Process optimization for bioethanol production from cassava starch using novel eco-friendly enzymes**

Although cassava (*Manihot esculenta* Crantz) is a potential bioethanol crop, high operational costs resulted in a negative energy balance in the earlier processes. The present study aimed at optimizing the bioethanol production from cassava starch using new enzymes like Spezyme[®] Xtra and Stargen[™] 001. The liquefying enzyme Spezyme was optimally active at 90 °C and pH 5.5 on a 10% (w/v) starch slurry at levels of 20.0 mg (280 Amylase Activity Units) for 30 min. Stargen levels of 100 mg (45.6 Granular Starch Hydrolyzing Units) were sufficient to almost completely hydrolyze 10% (w/v) starch at room temperature (30 ± 1 °C). Ethanol yield and fermentation efficiency were very high (533 g/kg and 94.0% respectively) in the Stargen + yeast process with 10% (w/v) starch for 48 h. Raising Spezyme and Stargen levels to 560 AAU and 91.2 GSHU

respectively for a two step loading [initial 20% (w/v) followed by 20% starch after Spezyme thinning]/initial higher loading of starch (40% w/v) resulted in poor fermentation efficiency. Upscaling experiments using 1.0 kg starch showed that Stargen to starch ratio of 1:100 (w/w) could yield around 558 g ethanol/kg starch, with a high fermentation efficiency of 98.4%. The study showed that Spezyme level beyond 20.0 mg for a 10% (w/v) starch slurry was not critical for optimizing bioethanol yield from cassava starch, although an initial thinning of starch for 30 min by Spezyme facilitated rapid saccharification–fermentation by Stargen + yeast system. The specific advantage of the new process was that the reaction could be completed within 48.5 h at 30 ± 1 °C [S. Shanavas, G. Padmaja*, S.N. Moorthy, M.S. Sajeev and J.T. Sheriff (Division of Crop Utilization, Central Tuber Crops Research Institute, Thiruvananthapuram, 695 017 Kerala, India), *Biomass and Bioenergy*, 2011, 35(2), 901-909].

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

NPARR 2(2), 2011-195, Selection of cultivars for minimization of waste and of water consumption in cassava starch production

When considering the sustainability of a business, deciding on the industrial use of starchy raw materials requires more than just the information on their agricultural productivity and starch yield. The main goal of this work was to investigate ten different cultivars to select for industrial applications seeking to minimize residue generation and water consumption in the production of cassava starch. The cassava cultivars that are richer in starch (22.61–22.89 g 100 g⁻¹) generated the smallest amounts of residues (420.63–423.52 kg ton⁻¹ of cassava roots) and required the smallest amounts of water for processing. There is an inverse relationship between the dry matter content in cassava roots and the amount of solid residues generated. One of the cultivars stood out for showing the following features: high starch yield, little tendency for generation of residues, low requirement of water for processing, easiness in the peeling process, and high content of total solids; therefore such features can suggest its use for starch extraction with wastes minimization [Helayne Aparecida Maieves, Daiana Cardoso De Oliveira, Júlia Rodrigues Frescura and Edna Regina Amante* (Food Science and Technology Department, Federal University of Santa Catarina, Rod. Admar Gonzaga, 1346, Florianópolis, Santa Catarina, CEP 88034001, Brazil), *Industrial Crops and Products*, 2011, 33, (1), 224-228].

NPARR 2(2), 2011-196, Gorse (*Ulex europæus*) as a possible source of xylans by hydrothermal treatment

Autocatalytic hydrothermal process conditions were used to study *Ulex europæus* (Gorse) as a source of xylan compounds. The aim was to study the possibilities for using this unutilised biomass material to produce xylans. *Ulex* is an evergreen shrub that grows in the northwest of Spain and has no economic value. Therefore, *Ulex* is considered a promising candidate as a biomass source. *Ulex* showed a total

xlylose content of 12%, thus qualifying it as a suitable material to extract xylan-derived compounds. Autohydrolysis was applied to extract xylans from *Ulex*. To find the best conditions for xylan extraction, samples of *Ulex* were subjected to different temperatures and time conditions. Results indicate that autohydrolysis is a suitable method to selectively extract xylans at temperatures between 160 and 190 °C for 5–30 min, reaching a maximum xylan recovery of almost 63% of the initial xylan at 180 °C for 30 min, with only small effects on cellulose and lignin contents [Pablo Ligeró, Alberto de Vega*, Johannes C. van der Kolk and Jan E.G. van Dam (Department of Physical Chemistry and Chemical Engineering, Faculty of Sciences, University of A Coruña, Alejandro de la Sota, 1, 15004 A Coruña, Spain), *Industrial Crops and Products*, 2011, 33 (1), 205-210].

NPARR 2(2), 2011-197, Rheological interactions between *Lallemantia royleana* seed extract and selected food hydrocolloids

Lallemantia royleana (Balangu) is a mucilaginous endemic plant which is grown in different regions of world. The flow behaviour of Balangu seed extract (BSE) and its mixture with xanthan, guar and locust bean gums at 1:3, 1:1 and 3:1 ratios, in addition to control samples (0% BSE), were evaluated. To describe the rheological properties of samples, the power law model was fitted on apparent viscosity–shear rate data. To evaluate the interaction between BSE and selected hydrocolloids in dilute solutions, the relative viscosity was also investigated.

There was no significant difference between the consistency coefficient of guar and locust bean solutions and their blends substituted with 250 g kg⁻¹ BSE. The BSE–xanthan mixture at 1:3 and 1:1 ratios had consistency index equal to xanthan solution. BSE–locust bean gum at all ratios, BSE–xanthan at 1:3 ratio and BSE–guar gum at 1:1 and 3:1 ratios indicated relative viscosity lower than values calculated assuming no interaction. The intrinsic viscosity value of BSE was determined 3.50 dL g⁻¹.

The apparent viscosities of BSE, selected hydrocolloids and their blends were the same at a shear rate of 293 s⁻¹ and the commercial gums can be

substituted by 250 g kg⁻¹ and 500 g kg⁻¹ BSE [T Mohammadi Moghaddam, Seyed M A Razavi *and B Emadzadeh (Department of Food Science and Technology, Ferdowsi University of Mashhad (FUM), P.O. Box 91775-1163, Mashhad, Iran), *Journal of the Science of Food and Agriculture*, 2011, 91(6), 1083-1088].

NPARR 2(2), 2011-198, Production of Okara and Soy Protein Concentrates Using Membrane Technology

Microfiltration (MF) membranes with pore sizes of 200 and 450 nm and ultrafiltration (UF) membranes with molecular weight cut off of 50, 100, and 500 kDa were assessed for their ability to eliminate nonprotein substances from okara protein extract in a laboratory cross-flow membrane system. Both MF and UF improved the protein content of okara extract to a similar extent from approximately 68% to approximately 81% owing to the presence of protein in the feed leading to the formation of dynamic layer controlling the performance rather than the actual pore size of membranes. Although normalized flux in MF-450 (117 LMH/MPa) was close to UF-500 (118 LMH/MPa), the latter was selected based on higher average flux (47 LMH) offering the advantage of reduced processing time. Membrane processing of soy extract improved the protein content from 62% to 85% much closer to the target value. However, the final protein content in okara (approximately 80%) did not reach the target value (90%) owing to the greater presence of soluble fibers that were retained by the membrane. Solubility curve of membrane okara protein concentrate (MOPC) showed lower solubility than soy protein concentrate and a commercial isolate in the entire pH range. However, water absorption and fat-binding capacities of MOPC were either superior or comparable while emulsifying properties were in accordance with its solubility. The results of this study showed that okara protein concentrate (80%) could be produced using membrane technology without loss of any true proteins, thus offering value addition to okara, hitherto underutilized.

Okara, a byproduct obtained during processing soybean for soymilk, is either underutilized or unutilized in spite of the fact that its protein quality is as good as that of soy milk and tofu. Membrane-

processed protein products have been shown to possess superior functional properties compared to conventionally produced protein products. However, the potential of membrane technology has not been exploited for the recovery of okara protein. Our study showed that protein content of okara extract could be improved from approximately 68% to approximately 81% without losing any true proteins in the process [K.H. Vishwanathan, K. Govindaraju, Vasudeva Singh, and R. Subramanian* (Dept. of Food Engineering, Central Food Technological Research Inst., Council of Scientific and Industrial Research, Mysore 570 020, India), *Journal of Food Science*, 2011, 76(1), E158-E164].

NPARR 2(2), 2011-0199, Selection of cultivars for minimization of waste and of water consumption in cassava starch production

When considering the sustainability of a business, deciding on the industrial use of starchy raw materials requires more than just the information on their agricultural productivity and starch yield. The main goal of this work was to investigate ten different cultivars to select for industrial applications seeking to minimize residue generation and water consumption in the production of cassava starch. The cassava cultivars that are richer in starch (22.61-22.89g100g⁻¹) generated the smallest amounts of residues (420.63–423.52kg ton⁻¹ of cassava roots) and required the smallest amounts of water for processing. There is an inverse relationship between the dry matter content in cassava roots and the amount of solid residues generated. One of the cultivars stood out for showing the following features: high starch yield, little tendency for generation of residues, low requirement of water for processing, easiness in the peeling process, and high content of total solids; therefore such features can suggest its use for starch extraction with wastes minimization [Helayne Aparecida Maieves, Daiana Cardoso De Oliveira, Júlia Rodrigues Frescura and Edna Regina Amante*(Food Science and Technology Department, Federal University of Santa Catarina, Rod. Admar Gonzaga, 1346, Florianópolis, Santa Catarina, CEP 88034001, Brazil), *Industrial Crops and Products*, 2011, 33(1), 224-228].

NPARR 2(2), 2011-200, Improving the barrier and

mechanical properties of corn starch-based edible films: Effect of citric acid and carboxymethyl cellulose

The films produced from pure starch are brittle and difficult to handle. Chemical modifications (e.g. cross-linking) and using a second biopolymer in the starch based composite have been studied as strategies to produce low water sensitive and relatively high strength starch based materials. A series of corn starch films with varying concentrations (0-20%, W/W) of citric acid (CA) and carboxymethyl cellulose (CMC) were produced by casting method. The effects of CA and CMC on the water vapor permeability (WVP), moisture absorption, solubility and tensile properties were investigated. The water vapor barrier property and the ultimate tensile strength (UTS) were improved significantly ($p < 0.05$) as the CA percentage increased from 0 to 10% (W/W). At the level of 15% (W/W) CMC, the starch films showed the lowest WVP values ($2.34 \times 10^{-7} \text{ gPa}^{-1} \text{ h}^{-1} \text{ m}^{-1}$) and UTS increased from 6.57 MPa for the film without CMC to 16.11 MPa for that containing 20% CMC [Babak Ghanbarzadeh*, Hadi Almasi and Ali A. Entezami (Department of Food Science and Technology, Faculty of Agriculture, University of Tabriz, P.O. Box

51666-16471, Tabriz, Iran), *Industrial Crops and Products*, 2011, 33(1), 229].

NPARR 2(2), 2011-201, Extraction of condensed tannins from grape pomace for use as wood adhesives

The extraction of condensed tannins from grape pomace was examined using a mixture water–sodium hydroxide at 120 °C. The extracts were characterized by solution ^{13}C NMR and have showed characteristic consistent with that of condensed tannins with dominant procyanidin units. The tannin fractions reactivity toward formaldehyde was studied by gel time analysis and thermomechanical analysis in bending. It has been demonstrated that the extracts obtained by using 10% of NaOH (w/w) displayed promising properties for adhesive applications [Lan Ping, Nicolas Brosse* Lauren tChrusciel, Paola Navarrete and Antonio Pizzi (Laboratoire d'Etude et de Recherche sur le MAteriau Bois, Faculté des Sciences et Techniques, Nancy-Université, Bld des Aiguillettes, F-54500 Vandoeuvre-lès-Nancy, France), *Industrial Crops and Products*, 2011, 33(1), 253-257].

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

NPARR 2(2), 2011-202, Repellent activity of catmint, *Nepeta cataria*, and iridoid nepetalactone isomers against Afro-tropical mosquitoes, ixodid ticks and red poultry mites

The repellent activity of the essential oil of the catmint plant, *Nepeta cataria* (Lamiaceae), and the main iridoid compounds (4a*S*,7*S*,7a*R*) and (4a*S*,7*S*,7a*S*)-nepetalactone, was assessed against (i) major Afro-tropical pathogen vector mosquitoes, i.e. the malaria mosquito, *Anopheles gambiae* s.s. and the Southern house mosquito, *Culex quinquefasciatus*, using a World Health Organisation (WHO)-approved topical application bioassay (ii) the brown ear tick, *Rhipicephalus appendiculatus*, using a climbing repellency assay, and (iii) the red poultry mite, *Dermanyssus gallinae*, using field trapping experiments. Gas chromatography (GC) and coupled GC–mass spectrometry (GC–MS) analysis of two *N. cataria* chemotypes (A and B) used in the repellency assays showed that (4a*S*,7*S*,7a*R*) and (4a*S*,7*S*,7a*S*)-nepetalactone were present in different proportions, with one of the oils (from chemotype A) being dominated by the (4a*S*,7*S*,7a*R*) isomer (91.95% by GC), and the other oil (from chemotype B) containing the two (4a*S*,7*S*,7a*R*) and (4a*S*,7*S*,7a*S*) isomers in 16.98% and 69.83% (by GC), respectively. The sesquiterpene hydrocarbon (*E*)-(1*R*,9*S*)-caryophyllene was identified as the only other major component in the oils (8.05% and 13.19% by GC, respectively). Using the topical application bioassay, the oils showed high repellent activity (chemotype A $RD_{50} = 0.081 \text{ mg cm}^{-2}$ and chemotype B $RD_{50} = 0.091 \text{ mg cm}^{-2}$) for *An. gambiae* comparable with the synthetic repellent DEET ($RD_{50} = 0.12 \text{ mg cm}^{-2}$), whilst for *Cx. quinquefasciatus*, lower repellent activity was recorded (chemotype A $RD_{50} = 0.34 \text{ mg cm}^{-2}$ and chemotype B $RD_{50} = 0.074 \text{ mg cm}^{-2}$). Further repellency testing against *An. gambiae* using the purified (4a*S*, 7*S*,7a*R*) and (4a*S*,7*S*,7a*S*)-nepetalactone isomers revealed overall lower repellent activity, compared to the chemotype A and B oils. Testing of binary mixtures of the (4a*S*,7*S*,7a*R*) and (4a*S*,7*S*,7a*S*)

isomers across a range of ratios, but all at the same overall dose (0.1 mg), revealed not only a synergistic effect between the two, but also a surprising ratio-dependent effect, with lower activity for the pure isomers and equivalent or near-equivalent mixtures, but higher activity for non-equivalent ratios. Furthermore, a binary mixture of (4a*S*,7*S*,7a*R*) and (4a*S*,7*S*,7a*S*) isomers, in a ratio equivalent to that found in chemotype B oil, was less repellent than the oil itself, when tested at two doses equivalent to 0.1 and 0.01 mg chemotype B oil. The three-component blend including (*E*)-(1*R*,9*S*)-caryophyllene at the level found in chemotype B oil had the same activity as chemotype B oil. In a tick climbing repellency assay using *R. appendiculatus*, the oils showed high repellent activity comparable with data for other repellent essential oils (chemotype A $RD_{50} = 0.005 \text{ mg}$ and chemotype B $RD_{50} = 0.0012 \text{ mg}$). In field trapping assays with *D. gallinae*, addition of the chemotype A and B oils, and a combination of the two, to traps pre-conditioned with *D. gallinae*, all resulted in a significant reduction of *D. gallinae* trap capture. In summary, these data suggest that although the nepetalactone isomers have the potential to be used in human and livestock protection against major pathogen vectors, intact, i.e. unfractionated, *Nepeta* spp. oils offer potentially greater protection, due to the presence of both nepetalactone isomers and other components such as (*E*)-(1*R*,9*S*)-caryophyllene. [Michael A. Birkett*, Ahmed Hassanali, Solveig Høglund, Jan Pettersson and John A. Pickett (Biological Chemistry Department, Rothamsted Research, Harpenden, Hertfordshire AL5 2JQ, UK), *Phytochemistry*, 2011, 72(1), 109-114].

NPARR 2(2), 2011-203, Antifeedant and larvicidal activities of Rhein isolated from the flowers of *Cassia fistula* L.

Antifeedant and larvicidal activities of rhein (1, 8-dihydroxyanthraquinone-3-carboxylic acid) isolated from the ethyl acetate extract of *Cassia fistula* flower were studied against lepidopteron pests *Spodoptera litura* and *Helicoverpa armigera*. Significant antifeedant activity was observed against *H. armigera* (76.13%) at 1000 ppm concentration. Rhein exhibited larvicidal activity against *H. armigera* (67.5), *S. litura* (36.25%) and the LC_{50} values was 606.50 ppm for *H. armigera* and 1192.55 ppm for *S. litura*. The survived

larvae produced malformed adults [V. Duraipandian, S. Ignacimuthu* and M. Gabriel Paulraj (Entomology Research Institute, Loyola College, Nungambakkam, Chennai 600034, India), *Saudi Journal of Biological Sciences*, 2011, 18(2), 129-133].

NPARR 2(2), 2011-204, Gaseous emissions from soil biodisinfestation by animal manure on a greenhouse pepper crop

Soil solarisation together with the application of animal manure has been described as an alternative process for control of *Phytophthora capsici* root rot in pepper crops. A mixture of fresh sheep manure and dry chicken litter (SCM) and a semi-composted mixture of horse manure and chicken litter (HCM) were applied at 5.1 kg m⁻² (dry weight) under plastic sheets to reduce *Phytophthora* inoculum survival rate and disease incidence. Non-solarised (C) and solarised (S) soils were used as control treatments. Mean NH₃ concentration increased in SCM during biodisinfestation process (14.8 mg NH₃ m⁻³) compared with HCM (9.1 mg NH₃ m⁻³), accounted for the higher organic N content and potential N mineralisation. The higher NH₃ concentration in SCM could have contributed to reduce the inoculum survival rate (30.6% and 75.0% in SCM and HCM plots, respectively). Inoculum survival rate was not reduced in S (94.4%) as temperature was below 33 °C throughout the experimental period. After biodisinfestation treatment, N₂O and CO₂ emissions tended to be higher in SCM, despite high spatial variability. Cumulative N₂O emissions were 1.31 and 0.42 g N₂O-N m⁻² in SCM and HCM after 43 days. The larger N application and organic N mineralisation rate on fresh manure amended soils might have contributed to higher N₂O emissions during and after soil biodisinfestation by denitrification and nitrification, respectively. Cumulative CO₂ emission averaged 211.0 and 159.9 g CO₂-C m⁻² in SCM and HCM, respectively. The soluble organic C, more abundant in fresh manure, might have favoured soil respiration in SCM. Disease incidence decreased in SCM and HCM plots (disease incidence, 2%–8%) in relation to solarised soils (42%) after 4 months. Microbial suppressiveness might have contributed to minimise *Phytophthora* disease incidence in SCM and HCM plots. Pepper fruit yield increased with manure amendment in SCM and HCM, which averaged 4.6

and 4.3 kg m⁻², respectively. Further research will be necessary to guarantee an effective *Phytophthora* biodisinfestation by fitting manure N and organic matter applications, improving crop yield and reducing greenhouse gas pollution [H. Arriaga*, M. Núñez-Zofio, S. Larregla and P. Merino (NEIKER-Tecnalia, Dept. Ecotechnologies, Basque Institute for Agricultural Research and Development, 48160 Derio, Bizkaia, Spain), *Crop Protection*, 2011, 30(4), 412-419].

NPARR 2(2), 2011-205, Use of farming and agro-industrial wastes as versatile barriers in reducing pesticide leaching through soil columns

Increased interest has been recently focused on assessing the influence of the addition of organic wastes related to movement of pesticides in soils of low organic matter (OM) content. This study reports the effect of two different amendments, animal manure (composted sheep manure) and agro-industrial waste (spent coffee grounds) on the mobility of 10 pesticides commonly used for pepper protection on a clay-loam soil (OM = 0.22%). The tested compounds were azoxystrobin, cyprodinil, fludioxonil, hexaconazole, kresoxim-methyl, pyrimethanil, tebuconazole, and triadimenol (fungicides), pirimicarb (insecticide), and propyzamide (herbicide). Breakthrough curves were obtained from disturbed soil columns. Cumulative curves obtained from unamended soil show a leaching of all pesticides although in different proportions (12–65% of the total mass of compound applied), showing triadimenol and pirimicarb the higher leachability. Significant correlation ($r = 0.93$, $p < 0.01$) was found between the observed and bibliographical values of GUS index. The addition of the amendments used drastically reduced the movement of the studied pesticides. Only two pesticides were found in leachates from amended soils, pyrimethanil (<1%) for both, and pirimicarb (44%) in the soil amended with spent coffee grounds. A decrease in pesticide leaching was observed with the increase in dissolved organic matter (DOM) of leachates. The results obtained point to the interest in the use of organic wastes in reducing the pollution of groundwater by pesticide drainage [J. Fenoll, E. Ruiz, P. Flores, N. Vela, P. Hellín and S. Navarro* (Departamento de Química Agrícola, Geología y Edafología, Facultad de Química, Universidad de Murcia, Campus Universitario de Espinardo, 30100 Murcia, Spain), *Journal of Hazardous Materials*, Volume 187, Issues 1-3, 15 March 2011, Pages 206-212.

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

NPARR 2(2), 2011-206, Characteristics, chemical composition and utilisation of *Albizia julibrissin* seed oil

The physicochemical characteristics, fatty acid and triacylglycerol compositions, DSC profile and UV/vis spectrum of oil extracted from *Albizia julibrissin* seeds were determined in this study. The oil content and the moisture of the seeds were 10.50% and 1.56%. The free fatty acid, the peroxide value, the p-anisidine value, the saponification value, the iodine value were 2.54%, 6.61 mequiv. O₂/kg of oil, 1.98, 190.63 (mg KOH/g) and 111.33 (g/100 g of oil), respectively. The specific extinction coefficients K_{232} , K_{268} were 7.55 and 0.96, respectively. Linoleic acid (C_{18:2}, 58.58%), palmitic acid (C₁₆, 13.86%) and oleic acid (C_{18:1}, 10.47%) were the dominant fatty acids in the *A. julibrissin* seed oil. LLL (36.87%), OLL (21.62%), PLL (16.69%) and PLO + SLL (8.59%) were the abundant triacylglycerol representing > 83% of the seed oil (L: linoleic, O: oleic, P: palmitic, S: stearic). The DSC melting curves reveal that: melting point = -14.70° C and melting enthalpy = 54.34 J/g. *A. julibrissin* seed oil showed some absorbance in the UV-B and UV-C ranges. The results of the present analytical study show that *A. julibrissin* is a promising oilseed crop, which can be used for making soap, hair shampoo and UV protectors. Furthermore, the high level of unsaturated fatty acids makes it desirable in terms of nutrition.

This study was conducted on the properties of the oil extracted from *Albizia julibrissin* seeds. The oil content of the seeds, the free fatty acid, the peroxide value, the saponification value, the iodine value of the oil were 10.50%, 2.54%, 6.61 mequiv. O₂/kg of oil, 190.63 (mg KOH/g) and 111.33 (g/100g of oil), respectively. Linoleic acid (58.58%), palmitic acid (13.86%) and oleic acid (10.47%) were the dominant fatty acids in the *A. julibrissin* seed oil. LLL (36.87%), OLL (21.62%), PLL (16.69%) and PLO + SLL (8.59%) were the abundant triacylglycerols (L: linoleic, O: oleic, P: palmitic, S: stearic). The DSC melting curves reveal that: melting point = -14.70 ° C and melting enthalpy = 54.34 J/g. *A. julibrissin* seed oil showed some absorbance in the UV-B and UV-C

ranges. The characterization of *A. julibrissin* seed oil shows that it could be successfully used for making soap, hair shampoo and in formulation of UV protectors in cosmetic. Furthermore, the high level of polyunsaturated fatty acids makes it desirable in terms of nutrition, and might be an acceptable substitute for highly polyunsaturated oils such soybean oil in diets. This new promising *A. julibrissin* crop can potentially create new rural jobs when used for industrial products [I. Nehdi* (King Saud University, College of Science, Chemistry Department, Riyadh 1145, Saudi Arabia), *Industrial Crops and Products*, 2011, 33(1), 30-34].

NPARR 2(2), 2011-207, Aqueous enzymatic sesame oil and protein extraction

In the present work we evaluated five enzyme-mixtures (Protex 7L, Alcalase 2.4L, Viscozyme L, Natuzyme, and Kemzyme) for their effectiveness in extracting the oil and protein recovery from sesame seeds during an enzyme-assisted aqueous extraction (EAAE) process. Alcalase 2.4L was found to be the best for attaining a high oil yield (57.4% of the total oil content in the seed), whereas, the maximum amount of protein (87.1% of the total seed protein), was recovered in the aqueous phase with Protex 7L. The quality attributes such as fatty acids profile, density, refractive index, free fatty acid contents, iodine value, colour, saponification number and unsaponifiable matter of the sesame oil, extracted by aqueous enzymatic process, were comparable with that of the control (oil extracted without enzyme treatment) and hexane-extracted oil (HEO), revealing no significant ($p > 0.05$) variations among oils, produced by either of the methods. The oxidative stability state of the enzyme-extracted oil (EEO) was noted to be considerably improved relative to the control and HEO. The amount of tocopherols for the oils, produced by the enzyme-adjuvant was found to be higher than the control and HEO. An appreciable increase in the antioxidant activity as assessed by determinations of total phenolic contents, DPPH radical scavenging capacity, and inhibition of linoleic acid oxidation of EEO was also established. Overall, the present results revealed improvement in the quality of the EEO while a major portion of the food grade protein was also extracted in the aqueous phase [Sajid Latif* and Farooq Anwar (Department of Chemistry and Biochemistry, University of

Agriculture, Faisalabad 38040, Pakistan) *Food Chemistry*, 2011, 125(2), 679-684].

NPARR 2(2), 2011-208, Hepatoprotective effects of almond oil against carbon tetrachloride induced liver injury in rats

This research aimed at evaluating the protective effects of almond oil against acute hepatic injury induced by carbon tetrachloride in rats. The study results showed that animals received almond oil prior to the administration of CCl₄ significantly decreased serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) activities, and total cholesterol (TC), triglyceride (TG) and low density lipoprotein (LDL) content, and increased serum high density lipoprotein (HDL) content. Whereas, pretreatment with almond oil markedly increased rat hepatic superoxide dismutase (SOD), catalase and glutathione peroxidase (GPx) levels, and decreased the malondialdehyde (MDA) level. These results combined with liver histopathology demonstrated that almond oil has potent hepatoprotective effects, and could be developed as a functional food for the therapy and prevention of liver damage [Xiao-Yan Jia, Qing-An Zhang, Zhi-Qi Zhang*, Yan Wang, Jiang-Feng Yuan, Hong-Yuan Wang and Di Zhao (Key Laboratory of Analytical Chemistry for Life Science of Shaanxi Province, School of Chemistry and Materials Science, Shaanxi Normal University, Xi'an 710062, China), *Food Chemistry*, 2011, 125(2), 673-678].

NPARR 2(2), 2011-209, The *in vitro* and *in vivo* antioxidant properties of seabuckthorn (*Hippophae rhamnoides* L.) seed oil

The antioxidant capacity of Seabuckthorn (*Hippophae rhamnoides* L.) seed oil was investigated with a number of established *in vitro* assays and in an *in vivo* study of carbon tetrachloride (CCl₄)-induced oxidative stress in mice. The results showed that DPPH radical scavenging activity, ferrous ion chelating activity, reducing power and inhibition of lipid peroxidation activity all increased with increasing concentrations of seabuckthorn seed oil. Moreover, the EC₅₀ values of seabuckthorn seed oil from the hydrogen peroxide, superoxide radical, hydroxyl radical scavenging assays were 2.63, 2.16

and 0.77mg/ml, respectively. In the *in vivo* study, seabuckthorn seed oil inhibited the toxicity of CCl₄, as seen from the significantly increased activities of the antioxidant enzymes superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase. The GSH content in the liver was also increased, whereas hepatic malondialdehyde was reduced. Taken together, these results clearly indicate that seabuckthorn seed oil has significant potential as a natural antioxidant agent [Hung-Chih Ting, Yu-Wen Hsu, Chia-Fang Tsai, Fung-Jou Lu, Ming-Chih Chou and Wen-Kang Chen*(National Tainan Institute of Nursing, No. 78, Sec. 2, Minzu Rd., Tainan City, Taiwan), *Food Chemistry*, 2011, 125(2), 652-659].

NPARR 2(2), 2011-210, Extraction of β -carotenes from palm oil mesocarp using sub-critical R134a

Sub-critical extraction of palm oil from palm mesocarp using R134a solvent was conducted via the dynamic mode to investigate the ability of R134a to extract β -carotene. The yield of palm oil and the solubility of β -carotene were investigated at 40, 60 and 80 °C and pressure range from 45-100 bar. The extracted oil was analysed for β -carotene content using UV-Vis spectrophotometry. The results showed that palm oil yield increased with pressure and temperature. The maximum solubility of β -carotene was obtained at 100 bar and 60 °C while the lowest solubility occurred at 80 bar and 40 °C. The higher concentration of extracted β -carotene ranging from 330-780 ppm as compared to that achieved through conventional palm oil processing indicates that extraction of β -carotene using R134a is viable [A.N. Mustapa, Z.A. Manan*, C.Y. Mohd Azizi, W.B. Setianto and A.K. Mohd Omar (Process Systems Engineering Centre (PROSPECT), Universiti Teknologi Malaysia, Skudai 81310, Johor, Malaysia), *Food Chemistry*, 2011, 125(1), 262-267].

NPARR 2(2), 2011-211, Compositional and textural properties of milkfat-*soybean* oil blends following enzymatic interesterification

Milkfat-*soybean* oil blends were enzymatically interesterified (EIE) by *Aspergillus niger* lipase immobilized on SiO₂-PVA hybrid composite in a solvent free system. An experimental mixture design was used to study the effects of binary blends of milkfat-*soybean* oil (MF:SBO) at different

proportions (0:100; 25:75; 33:67; 50:50; 67:33; 75:25; 100:0) on the compositional and textural properties of the EIE products, considering, as response variables, the interesterification yield (IY), consistency and hardness. Lipase-catalysed interesterification reactions increased the relative proportion of TAGs' C₄₆–C₅₂ and decreased the TAGs' C₄₀–C₄₂ and C₅₄ concentrations. The highest IY was attained (10.8%) for EIE blend of MF:SBO 67:33 resulting in a more spreadable material at refrigerator temperature in comparison with butter, milkfat or non-interesterified (NIE) blend. In this case, consistency and hardness values were at least 32% lower than values measured for butter. Thus, using *A. niger* lipase immobilized on SiO₂–PVA improves the textural properties of milkfat and has potential for development of a product incorporating unsaturated and essential fatty acids from soybean oil [Gisele Fátima Morais Nunes*, Ariela Veloso de Paula, Heizir Ferreira de Castro and Júlio César dos Santos* (Engineering School of Lorena, University of São Paulo, P.O. Box 116, Lorena 12602-810, SP, Brazil), *Food Chemistry*, 2011, 125(1), 133-138].

NPARR 2(2), 2011-212, **Phenolic and antioxidant potential of olive oil mill wastes**

Olive oil mill waste was subjected to conventional liquid solvent extraction and supercritical fluid extraction using different solvents and carbon dioxide, respectively. The optimum solvent extraction conditions of phenols were 180 min using ethanol, at a solvent to sample ratio 5:1 v/w, and at pH 2. Solvent and SFE extracts were tested for their antioxidant activity by the DPPH radical scavenging method and by determination of peroxide value on virgin olive oil and sunflower oil. The ethanol extract exhibited the highest antiradical activity, and no correlation was found between antiradical activity and phenol content. The SFE extract exerted good antioxidant capacity although its phenolic yield was not quite high. Moreover, the ethanol extract appeared to be a stronger antioxidant than BHT, ascorbyl palmitate and vitamin E by the Rancimat method on sunflower oil. HPLC analysis of

the extracts showed that the predominant phenolic compound was hydroxytyrosol. Various phenolic acids and flavonoids were also identified [Theodora-Ioanna Lafka, Andriana E. Lazou, Vassilia J. Sinanoglou and Evangelos S. Lazos* (Laboratory of Food Processing, Department of Food Technology, Technological Educational Institution of Athens, Agiou Spyridonos St., 122 10 Egaleo, Athens, Greece), *Food Chemistry*, 2011, 125(1), 92-98]. *NPARR* 2(2), 2011-213, **Thermal stability of corn oil flavoured with *Thymus capitatus* under heating and deep-frying conditions**

The thermal stability of corn oil flavoured with thyme flowers was determined and compared with that of the original refined corn oil (control). The oxidative stability index (OSI) was measured and samples were exposed to heating (30 min at 150, 180 and 200 °C) and deep-frying (180 °C). Changes in peroxide value (PV), free fatty acid (FFA) content, specific absorptivity values (K_{232} and K_{270}), colour and chlorophyll, carotenoid and total phenol contents were monitored.

The OSI and heating results showed that thyme incorporation was effective against thermal oxidation based on the increased induction time observed for the flavoured oil (6.48 vs 4.36 h), which was characterised by lower PV, FFA content, K_{232} and K_{270} than the control oil after heating from 25 to 200 °C, with higher red and yellow colour intensities and chlorophyll, carotenoid and total phenol contents. The deep-frying test showed the accelerated deterioration of both oils in the presence of French fries.

Compared with the control oil, the thyme-flavoured oil showed improved thermal stability after heating. This could be attributed to the presence of thyme pigments and antioxidant compounds allowing extended oil thermal resistance [Iness Jabri Karoui*, Wissal Dhifi, Meriam Ben Jemia and Brahim Marzouk (Aromatic and Medicinal Plants Unit, Center of Biotechnology of the Technopol Borj-Cedria, BP 901, 2050 Hammam-Lif, Tunisia), *Journal of the Science of Food and Agriculture*, 2011, 91(5), 927-933].

PHYTOCHEMICALS

NPARR 2(2), 2011-214, Phytochemicals and antioxidant capacities in rice brans of different color

Rice bran, a byproduct of the rice milling process, contains most of the phytochemicals. This study aimed at determining the concentrations of lipophilic, solvent-extractable (free), and cell wall-bound (bound) phytochemicals and their antioxidant capacities from brans of white, light brown, brown, purple, and red colors, and broccoli and blueberry for comparison. The concentrations of lipophilic antioxidants of vitamin E (tocopherol and tocotrienols) and γ -oryzanols were 319.67 to 443.73 and 3861.93 to 5911.12 $\mu\text{g/g}$ bran dry weight (DW), respectively, and were not associated with bran color. The total phenolic, total flavonoid, and antioxidant capacities of ORAC (oxygen radical absorbance capacity), DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging, and iron-chelating in the free fraction were correlated with the intensity of bran color, while variations of these in the bound fraction were less than those in the free fraction among brans. Compounds in the bound fraction had higher antioxidant capacity of ORAC than DPPH, relative to those in the free fraction. The bound fraction of light-color brans contributed as much to its total ORAC as the free fraction. Total proanthocyanidin concentration was the highest in red rice bran, while total anthocyanin was highest in purple brans. The predominant anthocyanin was cyanidin-3-glucoside. Red and purple brans had several fold higher total phenolics and flavonoids as well as ORAC and DPPH, from both free and bound fractions, than freeze-dried blueberry and broccoli. These results indicate that rice brans are natural sources of hydrophilic and lipophilic phytochemicals for use in quality control of various food systems as well as for nutraceutical and functional food application [Byungrok Min, Anna M. McClung and Ming-Hsuan Chen* (U.S. Dept. of Agriculture, Agricultural Research Service, Rice Research Unit, 1509 Aggie Dr., Beaumont, TX 77713, U.S.A.), *Journal of Food Science*, 2011, 76(1), C117–C126].

NPARR 2(2), 2011-215, Purification and partial biochemical characterization of polyphenol

oxidase from mamey (*Pouteria sapota*)

While a long shelf life for fruit products is highly desired, enzymatic browning is the main cause of quality loss in fruits and is therefore a main problem for the food industry. In this study polyphenol oxidase (PPO), the main enzyme responsible for browning was isolated from mamey fruit (*Pouteria sapota*) and characterized biochemically. Two isoenzymes (PPO 1 and PPO 2) were obtained upon ammonium sulfate precipitation and hydrophobic and ion exchange chromatography; PPO 1 was purified up to 6.6-fold with 0.28% yield, while PPO 2 could not be characterized as enzyme activity was completely lost after 24 h of storage. PPO 1 molecular weight was estimated to be 16.1 and 18 kDa by gel filtration and SDS–PAGE, respectively, indicating that the native state of the PPO 1 is a monomer. The optimum pH for PPO 1 activity was 7. The PPO 1 was determined to be maximum thermally stable up to 35 °C. Kinetic constants for PPO 1 were $K_m = 44 \text{ mM}$ and $K_m = 1.3 \text{ mM}$ using catechol and pyrogallol as substrate, respectively. The best substrates for PPO 1 were pyrogallol, 4-methylcatechol and catechol, while ascorbic acid and sodium metabisulfite were the most effective inhibitors [Gisela Palma-Orozco, Alicia Ortiz-Moreno, Lidia Dorantes-Álvarez, José G. Sampedro and Hugo Nájera* (Universidad Autónoma Metropolitana – Cuajimalpa, Departamento de Ciencias Naturales, México, D.F., Mexico), *Phytochemistry*, 2011, 72(1), 82-88].

NPARR 2(2), 2011-216, High value triterpenic compounds from the outer barks of several *Eucalyptus* species cultivated in Brazil and in Portugal

The chemical composition of the lipophilic extracts of the inner and outer bark fractions of *Eucalyptus grandis* and *Eucalyptus urograndis* (*E. grandis* \times *Eucalyptus urophylla*) cultivated in Brazil and *Eucalyptus maidenii*, cultivated in Portugal was studied by gas chromatography–mass spectrometry. The extracts were shown to be mainly composed of triterpenic compounds (along with mono and sesquiterpenes in *E. maidenii*) followed smaller amounts of fatty acids, fatty alcohols, and aromatic compounds.

Triterpenic acids (mainly ursolic, betulinic and oleanolic acids), are particularly abundant in outer barks representing 5.2 g/kg, 5.7 g/kg and 9.3 g/kg in *E. urograndis*, *E. grandis* and *E. maidenii* outer barks, respectively. Although these compounds were found in considerably smaller amounts than those previously reported for *Eucalyptus globulus*, the total amounts of bark generated every year in South American pulp mills using *E. urograndis* and *E. grandis*, as well as the growth potential of *E. maidenii* plantations, the bark residues from these species are obvious candidates for the extraction of valuable triterpenic compounds [R.M.A. Domingues, G.D.A. Sousa, C.M. Silva, C.S.R. Freire, A.J.D. Silvestre* and C. Pascoal Neto (CICECO and Department of Chemistry, University of Aveiro, 3810-193 Aveiro, Portugal), *Industrial Crops and Products*, 2011, 33(1), 158-164].

NPARR 2(2), 2011-217, Foliar application of chitosan activates artemisinin biosynthesis in *Artemisia annua* L.

There has been much interest in artemisinin owing to its excellent activity against malaria, an infectious disease threatening the tropical world. However, the low artemisinin content (0.01–0.8%, DW) in *Artemisia annua*, which is the only commercial source of artemisinin, makes artemisinin expensive to produce and not yet available on a global scale. Here we show that foliar application of 100 mg l⁻¹ chitosan improved artemisinin biosynthesis in *A. annua*. The content of dihydroartemisinic acid and artemisinin in chitosan-treated leaves increased by 72% and 53% compared with control values, respectively. Chitosan induced the expression of ADS and DBR2, which could explain the increase in level of artemisinic metabolites. After chitosan treatment, the amounts of hydrogen peroxide (H₂O₂) and superoxide anion (O₂⁻) in leaves of *A. annua* were 1.4 and 3.0 times higher than those of the control, respectively. Accumulation of reactive oxygen species (ROS) probably accelerated the conversion of dihydroartemisinic acid to artemisinin. Foliar application of 100 mg l⁻¹ chitosan had no harmful effect on *A. annua* growth. The simple method described here could be an effective method to improve artemisinin production in *A. annua* field cultivation [Caiyan Lei, Dongming Ma, Gaobin Pu, Xiaofang Qiu, Zhigao Du, Hong

Wang, Guofeng Li, Hechun Ye and Benye Liu* (Key Laboratory of Photosynthesis and Environmental Molecular Physiology, Institute of Botany, The Chinese Academy of Sciences, Nanxincun 20, Haidian District, Beijing 100093, China), *Industrial Crops and Products*, 2011, 33(1), 176-182].

NPARR 2(2), 2011-218, Optimization of extraction conditions of antioxidants from sunflower shells (*Helianthus annuus* L.) before and after enzymatic treatment

The effects of three independent variables: solvent polarity, temperature and extraction time on the antioxidant capacity, total phenolic content and phenolic acid composition in extracts obtained from sunflower shells before and after enzymatic treatment were studied. Response surface methodology based on three-level, three-variable Box–Behnken design was used for optimization of extraction parameters and evaluation of their effect on antioxidant capacity and total phenolic content in shell extracts.

The average antioxidant capacities of extracts from sunflower shells without enzymatic treatment (368.1–1574.4 μmol TE/100 g) were higher than those for cellulolytic and pectolytic enzymes-treated shells (222.7–1419.0 and 270.7–1570.7 μmol TE/100g, respectively). The content of total phenolic compounds ranged between 58.2–341.2 mg CGA/100 g, 26.7–277.3mg CGA/100g and 51.4–301.5mg CGA/100 g for extracts obtained from shells without enzyme and treated with cellulolytic and pectolytic enzymes, respectively. Total phenolic content (TPC) in the studied shell extracts correlated significantly ($p < 0.0001$) positively with their antioxidant capacity determined by the ferric reducing antioxidant power (FRAP) method ($r = 0.9275$). Results of FRAP, TPC and phenolic acid composition in the studied shell extracts depend on the extraction conditions (solvent polarity, temperature, time), but they are independent on the addition of enzyme solutions. The antioxidant capacity and total phenolic content in the resulting extracts increased with a line in extraction temperature and solvent polarity [Aleksandra Szydłowska-Czerniak*, Konrad Trokowski and Edward Szłyk (Faculty of Chemistry, Nicolaus Copernicus University, 7 Gagarin Street, 87 – 100 Toruń, Poland), *Industrial Crops and Products*, 2011, 33(1), 123-131].

NPARR 2(2), 2011-219, Phenolics and antioxidant activity of lentil and pea hulls

Hulls obtained by pilot-scale dehulling process from green and red lentils and yellow peas were fractionated into hulls (> 500 µm) and residues (< 500 µm). These fractions together with the corresponding whole seeds were extracted with four solvents, aqueous (70%) acetone, (80%) ethanol, hot water (70–80 °C) and water (22 ± 1 °C) and evaluated for antioxidant activity in relation to phenolic contents. Aqueous acetone (70%, v/v) extracted the highest level of total phenolics at about 87 mg of catechin equivalent per gram of sample from lentil hulls followed by hot water, water and aqueous ethanol (80%, v/v). Red lentil hull with maximum concentration of phenolic compounds exhibited the strongest antioxidant activity of 260 mg (1040 µM) trolox equivalent/g hull. Hot water and water extracted significantly higher total phenolics from whole pulse and their residue than other solvents, but with weaker antioxidant activity. Aqueous ethanol was always the best extractant of phenolic antioxidant from yellow pea irrespective of its millstream. The most potent phenolic antioxidant was obtained from water extract of green and red lentil hulls, followed by those extracted with ethanol, acetone, and hot water. Total phenolic content was highly correlated with antioxidant activity of pulses and its millstreams [B. Dave Oomah*, François Caspar, Linda J. Malcolmson and Anne-Sophie Bellido (National Bioproducts and Bioprocesses Program, Pacific Agri-Food Research Centre, Agriculture and Agri-Food

Canada, 4200 Highway 97, P.O. Box 5000, Summerland, BC, Canada V0H 1Z0), *Food Research International*, 2011, 44(1), 436-441].

NPARR 2(2), 2011-220, *Jatropha platyphylla*, a new non-toxic *Jatropha* species: Physical properties and chemical constituents including toxic and antinutritional factors of seeds

Local communities in Mexico consume *Jatropha platyphylla* seeds after roasting. The kernels of *J. platyphylla* contained ca. 60% oil and were free of phorbol esters. The kernel meal of this *Jatropha* species contained trypsin inhibitor, lectins and phytate. However, trypsin inhibitor and lectins are heat labile so this explains why the local people can eat roasted seeds without ill effects. Heat-treated *J. platyphylla* kernel meal (JPKM) was free of trypsin inhibitor and lectin activities. Crude protein content of JPKM was 75%. Heated JPKM and soybean meal were included in a standard diet (crude protein 36%) for Nile tilapia (*Oreochromis niloticus*) to replace 50% of the fish meal protein. The growth of fish in all the three groups was statistically similar and the blood biochemical parameters that serve as biomarkers for toxicity were within the normal ranges. This is the first study that confirms the non-toxic nature of *J. platyphylla* [Harinder P.S. Makkar*, Vikas Kumar, Olubisi O. Oyeleye, Akinwale O. Akinleye, Miguel A. Angulo-Escalante and Klaus Becker (Institute for Animal Production in the Tropics and Subtropics, University of Hohenheim, Stuttgart, Germany), *Food Chemistry*, 2011, 125(1), 63-71].

SPICES/CONDIMENTS

NPARR 2(2), 2011-221, Isolation, structural elucidation and immunomodulatory activity of fructans from aged garlic extract

Traditionally, garlic (*Allium sativum*) is known to be a significant immune booster. Aged garlic extract (AGE) possesses superior immunomodulatory effects than raw garlic; these effects are attributed to the transformed organosulfur compounds. AGE is also known to contain fructans; the amount of fructans in AGE represents a small fraction (0.22%) of the total fructans in raw garlic. In order to evaluate the biological activity of fructans present in AGE, both high molecular weight (>3.5kDa; HF) and low molecular weight (<3kDa; LF) fructans were isolated. The structures of purified HF and LF from AGE determined by ¹H NMR and ¹³C NMR spectroscopy revealed that both have (2→1) β-d-fructofuranosyl bonds linked to a terminal glucose at the non-reducing end and β-d-fructofuranosyl branching on its backbone. Biological activity of fructans was assessed by immunostimulatory activity using murine lymphocytes and peritoneal exudate cells (source of macrophages). Both HF and LF displayed mitogenic activity and activation of macrophages including phagocytosis. These activities were comparable to that of known polysaccharide immunomodulators such as zymosan and mannan. This study clearly demonstrates that garlic fructans also contribute to the immunomodulatory properties of AGE, and is the first such study on the biological effects of garlic fructans [Puthanapura M. Chandrashekar, Keelara V. Harish Prashanth and Yeldur P. Venkatesh* (Department of Biochemistry and Nutrition, Central Food Technological Research Institute, Council of Scientific and Industrial Research Laboratory, Mysore 570020, Karnataka State, India), *Phytochemistry*, 2011, 72(2-3), 255-264].

NPARR 2(2), 2011-222, Effects of chitosan coating enriched with cinnamon oil on qualitative properties of sweet pepper (*Capsicum annuum* L.)

Effect of chitosan–oil coating on qualitative properties of sweet pepper (*Capsicum annuum* L.) stored at 8°C for 35days was investigated. The chitosan–oil coating treatment exhibited the best

control effect on decay (below 5%). At the end of storage, samples treated with chitosan–oil coatings maintained good sensory acceptability, whereas the sensory quality of control samples became unacceptable. The higher activities of scavenger antioxidant enzymes, including superoxide dismutase (SOD), peroxidase (POD) and catalase (CAT), in treated peppers at the 35th day should be contributed to the chitosan–oil coating. Malondialdehyde (MDA) and electrolyte leakage contents in chitosan–oil-coated peppers were increased but were still lower than in control samples. Atomic force microscopy images showed that the surface of sweet pepper without coating treatment was rougher than that of peppers treated with chitosan–oil coating. Our study suggests that chitosan–oil coating might be a promising candidate for enhancing the keeping quality [Yage Xing, Xihong Li*, Qinglian Xu, Juan Yun, Yaqing Lu and Yao Tang (Key Laboratory of Food Nutrition and Safety (Tianjin University of Science and Technology), Ministry of Education, Tianjin 300457, PR China), *Food Chemistry*, 2011, 124(4), 1443-1450].

NPARR 2(2), 2011-223, Preparative separation of gingerols from *Zingiber officinale* by high-speed counter-current chromatography using stepwise elution

Following an initial clean-up step on silica column, high-speed counter-current chromatography (HSCCC) was used to purify gingerols from an extract of the dried rhizome of *Zingiber officinale*. The sample was separated with petroleum ether–ethyl acetate–methanol–water (1:0.2:0.5:0.7, v/v) and petroleum ether–ethyl acetate–methanol–water (1:0.2:0.7:0.5, v/v) in a stepwise elution and yielded 132 mg of 6-gingerol, 31 mg of 8-gingerol and 61 mg of 10-gingerol from 360 mg of pre-purified sample. The purity of each compound was over 98% as determined by HPLC. The structures of the three compounds have been identified by LC-ESI-MS, ¹H NMR and ¹³C NMR [Xiao Wang*, Zhenjia Zheng, Xingfeng Guo, Jinpeng Yuan and Chengchao Zheng (Shandong Analysis and Test Centre, Shandong Academy of Sciences, 19 Keyuan Street, Jinan, Shandong 250014, China), *Food Chemistry*, 2011, 125(4), 1476-1480].

NPARR 2(2), 2011-224, The use of caraway seed meal as a feed additive in fish diets: Growth performance, feed utilization, and whole-body composition of Nile tilapia, *Oreochromis niloticus* (L.) fingerlings

The use of medicinal plants for humans has been well known since the ancient civilizations, but their uses in fish diets are still limited. It is believed that the use of medicinal plants as natural feed additives is less toxic and safer than chemical ones. So, this study was conducted to evaluate the use of caraway seed meal (*Carum carvi* L.; CSM) as a feed additive on growth performance, feed utilization, and whole body composition of Nile tilapia, *Oreochromis niloticus* (L.). Five iso-nitrogenous (30.3% crude protein) and iso-caloric (4.5 kcal/g diet) diets were formulated to contain 0.0 (control), 5, 10, 15, or 20 g CSM/kg diet. Fish (3.6 ± 0.3 g) were distributed at a rate of 20 fish per 100-L aquarium and three aquaria have been assigned for each treatment. Fish were fed one of the

tested diets at a rate of 4% of live body weight twice daily; six days a week for 12 weeks. The CSM supplementation enhanced fish growth over the control diet; the highest fish growth and feed utilization were obtained when fish fed on a diet containing 10 g CSM/kg diet. There were no significant changes in fish survival among the different treatments and its range was 98.5–100% suggesting that CSM had no toxic effect. Moreover, CSM has no impact on moisture and protein contents in whole fish. Total lipid increased significantly and total ash contents decreased significantly with increasing CSM levels. A dietary CSM level of 12.5 g/kg provided the best fish performance based on second-order polynomial regression analysis of growth parameters against dietary CSM levels [Mohammad H. Ahmad and Mohsen Abdel-Tawwab*(Department of Fish Biology and Ecology, Central Laboratory for Aquaculture Research, Abbassa, Abo-Hammad, Sharqia 44662, Egypt), *Aquaculture*, 2011, 314(1-4), 110-114].

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

NPARR 2(2), 2011-225, Phenolic composition and antioxidant activity of culms and sugarcane (*Saccharum officinarum* L.) products

The present work reports amounts of flavonoids and phenylpropanoids of culms of three sugarcane varieties and of raw juice, syrup, molasse and VHP sugar. The antioxidant activity of those materials was evaluated by the DPPH and β -carotene/linoleic acid methods. The predominant phenolics in culms were phenylpropanoids (caffeic, chlorogenic and coumaric acids), while flavones (apigenin, tricetin and luteolin derivatives) appeared in lower amounts. Differences were noted either among phenolic profiles of sugarcane culms or between culms and sugarcane products. The antioxidant activities of solutions from most samples were similar or higher than a 80 μ M Trolox solution [[Joaquim Maurício Duarte-Almeida*, Antonio Salatino, Maria Inés Genovese and Franco M. Lajolo (Departamento de Alimentos e Nutrição Experimental, FCF, Universidade de São Paulo, Av. Prof. Lineu Prestes 580, Bloco 14, CEP 05508-900 São Paulo, SP, Brazil), *Food Chemistry*, 2011, 125(2), 660-664].

NPARR 2(2), 2011-226, Soy protein- and casein-based weaning diets differ in effects on food intake and blood glucose regulation in male Wistar rats

The effect of weaning male Wistar rats to AIN-93G diets based on casein (C) and soy protein (S) on blood glucose and food intake (FI) regulation was determined. In experiment 1, male Wistar rats ($n = 21$ per group) received either C or S AIN-93G diets for 7 weeks. In experiment 2, 3 groups of rats were formed ($n = 21$ per group). The C followed by the S diet group (CS) was weaned to the C diet for 6 weeks followed by the S diet for another 7 weeks. Diet sequence was the reverse for the S followed by the C diet group (SC). The control group (CC) received the C diet throughout 13 weeks. Body weight and cumulative FI were not affected by diet in either experiment. In experiment 1, in fasted rats, S preloads reduced FI for 1 hour more in the C diet group ($P < .05$), but response to C preloads was not affected by diet. A cholecystokinin A receptor blocker prevented

FI reduction by S in rats fed C but not S diet ($P < .05$). At week 7, rats fed the S diet had higher plasma insulin (67%) ($P < .005$), glucose (30%) ($P < .05$) and homeostatic model assessment of insulin resistance index (75%) ($P < .005$). In experiment 2, FI at weeks 6 and 12 was, again, suppressed most strongly by S preloads in rats fed the C diet ($P < .05$). At week 13, S and C preloads increased insulin and the insulin/glucose ratio ($P < .05$), but no differences were found due to preload or diet composition. In conclusion, differences in the effects of first diet exposure to the AIN-93G diets on blood glucose did not persist through either diet change or time. In contrast, protein composition of the most recent diet, but not time, affected FI regulation in response to protein preloads [Alireza Jahan-mihan, Chris E. Smith and G. Harvey Anderson* (Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada, M5S 3E2), *Nutrition Research*, 2011, 31(3), 237-245].

NPARR 2(2), 2011-227, Honey promotes lower weight gain, adiposity, and triglycerides than sucrose in rats

Various dietary carbohydrates have been linked to obesity and altered adipose metabolism; however, the influences of honey vs common sweeteners have not been fully explored. We hypothesized that in comparison with sucrose, a honey-based diet would promote lower weight gain, adiposity, and related biomarkers (leptin, insulin, and adiponectin) as well as a better blood lipid profile. Thirty-six male Sprague-Dawley rats (228.1 ± 12.5 g) were equally divided by weight into 2 groups ($n = 18$) and provided free access to 1 of 2 diets of equal energy densities differing only in a portion of the carbohydrate. Diets contained 20% carbohydrate (by weight of total diet) from either clover honey or sucrose. After 33 days, epididymal fat pads were excised and weighed, and blood was collected for analyses of serum concentrations of lipids, glucose, and markers of adiposity and inflammation. Body weight gain was 14.7% lower ($P \leq .05$) for rats fed honey, corresponding to a 13.3% lower ($P \leq .05$) consumption of food/energy, whereas food efficiency ratios were nearly identical. Epididymal fat weight was 20.1% lower ($P \leq .05$) for rats fed honey. Serum concentrations of triglycerides and leptin were lower ($P \leq .05$) by 29.6% and 21.6%, respectively, and non-

high-density lipoprotein cholesterol was higher ($P \leq .05$) by 16.8% for honey-fed rats. No significant differences in serum total cholesterol, high-density lipoprotein cholesterol, adiponectin, C-reactive protein, monocyte chemoattractant protein-1, glucose, or insulin were detected. These results suggest that in comparison with sucrose, honey may reduce weight gain and adiposity, presumably due to lower food intake, and promote lower serum triglycerides but

higher non-high-density lipoprotein cholesterol concentrations Tricia M. Nemoseck, Erin G. Carmody, Allison Furchner-Evanson, Marsa Gleason, Amy Li, Hayley Potter, Lauren M. Rezende, Kelly J. Lane and Mark Kern* (School of Exercise and Nutritional Sciences, San Diego State University, San Diego, CA 92182-7251, USA), *Nutrition Research*, 2011, 31(1), 55-60].

THERAPEUTICS

NPARR 2(2), 2011-228, **Anti-obesity effects of highly polymeric proanthocyanidins from seed shells of Japanese horse chestnut (*Aesculus turbinata* Blume)**

Recently, we have shown that seed shells contain a large amount of highly polymeric proanthocyanidins having a series of heteropolyflavan-3-ols with doubly linked A-type linkages as well as single B-type bonds without gallic acid esterified to them. Here, we attempted to evaluate in vivo anti-obesity effects of the polymerized proanthocyanidins in mice. An oral starch or glucose tolerance test in mice revealed that the isolated two fractions of highly polymerized proanthocyanidins with the different degree of polymerization suppressed effectively the elevation of blood glucose from oral starch, but not from oral glucose, suggesting the preferential inhibition of the digestive enzymes of carbohydrates. Moreover, in vivo anti-obesity effects of the total fraction containing the proanthocyanidins as a drink were investigated in mice fed a high-fat diet. Their anti-obesity effects became more evident after 9 weeks as determined by the attenuation of the elevation in body weight, the mass of peritoneal adipose tissues, and the plasma levels of total cholesterol and leptin. Furthermore, the increased size of hepatocytes and the generation of steatosis with micro- and macrovesicles in liver were normalized by the dietary supplementation of the total proanthocyanidin fraction.

The findings suggest the usefulness of highly polymeric proanthocyanidins from seed shells in the application to food as a dietary supplement with anti-obesity effects in vivo through the inhibition of digestive enzymes of carbohydrates and fats [Hideto Kimura, Satoshi Ogawa, Akihiko Sugiyama, Mitsuo Jisaka, Takashi Takeuchi and Kazushige Yokota* (The United Graduate School of Agricultural Sciences, Tottori University, 4-101 Koyama, Tottori-shi, Tottori 680-8553, Japan), *Food Research International*, 2011, 44(1), 121-126].

NPARR 2(2), 2011-229, **The chloroform fraction of guava (*Psidium cattleianum* Sabine) leaf extract**

inhibits human gastric cancer cell proliferation via induction of apoptosis

The antiproliferative activities of the chloroform fraction (CF) of guava (*Psidium cattleianum* Sabine) leaf extract were evaluated using several cancer cell lines. Maximum cytotoxicity was observed in SNU-16, a human gastric carcinoma cell line, at concentrations of 50–100 µg/ml. Flow cytometric analysis demonstrated that CF treatment resulted in a marked accumulation of SNU-16 cells in the sub-G1 phase at concentrations of 100–200 µg/ml. The induction of apoptosis in SNU-16 cells was confirmed by immunoblotting using antibodies against Bcl-2, Bax, poly (ADP-ribose) polymerase (PARP), caspase-8, and caspase-3. The major CF phytochemicals were identified as ferulic acid, genistein, 3', 4', 5' trimethoxy flavone, phlorizin, and oleanolic acid by high performance liquid chromatography coupled with a photo diode array and electrospray ionisation mass spectrometry (HPLC-PDA-ESI-MS). The results suggest that phytochemicals in the CF of guava (*P. cattleianum*) leaf extract induce apoptosis in SNU-16 cells. These findings may lead to new strategies for treating human gastric cancer [Jeong Yong Moon, Ashik Mosaddik, Hana Kim, Moonjae Cho, Hyung-Kyoon Choi, Young Suk Kim and Somi Kim Cho* (Subtropical Horticulture Research Institute, Jeju National University, Jeju 690-756, Republic of Korea), *Food Chemistry*, 2011, 125(2), 369-375].

NPARR 2(2), 2011-230, **Protective effect of bamboo shoot oil on experimental nonbacterial prostatitis in rats**

This study aim to investigate the protective effects of bamboo shoot oil (BSO) and its mechanisms on nonbacterial prostatitis (NBP). The anti-prostatitis effect of BSO were evaluated by prostate weight, acid phosphatase, density of lecithin corpuscles (DLCC), white blood cell count (WBC), and prostatic histomorphological parameters using Xiaozhiling-induced experimental NBP model in rats. The mechanisms of anti-prostatitis effect were assessed using functionally focused cDNA microarray and real-time PCR. BSO could significantly inhibited absolute prostate weight, prostate index, total acid phosphatase, prostatic acid phosphatase, WBC and the expression levels of thirty up-regulated genes,

while BSO could significantly increased DLCC and the expression levels of fifteen down-regulated genes. Histologically, BSO treatment significantly suppressed the severity of the lesion in NBP-induced rats. Thus, BSO may be useful for treatment of NBP, as it may inhibits prostate inflammation in NBP patients by affecting the expression of inflammatory cytokines, their receptors, and related genes [Baiyi Lu, Huafang Cai, Weisu Huang, Xiaoqin Wu, Yanxi Luo, Lianliang Liu and Ying Zhang* (The Department of Food Science and Nutrition, School of Biosystems Engineering and Food Science, Zhejiang University, Hangzhou 310029, PR China), *Food Chemistry*, 2011, 124(3), 1017-1023].

NPARR 2(2), 2011-231, Analgesic and anti-nociceptive activity of hydroethanolic extract of *Drymaria cordata* Willd.

To study the analgesic and anti-nociceptive activity of hydroethanolic extract of *Drymaria cordata* Willd. Wistar rats and Swiss albino mice were used for studying analgesic and anti-nociceptive activity of *Drymaria cordata* hydroethanolic extract (DCHE) at doses 50, 100 and 200 mg/kg p.o. Various models viz. acetic acid induced writhing model (female mice), Eddy's hot plate (mice) and tail flick model (rat) for analgesic study and formalin-induced paw licking model (mice) were used for anti-nociceptive study. In acetic acid induced writhing model, effect of DCHE was better than the standard drug- indomethacin 10 mg/kg (p.o.). In the hot plate model, the maximum effect was observed at 60 min at a dose of 200 mg/kg p.o., which was higher than the standard drug morphine sulfate (1.5 mg/kg i.p.), whereas in the tail flick model, effect was comparable with morphine sulfate. In formalin-induced paw licking model, administration of DCHE completely abolished the early phase at 100 and 200 mg/kg p.o. and in the late phase, the effect of DCHE (200 mg/kg p.o.) was higher than indomethacin (10 mg/kg p.o.). DCHE was effective in both non-narcotic and narcotic models of nociception, suggesting its possible action via peripheral and central mechanism. It also abolished the early phase in formalin-induced paw licking model, suggesting complete inactivation of C-fiber at higher dose. The activity can be attributed to the phyto-constituents viz tannins, diterpenes, triterpenes and steroids present in the DCHE extract. In conclusion, DCHE can be developed as a potent

analgesic and anti-nociceptive agent in future [Chandana Choudhury Barua*, Jayanti Datta Roy, Bhaben Buragohain, Acheenta Gohain Barua., Prabodh Borah and Mangala Lahkar (Department of Pharmacology and Toxicology, College of Veterinary Science, Assam Agricultural University, Khanapara, Assam India), *Indian Journal of Pharmacology*, 2011, 43(2), 121-125].

NPARR 2(2), 2011-232, Antileukemic activity of the leaf extract of *Bischofia javanica* blume on human leukemic cell lines

Leaves of *Bischofia javanica* (BJ) have been traditionally used for many ailments including cancer. In the present study, antileukemic activity of the leaf extract was evaluated on human leukemic cell lines. Human leukemic cell lines U937, K562, and HL60 were purchased from National Facility for Animal Tissue and Cell Culture, Pune, India. The cells were routinely maintained in RPMI 1640 medium supplemented with 10% heat inactivated fetal calf serum. Cultures were maintained at 37°C in a humidified atmosphere containing 5% CO₂ in air. The methanol extract of BJ (MEBJ) was dissolved in PBS and used at the concentrations of 5, 10, and 15 µg/ml for cell viability and cytotoxicity studies (MTT assay). Cell counts were made in quadruplicate samples at the interval of 24, 48, and 72 h and cytarabine (20 µg/ml) served as standard drug. The apoptotic pathway of cytotoxicity was assessed by DNA agarose gel electrophoresis technique and confirmed by fluorescence and confocal microscopic methods at the concentration of 10 µg/ml. MEBJ showed significant cytotoxicity (P<0.001) in leukemic cell lines in the in-vitro cell proliferation assay. IC₅₀ of MEBJ was very low (3.5 µg/ml) at 72 h in the HL60 cell line. The apoptotic pathway of cytotoxicity was observed at 10 µg/ml of MEBJ by the fragmented DNA pattern in the apoptosis assay, chromatin condensation, and apoptotic body formation as revealed in the fluorescence and confocal microscopic studies. The present findings support the ethno-medicinal use of BJ for cancer by mediating through the apoptosis pathway [Sutharson Lingadurai*, Soma Roy, Rajan Vedasiromoni Joseph and Lila Kant Nath(Department of Pharmacology, Himalayan Pharmacy Institute, Majhitar, Sikkim - 737 136 India), *Indian Journal of Pharmacology*, 2011, 43(2), 143-149].

NPARR 2(2), 2011-233, Effect of *Argyrea speciosa* root extract on cafeteria diet-induced obesity in rats

To evaluate the antiobesity effects of the ethanolic extract of *Argyrea speciosa* roots in rats fed with a cafeteria diet (CD). Obesity was induced in albino rats by feeding them a CD daily for 42 days, in addition to a normal diet. Body weight and food intake was measured initially and then every week thereafter. On day 42, the serum biochemical parameters were estimated and the animals were sacrificed with an overdose of ether. The, liver and parametrial adipose tissues were removed and weighed immediately. The liver triglyceride content was estimated. The influence of the extract on the pancreatic lipase activity was also determined by measuring the rate of release of oleic acid from triolein. The body weight at two-to-six weeks and the final parametrial adipose tissue weights were significantly lowered ($P < 0.01$ and $P < 0.05$, respectively) in rats fed with the CD with *Argyrea speciosa* extract 500 mg/kg/day as compared to the CD alone. The extract also significantly reduced ($P < 0.01$) the serum contents of leptin, total cholesterol, low density lipoprotein (LDL), and triglycerides, which were elevated in rats fed with CD alone. In addition, the extract inhibited the induction of fatty liver with the accumulation of hepatic triglycerides. The extract also showed inhibition of pancreatic lipase activity by using triolein as a substrate. The ethanolic extract of *Argyrea speciosa* roots produces inhibitory effects on cafeteria diet-induced obesity in rats [Shiv Kumar*, KR Alagawadi and M Raghavendra Rao (Department of Pharmacology, N.E.T. Pharmacy College, Navodaya Nagar, Raichur - 584 103, Karnataka, India), *Indian Journal of Pharmacology*, 2011, 43(2), 163-167].

NPARR 2(2), 2011-234, Evaluation of *Caesalpinia pulcherrima* Linn. for anti-inflammatory and antiulcer activities

To evaluate the ethanolic and aqueous extracts of aerial parts of *Caesalpinia pulcherrima* (Linn.) Sw. for anti-inflammatory and antiulcer activities. Anti-inflammatory action of the ethanolic and aqueous extracts of *C. pulcherrima* (100 and 200 mg/kg b.w.) (CPE and CPA) were evaluated by cotton pellet granuloma models. Pylorus ligation and aspirin

induced ulcer models were employed for evaluating antiulcer activity for both the extracts. Ulcerogenic potential of CP was also evaluated. Result : The ethanolic and aqueous extracts of *C. pulcherrima* significantly decreased ($P < 0.01$) the granuloma tissue development. CPE and CPA at both the doses exhibited significant ($P < 0.01$) antiulcer activity by decreasing the ulcer score in both the ulcer models and it was not ulcerogenic. The ethanolic and aqueous extracts of aerial parts of *C. pulcherrima* (CPE and CPA) possess significant anti-inflammatory and antiulcer activities [Vivek Sharma* and GP Rajani (Department of Pharmacology, K. L. E. Society's College of Pharmacy, Bangalore - 560 010, Karnataka, India), *Indian Journal of Pharmacology*, 2011, 43(2), 168-171].

NPARR 2(2), 2011-235, Anticataleptic and antiepileptic activity of ethanolic extract of leaves of *Mucuna pruriens*: A study on role of dopaminergic system in epilepsy in albino rats

To assess the anticataleptic and antiepileptic activity of leaves of *Mucuna pruriens* in albino rats. Haloperidol-induced catalepsy (HIC), maximum electroshock (MES) method, pilocarpine-induced Status epilepticus (PISE) and single-dose effect of *M. pruriens* were employed. *M. pruriens* (100 mg/kg) had significant anticataleptic and antiepileptic activity in HIC, MES, and PISE. *M. pruriens* extract has the potential to be an anticataleptic and antiepileptic drug. Dopamine and 5-HT may have a role in such activity [D Champatisingh, PK Sahu*, A Pal and GS Nanda (Department of Pharmacology, School of Pharmaceutical Sciences, Siksha O Anusandhan University, Bhubaneswar-751 003, Orissa, India), *Indian Journal of Pharmacology*, 2011, 43(2), 197-199].

NPARR 2(2), 2011-236, Antihyperhomocysteinemic and antihyperlipidemic effect of *Trichilia connaroides* in methionine-induced hyperhomocysteinemic animals

The current study investigates the antihyperhomocysteinemic and antihyperlipidemic effect of chloroform and methanol extracts of the leaves of *Trichilia connaroides* in methionine-induced hyperhomocysteinemic rats. Hyperhomocysteinemia was induced in albino Wistar rats by oral administration of L-Methionine (1 gm / kg) and they were treated

simultaneously with chloroform and methanol extracts (100 mg / kg) from the leaves of *Trichilia connaroides*. Serum homocysteine, lipid profile, and products of lipid peroxidation (MDA) in the heart homogenate were recorded and treated for statistical significance. Hyperhomocysteinemic animals recorded significantly elevated serum homocysteine changes in lipid profile ($P < 0.01$) and Thibarbituric acid reactive substances ($P < 0.01$), compared to the vehicle control animals. Animals treated with chloroform and methanol extracts recorded significantly ($P < 0.01$) lower serum homocysteine, entire lipid profile, LPO ($P < 0.01$), except a significant increase in HDL-cholesterol ($P < 0.01$) compared to hyperhomocysteinemic animals. Thus, we conclude that chloroform and methanol extracts of *Trichilia connaroides* have significant antihyperhomocysteinemic and antihyperlipidemic effects on methionine-induced hyperhomocysteinemic animals. *Trichilia connaroides*, therefore, holds promise as a cardioprotective herb [GS Prasanna* and Purnima Ashok (Department of Pharmacology, KLE University's College of Pharmacy, Rajajinagar 2nd Block, Bangalore - 560 010, Karnataka, India), *Indian Journal of Pharmacology*, 2011, 43(2), 203-206]

NPARR 2(2), 2011-237, Study of the antioxidant properties of extracts obtained from nopal cactus (*Opuntia ficus-indica*) cladodes after convective drying

The process of convective drying was evaluated in terms of the bioactive compounds contained in nopal samples before and after dehydration. Total polyphenol, flavonoid, flavonol, carotene and ascorbic acid contents were determined in undehydrated and dehydrated samples. Two drying temperatures (45 and 65 °C) and two air flow rates (3 and 5 m s⁻¹) were evaluated. The rheology of samples under the best drying conditions was also studied, since it provides important information regarding processing (mixing, flow processing) as well as the sensory attributes (texture) of rehydrated samples.

Non-Newtonian shear-thinning behaviour was observed for samples dried at 45 °C, while samples dried at 65 °C showed shear-thickening behaviour, possibly caused by thermal chain scission of high-molecular-weight components.

The best conditions for bioactive compound

preservation were a drying temperature of 45 °C and an air flow rate of 3 m s⁻¹, resulting in 40.97 g phenols, 23.41 g flavonoids, 0.543 g β-carotene and 0.2815 g ascorbic acid kg⁻¹ sample as shown in table 3 [Luis Medina-Torres, E Jaime Vernon-Carter, J Alberto Gallegos-Infante, Nuria E Rocha-Guzman, E E Herrera-Valencia, Fausto Calderas, and Rubén Jiménez-Alvarado* (Universidad de la Cañada, Jefatura de Carrera de Ingeniería en Agroindustrias, Carretera Teotitlán-San Antonio Nanahuatipán km 1.7 s/n, Paraje Titlacuatitla, CP 68540 Teotitlán de Flores Magón, Oaxaca, Mexico), *Journal of the Science of Food and Agriculture*, 2011, 91(6), 1001-1005].

NPARR 2(2), 2011-238, “Every mother is a mini-doctor”: Ethnomedicinal uses of fish, shellfish and some other aquatic animals in

Historically, fishers have used fish and other aquatic animals not only as food items for nutrition, but also to solve a host of physical problems and diseases. Fish and shellfish are widely used for their galactogogue and aphrodisiac properties, for quick recovery from long-time sickness, to enhance the ‘intelligence level’ of children, and to prevent and treat a host of diseases like night blindness, chicken pox, dysentery, piles, muscular inflammation, fistula, malaria, skin diseases and ‘big belly’ syndrome in children. Depending on the objective of the use, different parts of the animal body, its derivatives, or the whole animal are used. The research also clarified different forms of the recipes used. The socio-cultural construction of the ethnomedicinal uses and the distinct gender roles of the fisherwomen were analyzed.

Thus the aetiologies and the preventive measures against folk illness are socio-culturally embedded and such indigenous medical systems grow and are sustained as a situated body of knowledge within the boundaries of a typical world view framed by local culture and biodiversity [Apurba Krishna Deb*and C. Emdad Haque (Natural Resources Institute, Clayton H. Riddell Faculty of Environment, Earth and Resources, University of Manitoba, 319 Sinott Building, 70 Dysart Rd, Winnipeg, MB, Canada R3T 2N2), *Journal of Ethnopharmacology*, 2011, 134(2), 259-267].

VEGETABLES

NPARR 2(2), 2011-239, Effect of Processing and Packaging Conditions on Quality of Refrigerated Potato Strips

Although sulfiting agents are commonly used in the fresh-cut potato industry, concerns about further regulatory restrictions on sulfite use and consumer fear of sulfite-treated foods have led to increased research in alternative processing methods. The objective of this study was to determine processing and packaging techniques to achieve a safe and high-quality potato strips with a 4 wk minimum refrigerated shelf life. Potato strips were 1st blanched at low temperature (60 °C) in 0.5% CaCl₂ solution for 20 min and then 2nd blanched at high temperature (approximately 98 °C) in water for 5 min. Blanched strips were packaged in a near-aseptic environment or treated in-package with gaseous ozone, sodium metabisulfite (SM) solution, or FIT Fruit and Vegetable Wash™ (Procter and Gamble Co., Cincinnati, Ohio, U.S.A.) and then stored at 7 ± 1 °C for 28 d. No significant difference was observed in lightness of near-aseptically packaged fries, FIT-treated fries, and frozen fries; however, less color difference was determined in near-aseptically packaged fries and FIT-treated fries compared to frozen fries. Gaseous ozone treatment decreased color quality of potato strips, significantly. The highest after-frying peak force was observed in FIT-treated strips. There was no significant difference in oil absorption of refrigerated and unprocessed strips. These results indicate that either near-aseptic packaging or in-package FIT treatment are the better alternatives for blanched potato strips to extend shelf life and maintain quality.

In this study, several processing conditions and packaging methods were evaluated to improve quality and extend shelf life of refrigerated potato strips. Results indicate that the combination of 2-step blanching and near-aseptic packaging was an effective nonchemical processing method, giving 28 d refrigerated shelf life. Similarly, FIT Fruit and Vegetable Wash™ proved to be an effective chemical alternative to sulfites and avoids the allergen concern [ME Oner* and PN Walker (Authors are with Agricultural and Biological Engineering Dept., The

Pennsylvania State Univ., 249 Agricultural Engineering Building, Univ. Park, PA 16802, U.S.A.), *Journal of Food Science*, 2011, 76(1), S35–S40].

NPARR 2(2), 2011-240, Safety Evaluations on Ethanolic Extract of Red Cabbage (*Brassica oleracea* L.) in Mice

The present study has carried out safety evaluations on an ethanolic extract of red cabbage (RC) leaves in terms of acute and subchronic oral toxicity tests as per Organisation for Economic Cooperation and Development (OECD) guidelines in Swiss albino mice. Single-dose administration of RC extract (1000, 2000, 3000, 4000, or 5000 mg/kg body weight) to Swiss albino mice did not manifest toxicity or any significant adverse behavioral alterations. Chronic administration of RC extract (1000, 2000, and 3000 mg/kg body weight) for 28 d also did not register any significant alterations in fluid intake, organ weights, plasma lipid profile, plasma creatine kinase-MB, lactate dehydrogenase, aspartate transaminase, alanine transaminase, creatinine, electrolytes, and calcium levels, and the total blood count showed a nonsignificant change. However, significant reduction in body-weight gain, food intake, red blood cell count, and hemoglobin content along with higher alkaline phosphatase, bilirubin, and urea levels was observed in mice treated with 3000 mg/kg body weight for 28 d. Since there was no mortality up to a dose of 5000 mg/kg body weight, 50% lethal dose (LD₅₀) could not be determined, and hence, it can be assumed that, LD₅₀ of RC extract is >5000 mg/kg. No observable adverse effect level dose of the RC extract was found to be 2000 mg/kg body weight. Hence, consumption of RC extract for various medicinal purposes is safe.

RC is a popularly consumed foodstuff that has been ubiquitously reported to exert medicinal properties. It is mandatory to understand the highest permissible consumption limit of any food supplement to avoid toxicity. This study establishes the safe dose of RC. These results can be of relevance for the scientific fraternity as well as laymen who consume this vegetable or its phytochemical preparation [Menaka C. Thounaojam, Ravirajsinh N. Jadeja, Jayanta M. Sankhari, Ranjitsinh V. Devkar* and A.V. Ramachandran (Div. of Phytotherapeutics

and Metabolic Endocrinology, Faculty of Science, The M. S. Univ. of Baroda, Vadodara-390002, Gujarat, India), *Journal of Food Science*, 2011, 76 (1), T35–T39].

NPARR 2(2), 2011-241, Physical and mechanical properties of tomato fruits as related to robot's harvesting

In order to better design, fabricate and control tomato harvesting robot, selected physical properties such as height, diameter, sphericity, surface area, volume, total mass, mass of pericarp and gelatinous matter, bulk density, density of pericarp and gelatinous matter, porosity, projected area, shape factor, and radius of curvature of two cultivar tomato fruits with different locule numbers were mainly investigated by image analysis and water displacement method. Mechanical properties such as friction and rolling resistance coefficients, and rupture energy, rupture force, compressibility, and loading slope of tomato fruits at two loading positions were determined by pull and loading test. Results showed the locule number had a significant effect ($P < 0.05$) on certain physical and mechanical parameters, such as height, diameter, surface area, rupture force, compressibility, and friction coefficient. The loading position also showed a significant effect ($P < 0.05$) on certain mechanical parameters, such as compressibility. The obtained properties are closely related to robot's harvesting [Zhiguo Li, Pingping Li* and Jizhan Liu (Institute of Agricultural Engineering, Jiangsu University, 212013 Zhenjiang, China), *Journal of Food Engineering*, 2011, 103(2), 170-178].

NPARR 2(2), 2011-242, Shrinkage, density, porosity and shape changes during dehydration of pumpkin (*Cucurbita pepo* L.) fruits

The aim of this work was to study the changes in volume, density, porosity and shape factors of pumpkin tissue during osmotic dehydration (OD) and air drying (AD). Pumpkin cylinders with length/diameter ratio of 5/3 were used. OD experiments were carried out with solutions of sucrose, sodium chloride and mixtures of both solutes at different temperatures. AD experiments were conducted at 70 °C. Volume of samples decreased linearly with weight reduction (WR). Bulk density varied in a restricted range (5–13%) during

dehydration and for all the methods maximum values were found. Particle density increased during both processes. Porosity increased at advanced degrees of dehydration, showing a minimum value at the beginning of OD and AD. The proposed models to evaluate shrinkage, bulk and particle densities and porosity from WR were satisfactorily applied. Image analysis showed that shrinkage of samples during OD was isotropic. Pumpkin cylinders increased elongation and decreased roundness and compactness during osmotic dehydration [L. Mayor*, R. Moreira and A.M. Sereno (Instituto Universitario de Ingeniería de Alimentos para el Desarrollo, Universidad Politécnica de Valencia, Camino de Vera, s/n, 46022 Valencia, Spain), *Journal of Food Engineering*, 2011, 103(1), 29-37].

NPARR 2(2), 2011-243, Studies on the antioxygenic activity of bitter gourd (*Momordica charantia*) and its fractions using various *in vitro* models

A study was undertaken to evaluate the antioxygenic activity of bitter gourd pulp and seed powders as well as their various solvent extracts using different methods and to minimise the oxidative deterioration of lipids by natural antioxidants.

Bitter gourd pulp and seed powders at 20 g kg⁻¹ and their ethanol/water extracts exhibited stronger antioxygenic activity than other solvent extracts. Bitter gourd pulp and its extracts showed slightly higher antioxygenic activity than bitter gourd seed and its extracts. This may be attributed to the presence of higher amounts of phenolics and flavonoids, which have been reported as potential antioxidants. The seed portion of bitter gourd contained higher levels of total protein (188.3 g kg⁻¹), total fat (238.9 g kg⁻¹) and crude fibre (350.2 g kg⁻¹) than the pulp portion. Fatty acid analysis of bitter gourd seed oil indicated the presence of α -eleostearic acid, an isomer of conjugated linolenic acid, as a major fatty acid, but this acid was absent in the pulp.

The results of this study confirmed the presence of antioxygenic compounds in both bitter gourd pulp and seed. In particular, their ethanol/water extracts showed great potential as natural antioxidants to inhibit lipid peroxidation in foods [Ananthan Padmashree, Gopal K Sharma*, Anil D Semwal and Amarinder S Bawa (Defence Food Research

Laboratory—CPT Siddarthanagar, Mysore, Karnataka 570 011, India), *Journal of the Science of Food and Agriculture*, 2011, 91(4), 776-782].

WOOD

NPARR 2(2), 2011-244, Effect of outdoor exposure on some properties of resin-treated plybamboo

The objective of this investigation was to evaluate some of the physical and mechanical properties of resin-treated plywood type panels manufactured from bamboo strips (*Gigantochloa scortechinii*). Experimental plybamboo samples were made from low molecular weight phenol formaldehyde (LMwPF) treated bamboo strips. They were exposed to outdoor condition ranging from 1 to 12 months. Modulus of elasticity (MOE), modulus of rupture (MOR), compression strength, and surface roughness of treated and untreated samples were evaluated. Resin impregnated samples had the highest bending and compression strength properties. While the untreated samples failed after 3-month of outdoor exposure. Treated specimens exposed for 12-month had the MOE, MOR, and compression strength values of 14,253 N/mm², 101.3 N/mm², and 34.63 N/mm², respectively. Surface quality of both treated and untreated samples was adversely influenced as the function of outdoor exposure time, based on numerical values obtained from a stylus type equipment. Overall properties of treated samples tested in work resulted in higher values than those of untreated samples. It appears that resin impregnation could be considered as an alternative method to enhance the characteristics of plybamboo exposed to environmental conditions as can be concluded from the results of this study [U.M.K. Anwar, Salim Hiziroglu*, H. Hamdan and M. Abd.Latif (Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, Oklahoma 74078, USA), *Industrial Crops and Products*, 2011, 33(1), 140-145].

NPARR 2(2), 2011-245, Biological control of wood decay against fungal infection

Wood (timber) is an important raw material for various purposes, and having biological composition it is susceptible to deterioration by various agents. The history of wood protection by impregnation with synthetic chemicals is almost two hundred years old. However, the ever-increasing public concern and the new environmental regulations on the use of

chemicals have created the need for the development and the use of alternative methods for wood protection. Biological wood protection by antagonistic microbes alone or in combination with (bio) chemicals, is one of the most promising ways for the environmentally sound wood protection. The most effective biocontrol antagonists belong to genera *Trichoderma*, *Gliocladium*, *Bacillus*, *Pseudomonas* and *Streptomyces*. They compete for an ecological niche by consuming available nutrients as well as by secreting a spectrum of biochemicals effective against various fungal pathogens. The biochemicals include cell wall-degrading enzymes, siderophores, chelating iron and a wide variety of volatile and non-volatile antibiotics. In this review, the nature and the function of the antagonistic microbes in wood protection are discussed [Susi, P.*, Aktuganov, G, Himanen, J., Korpela, T (Institute of Microbiology and Pathology, Department of Virology, University of Turku, Kiinamyllynkatu 13, 20520 Turku, Finland), *Journal of Environmental Management*, 2011, 92(7), 1681-1689].

NPARR 2(2), 2011-246, Termite resistance of solid wood and plywood treated with quaternary ammonia compounds and common fire retardants

The ability of termites to attack solid wood and plywood treated with quaternary ammonia compounds and common fire retardants was evaluated. The plywood and solid-wood specimens treated with either monoammonium phosphate (MAP), diammonium phosphate (DAP), ammonium sulfate (AS), didecyl dimethyl ammonium chloride (DDAC), or didecyl dimethyl ammonium tetrafluoroborate (DBF) were subjected to termite resistance tests using the subterranean termites *Coptotermes formosanus* Shiraki under laboratory conditions. The lowest mass losses and the highest termite mortalities were obtained for the solid-wood and plywood specimens treated with DDAC and DBF. Higher termite mortalities were seen in the plywood specimens treated with the fire retardants when compared to the solid-wood specimens. The MAP, DAP, and AS treatments lowered the mass losses in both solid-wood and plywood specimens in comparison with control specimens; however, DBF and DDAC protected specimens well against termite attack at both concentration levels tested [Terzi, E, Taşçioğlu, C., Kartal, S.N.*, Yoshimura, T

(Department of Forest Biology and Wood Protection Technology, Forestry Faculty, Istanbul University, 34473 Bahcekoy, Istanbul, Turkey), *International Biodeterioration and Biodegradation*, 2011, 65(3), 565].

NPARR 2(2), 2011-247, Immobilizing bifenthrin on wood for termite control

Termites are world-wide pests causing significant losses to annual and perennial crops, as well as damages to wooden components in buildings. Although various chemical, physical, and biological methods have been explored to prevent termite attack on wooden structures, new guiding principles are still needed for environmental protection. In this study, by combining the effective chemical control of bifenthrin and photo-immobilization technique of biomolecules, we developed chitosan as a carrier to embed bifenthrin, which was then immobilized by ultraviolet treatment on the surface of wood (*Cunninghamia lanceolata*). The immobilized bifenthrin embedded in the photoactive chitosan was characterized by Fourier transform infrared spectroscopy (FTIR), C.H.N analysis, ultraviolet, and fluorescence measurements. The surface structures and biological activity were examined by scanning electron microscopy (SEM), atomic force microscope (AFM), electron spectroscopy for chemical analysis (ESCA), and bioassays. The results indicated that the immobilized bifenthrin can be well protected from free and non-controlled releasing, and has a long-term stability allowing high efficiency against the termite at a dose of $2.5 \mu\text{g}/\text{cm}^2$. This study provides a novel and environmentally-benign technique for the termite

control by photo-immobilizing the bifenthrin-embedded chitosan on the surface of *C. lanceolata*. This technique may be used in combination with the traditional methods for effective termite control [Guan, Y.Q, Chen, J., Tang, J., Yang, L., Liu, J.-M.* (School of Physics, South China Normal University, Guangzhou 510631, China), *International Biodeterioration and Biodegradation*, 2011, 65(3), 389].

NPARR 2(2), 2011-248, Solar drying of pine lumber: Verification of a mathematical model

This work presents verification of a mathematical model for drying of a wood stack in a greenhouse type solar dryer. A simplified heat and mass transfer numerical model has been developed with input parameters based on the actual metrological data of a Moroccan climate. For its validation, a comparative study is performed in this work; the present model is solved to simulate the solar drying of pine wood using experimental data of previous wood drying experiments. The average relative discrepancies between the model predicted and experimental data are 1,2% for wood moisture content, 1% for drying air temperature and 5% for the air relative humidity. The close agreement between the predicted and experimental results shows the ability of the model to reproduce experimental drying data for wood [Bekkioui, N.*, Hakam, A., Zoulalian, A., Sesbou, A., and Kortbi, M.E. (Laboratoire des Sciences et Technologie du Bois, Faculté des Sciences, 4 Avenue Ibn Battouta, BP 1014, Rabat, Morocco), *Maderas Ciencia y Tecnologia*, 2011, 13(1), 29-40]

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

CULTIVATION

NPARR 2(2), 2011-249, *In vitro* regeneration from petiole explants of non-toxic *Jatropha curcas*

Jatropha curcas, a multipurpose shrub has acquired significant economic potential as biodiesel plant. The seeds or pressed cake is toxic due to the presence of toxic substances and is not useful as food/fodder despite having the best protein composition. A simple, efficient, and reproducible method for plant regeneration through direct organogenesis from petiole explants of non-toxic *J. curcas* was developed using Murashige and Skoog (MS) medium supplemented with different concentrations of thidiazuron (TDZ). The best induction of shoot buds (57.61%), and number of shoot buds (4.98) per explant were obtained when *in vitro* petiole explants were placed horizontally on MS medium supplemented with 2.27 μM TDZ. The induced shoot buds were transferred to MS medium containing 10 μM kinetin (Kn), 4.5 μM 6-benzyl aminopurine (BA), and 5.5 μM α -naphthaleneacetic acid (NAA) for shoot proliferation and subsequent elongation was achieved on MS medium supplemented with 2.25 μM BA and 8.5 μM IAA. The elongated shoots could be rooted on half-strength MS medium with 15 μM IBA, 11.4 μM IAA and 5.5 μM NAA with more than 90% survival rate [Nitish Kumar*, K.G. Vijay Anand and Muppala P. Reddy (Discipline of Wasteland Research, Central Salt & Marine Chemicals Research Institute, Council of Scientific and Industrial Research, Bhavnagar, Gujarat 364002, India), *Industrial Crops and Products*, 2011, 33 (1), 146-151].

NPARR 2(2), 2011-250, Highly efficient *in vitro* regeneration of the industrial oilseed crop *Crambe abyssinica*

A highly efficient regeneration protocol for oilseed crop *Crambe abyssinica* has been developed using hypocotyls as explants in this study. *Crambe* is a potential engineering oilseed crop for industrial purposes as it contains 55–60% erucic acid in its oil and, more importantly, it does not outcross with any food oil seed crops. However, the low regeneration frequency with the currently available protocols is still a limiting factor for genetic modification of *Crambe*. In this study, we investigated the effects of N-source, C-source, AgNO_3 , cultural conditions as well as the concentration and combination of plant growth regulators (PGR) on the regeneration frequency of *C. abyssinica*. The results showed that all these factors, especially the N-source and PGR concentrations and combinations, played an important role in shoot regeneration. Among all the factors tested, the combination of using hypocotyls from *C. abyssinica* cv. galactica, the Lepiovre basal medium supplemented with 16 g l^{-1} glucose, 0.5 g l^{-1} AgNO_3 , 2.2 mg l^{-1} thidiazuron (TDZ), 0.5 mg l^{-1} α -naphthaleneacetic acid (NAA), 2.5 g l^{-1} Gelrite, seeds germinated in dark for 3 days and explants cultured in light, gave the best regeneration frequency (over 95%). The results also suggest that reducing the content of NH_4^+ or keeping a suitable $\text{NO}_3^-/\text{NH}_4^+$ ratio in the regeneration medium would be crucial to *Crambe* shoot regeneration [Xueyuan Li, Annelie Ahlman, Helén Lindgren and Li-Hua Zhu*(Department of Plant Breeding and Biotechnology, Swedish University of Agricultural Sciences, Box 102, 230 53 Alnarp, Sweden), *Industrial Crops and Products*, 2011, 33(1), 170-175].

NPARR 2(2), 2011-251, Efficient genetic transformation of *Jatropha curcas* L. by microprojectile bombardment using embryo axes

An efficient and reproducible protocol was established for genetic transformation in *Jatropha curcas* through microprojectile bombardment. Decotyledonated embryos from mature seeds were pre-cultured for 5 days and elongated embryonic axis was subjected to bombardment for the optimization of physical parameters. The frequency of transient *gus* expression and survival of putative transformants were taken into consideration for the assessment of physical parameters. Statistical analysis reveal that microcarrier size, helium pressure and target distance

had significant influence on transformation efficiency. Among different variables evaluated, microcarrier size 1 μm , He pressure 1100 and 1350 psi with a target distance of 9 and 12 cm respectively were found optimum by co-relating microcarrier size, helium pressure and target distance on the frequency of *gus* expression and survival of putative transformants. Selection of putative transformants was done with increasing concentrations (5–7 mg L^{-1}) of hygromycin. The integration of desired gene into *Jatropha* genome was confirmed with PCR amplification of 0.96 and 1.28 kb bands of *hptII* and *gus* gene respectively from the T_0 transgenics and Southern blot analysis using PCR amplified DIG labeled *hptIII* gene as a probe. A successful attempt of genetic transformation was made with optimized conditions using particle gene gun and establishing a stable transformation in *J. curcas* with 44.7% transformation efficiency. The procedure described will be very useful for the introgression of desired genes into *J. curcas* and the molecular analysis of gene function [Mukul Joshi, Avinash Mishra and Bhavanath Jha* (Discipline of Marine Biotechnology and Ecology, Central Salt and Marine Chemicals Research Institute, Council of Scientific and Industrial Research (CSIR), G. B. Marg, Bhavnagar 364021, Gujarat, India), *Industrial Crops and Products*, 2011, 33(1), 67-77].

NPARR 2(2), 2011-252, Impact of intercropping of medicinal and aromatic plants with organic farming approach on resource use efficiency in arecanut (*Areca catechu* L.) plantation in India

The present investigation was conducted at Vittal, Karnataka, India during 2004–2007 to study the feasibility of intercropping of medicinal and aromatic plants (MAPs) in arecanut plantation. The results revealed that MAPs can be successfully grown as intercrops in arecanut plantation with increased productivity and net income per unit area. Kernel equivalent yield of MAPs varied between 272 kg ha^{-1} in case of *Piper longum* to 1218 kg ha^{-1} in *Cymbopogon flexuosus*. Pooled data indicated that *Asparagus racemosus* produced fresh root yield of 10,666 kg ha^{-1} of arecanut plantation and contributed to maximum kernel equivalent yield of 1524 kg ha^{-1} among all medicinal and aromatic plants. Intercropping of MAPs in arecanut was found economical. The net return per rupee investment was

highest in *C. flexuosus* (4.25) followed by *Bacopa monnieri* (3.64), *Ocimum basilicum* (3.46) and *Artemisia pallens* (3.12). The total system productivity of arecanut + MAPs intercropping system varied from 2990 to 4144 kg ha^{-1} . Arecanut + *O. basilicum* intercropping system registered significantly higher production efficiency 8.2 $\text{kg ha}^{-1} \text{ day}^{-1}$ than other systems. Intercropping of MAPs had more positive effect on soil pH in arecanut based cropping system. The soil pH was 5.6 in 2004 and it was 0.3–0.9 units higher in 2007. Soil organic carbon (SOC) content varied significantly due to intercropping of MAPs at the end of experiment. The SOC content increased in *Aloe vera*, *A. pallens*, *P. longum* and *B. monnieri*, while it depleted in grasses and rhizomatic MAPs. Based on demand and marketing opportunities for MAPs, farmers are advised to grow aromatic plants in large areas on a community basis to meet huge industrial demand and variety of medicinal crops in small areas to meet the requirement of traditional systems of medicine [S. Sujatha*, Ravi Bhat, C. Kannan and D. Balasimha (Central Plantation Crops Research Institute, Regional Station, Vittal 574 243, Karnataka, India), *Industrial Crops and Products*, 2011, 33(1), 78-83]

NPARR 2(2), 2011-253, Effect of drought stress on growth and accumulation of active constituents in *Salvia miltiorrhiza* Bunge

The roots of *Salvia miltiorrhiza* Bunge are widely used in traditional Chinese medicine. The objective of this study was to investigate the effect of drought stress on growth and active constituents composition in *S. miltiorrhiza*. Three water-stress treatments, including control, medium drought stress and severe drought stress, were applied on the whole growth cycle. The results showed that drought stress significantly decreased both shoot and root dry weight in *S. miltiorrhiza*, but increased the root to shoot ratio at later growth cycle. Except rosmarinic acid the other active constituents content increased under water-stress conditions. Water stress significantly increased salvianolic acid B yield, and decreased that of tanshinone IIA. Our study suggests that it might be feasible to improve or develop *S. miltiorrhiza* cultivation methods under semi-arid and arid regions [Hongyun Liu, Xiangdong Wang, Donghui Wang, Zhirong Zou and Zongsuo Liang* (College of Life Sciences, Northwest A & F University, Yangling,

Shaanxi 712100, PR China), *Industrial Crops and Products*, 2011, 33(1), 84-88].

NPARR 2(2), 2011-254, Cuphea growth, yield, and oil characteristics as influenced by climate and soil environments across the upper Midwest USA

Cuphea is a potential new oilseed crop rich in medium-chain fatty acids (C8:0 to C14:0) that may serve as a renewable, biodegradable source of oil for lubricants, motor oil, and aircraft fuel. Impacts of climate and soil environment on cuphea growth and development are not well understood. The objective of this study was to evaluate the influence of climate and soil on growth, seed yield, and seed oil characteristics of two semi-domesticated cuphea genotypes [PSR23 and HC-10 (*Cuphea viscosissima* Jacq. × *C. lanceolata* W.T. Aiton)] and three wild species [*Cuphea wrightii*, *Cuphea lutea*, and *C. viscosissima* (VS-6-CPR-1)] that show potential for domestication. The study was conducted in 2007 and 2008 at field sites in North Dakota (ND), Minnesota (MN), Iowa (IA), and Illinois (IL). Cuphea PSR23 and HC-10 were direct seeded in the field, while the three wild species were transplanted. The two plantings were treated as separate experiments. Plant growth, seed yield and oil content for the two direct-seeded lines tended to be distinctly greater in MN and ND than IL and IA, which was related more to growth temperature than soil environment. The three wild species generally performed similarly across the four different environments. *C. wrightii* had the greatest oil content, ranging from 320 to 360 g kg⁻¹, which was comprised of 59–64% lauric acid. For each genotype, the content of its most prominent saturated medium-chain fatty acid (e.g., C10:0 or C12:0) increased with decreasing latitude of field site. Seed yields for *C. wrightii* and *C. lutea* were as high as 1116 kg ha⁻¹. Combined with relatively high seed oil contents (280–350 g kg⁻¹) these species may be good candidates for domestication. Results indicate that PSR23 and HC-10 are more regionally adapted than the wild species studied, which tended to exhibit a greater range of adaptability to climate and soil conditions [Ki-In Kim, Russ W. Gesch*, Steven C. Cermak, Winthrop B. Phippen, Marisol T. Berti, Burton L. Johnson and

Laura Marek (USDA-ARS-North Central Soil Conservation Research Lab, Morris, MN, USA), *Industrial Crops and Products*, 2011, 33(1), 99-107

NPARR 2(2), 2011-255, Large scale cultivation of *Cynara cardunculus* L. for biomass production—A case study

Large scale cultivation of the cardoon *Cynara cardunculus* L. for biomass production was installed using common agricultural practices and machinery in a total of 77.4 ha in southern Portugal in a region characterized by very hot and dry summers. This species is a perennial with an annual growth cycle. Installation by sowing was successful in spite of the extreme drought that occurred during this first cycle (221 mm), and the plants developed well during the second cycle (with 556 mm rainfall) with a mean density of 27 thousand plants per ha. Aerial photographs showed that 45.8 ha of the field had over 50% of ground cover by cardoon plants. The observed differences in soil occupation could be explained by rock outcrops, soil heterogeneity and land topography. The field biomass yield was estimated at 7.5 t ha⁻¹ and the plants at harvest had on average 2.1 m height and 2.2 cm stalk diameter, with 5.3 capitula per plant. Stalks represented 59.1% of total dry biomass. The capitula contain small oil seeds with an average of 126 seeds per capitulum and weighing 32 g per 1000 seeds. The mean seed yield was 603 kg ha⁻¹. The results of this experiment confirm that *Cynara* crops are suitable for biomass production in Mediterranean regions and that large scale operation can be applied including whole plant harvest or field fractionation for seed recovery. Careful attention to cultural practices was deemed important for field homogeneity and production. The observed plant variation, namely in oil seed production, suggests potential improvements through breeding [J. Gominho*, A. Lourenço, P. Palma, M.E. Lourenço, M.D. Curt, J. Fernández and H. Pereira (Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal), *Industrial Crops and Products*, 2011, 33(1), 1-6].

ANALYTICAL METHODS

NPARR 2(2), 2011-256, Validation of HPLC method for determination of tetracycline residues in chicken meat and liver

High-performance liquid chromatographic method with diode-array detection (HPLC–DAD) was optimised and validated for determination of tetracyclines (TCs) residue in chicken meat and liver through evaluating each step of various methods. The principle steps involved ultrasonic-assisted extraction of TCs from chicken samples by 2 ml of 20% trichloroacetic acid and citrate buffer (pH 4) which gave a clearer supernatant and high recovery, followed by centrifugation and purification on SPE (Strata C18-E cartridge) using 10 ml of 0.01 M methanolic oxalic acid for TCs elution. Separation was on reversed-phase column (Nuclosil 100 C18, 25 cm × 4.6 mm ID, 5 μ) by multisteps gradient elution which provided a better chromatographic peak resolution and the late eluting peaks were as sharp as those eluting earlier. Monitoring was at 351 nm which gave a higher detector response factor. Validity study of the method revealed that all obtained calibration curves showed good linearity ($r^2 > 0.999$) over the range of 50–5000 ng. Sensitivity was found to be 1.44, 1.90, 0.95 and 1.23 ng for OTC, TC, CTC and DC, respectively. Accuracy was in the range of 71.88–92.44.3% and 68.88–84.84% for meat and liver, respectively. Precision was lower than 10% in all cases indicating that the method can be used as a validated method. Limit of detection (LOD) was found to be 4.4, 5, 13 and 10 ng for OTC, TC, CTC and DC, respectively. The corresponding values of limit of quantitation (LOQ) were 10, 13, 27 and 22 [R. Shalaby*, Nadia A. Salama, S.H. Abou-Raya, Wafaa H. Emam and F.M. Mehaya) (Food Tech. Dept., National Research Centre, Dokki, Cairo, Egypt) *Food Chemistry*, 2011, 24(4)1660-1666].

NPARR 2(2), 2011-257, HPLC–MS identification of phenols in hazelnut (*Corylus avellana* L.) kernels

In whole hazelnut kernels, as the main product of hazelnut (*Corylus avellana* L.), phenols were analysed in 20 hazelnut cultivars by high-performance liquid chromatography–tandem mass spectrometry (HPLC–MS). Twenty-three compounds from different

phenolic groups were detected, and 15 of them were identified. In hazelnut kernels, these substances were detected: nine flavan-3-ols, two benzoic acids (gallic and protocatechuic acid), three flavonols and phloretin glycoside. Total phenol concentrations ranged from 70 to 478 mg gallic acid equivalents per kg hazelnut kernels. A high content level of total phenols was observed in the ‘Tonda Gentile delle Langhe’ and ‘Lewis’ cultivars, which was followed by the ‘Corabel’, ‘Fertile de Coutard’, ‘Daria’ and ‘Tonda Gentile Romana’ cultivars. Similarly, the highest antioxidative activity, measured by employing DPPH-antiradical assay, was also found in the ‘Tonda Gentile delle Langhe’ cultivar, followed by the ‘Fertile de [Jerneja Jakopic*, Maja Mikulic Petkovsek, Ana Likozar, Anita Solar, Franci Stampar and Robert Veberic (University of Ljubljana, Biotechnical Faculty, Agronomy Department, Chair for Fruit Growing Viticulture and Vegetable Growing, Jamnikarjeva 101, SI-1000 Ljubljana, Slovenia, Coutard, *Food Chemistry*, 2011, 124(3), 1100-1106].

NPARR 2(2), 2011-258, Determination of curcuminoid colouring principles in commercial foods by HPLC

The present study deals with determination of curcuminoids, which are potential sources of a natural food colourant, present in commercially available food items in Korean markets. Three principles, curcumin (1), demethoxycurcumin (2), and bisdemethoxycurcumin (3), were isolated from *Curcuma longa* roots. Moreover, their contents were investigated in 54 items of 16 food types by HPLC–DAD at 420 nm. The recovery rates showed remarkable differences, and ham of solid state exhibited the highest rate (98.9%), while beverage of liquid state was the lowest (0.34%). Among food items, curcumin (1) detected the predominant content and curry showed the highest curcuminoid in the range of 37.24–617.98 μg/g. Interestingly, curry powder was the highest content, followed by compressed curry, and retorted curry. The remaining food items, only mustard, candy, and pickle exhibited curcuminoids. This study provides that analysis of curcuminoids may be a potential tool for the quality control of manufactured foods [Jin Hwan Lee and Myoung-Gun Choung*(Department of Herbal Medicine Resource, Kangwon National University, Samcheok, Gangwon 245-711, Republic of Korea),

Food Chemistry, 2011, 124(3), 1217-1222].

NPARR 2(2), 2011-259, **Microwave assisted extraction of anthocyanins from grape skins**

A new method for the analysis of anthocyanins in grapes based on a systematic study of the extractability of eleven anthocyanins from grapes has been developed. Microwave assisted extraction was applied as a prior stage to the chromatographic determination of anthocyanins in the extracts. The stability of anthocyanins under the extraction conditions was checked using a standardised extract from grape skins. Temperatures from 50°C up to 150 °C were evaluated. A fractional factorial experimental design was developed to analyse the influence on the extraction process of six different extraction variables: solvent (mixtures of methanol

and water), stirring, extraction temperature, extraction time, microwave power and extraction volume. The extraction solvent was the most important variable for the recovery of most anthocyanins from grapes. Finally, the influence of the extraction time was also studied. With this new method, anthocyanins can be extracted from grapes in 5 min, using 100 °C as extraction temperature and 40% methanol in water as the extraction solvent. Repeatability and reproducibility were also checked, the resulting RSDs ($n = 9$) were lower than 7% for glucosides, the main components, and lower than 9% for the acyl derivatives, the compounds found in the lowest concentrations [A. Liazid, R.F. Guerrero, E. Cantos, M. Palma*and C.G. Barroso (Department of Analytical Chemistry, Faculty Sciences, University of Cádiz, P.O. Box 40, 11510 Puerto Real, Cádiz, Spain), *Food Chemistry*, 2011, 124(3), 1238-1243].

POSTHARVEST TECHNOLOGIES

NPARR 2(2), 2011-260, A combination of marine yeast and food additive enhances preventive effects on postharvest decay of jujubes (*Zizyphus jujuba*)

The effects of marine yeast *Rhodospiridium paludigenum* in combination with a food additive, carboxymethylcellulose sodium (CMC-Na), on prevention of postharvest decay and food quality of Chinese winter jujubes was investigated. *R. paludigenum* (1×10^8 cells/ml) combined with CMC-Na (0.3%) significantly increased the inhibition of black rot on jujubes at 25 °C when compared with *R. paludigenum*-alone treatment (5.8% vs. 20%, $p < 0.05$). The combination also reduced natural rot from 86% (control) to 56%. The combination caused transient changes in enzyme activities or contents of some oxidation reactive markers such as peroxidase (POD), superoxide dismutase (SOD), and malondialdehyde (MDA) of jujubes. The combination had no significant effect on the food qualities such as colour (chroma and hue angle), total soluble solid (TSS) and titratable acidity (TA) of the fruit. While enhancing these effects, CMC-Na did not affect the survival of *R. paludigenum* in nutrient yeast dextrose agar (NYDA) culture. Thus, it is concluded that the combination of *R. paludigenum* and CMC-Na is a promising formulation to control postharvest decay of Chinese winter jujubes [Yifei Wang, Fei Tang, Jindan Xia, Ting Yu, Jun Wang, Remila Azhati and Xiao Dong Zheng* (College of Biosystems Engineering and Food Science, Zhejiang University, Hangzhou 310029, People's Republic of China), *Food*

Chemistry, 2011, 125(3), 835-840].

NPARR 2(2), 2011-261, Image analysis for detecting insect fragments in semolina

Semolina is used for the manufacture of pasta (long goods and short goods) and couscous and any contrasting colored specks adversely affect the appearance of the finished product. The specks result from wheat bran, diseased wheat, ergot or weed seeds. However, there is also the possibility that insect fragments will appear as specks. Specks are currently mostly determined by a manual process or by a speck counter in milling units. We compared the speck counts from an electronic speck counter (SPX Maztech Micro Vision), acid hydrolysis and flotation (AOAC method 993.26), and near-infrared (NIR) hyperspectral imaging in semolina seeded with insect fragments (50–300 fragments/50 g) of *Tribolium castaneum* (Coleoptera: Tenebrionidae). There was a significant positive correlation between the number of insect fragments added and detected by all three methods. These results underline the importance of controlling insects in flour mills producing semolina, and also in plants producing pasta and couscous, to reduce speck counts in the finished products [K. Bhuvaneswari, Paul. G. Fields*, Noel D.G. White, Ashok K. Sarkar, Chandra. B. Singh and Digvir S. Jayas (195 Dafoe Rd. Cereal Research Centre, Agriculture and Agri-Food Canada, Winnipeg, MB, R3T 2M9, Canada), *Journal of Stored Products Research*, 2011, 47(1), 20-24]

Book Review

Bibliography of Flora and Ethnobiology in West Bengal by Sunit Mitra, Subhajt Bandyopadhyay and Sobhan Kr. Mukherjee, East Himalayan Society for Spermatophyte Taxonomy, Siliguri-734013, West Bengal, India, 2010, Paperbound, Price: Rs. 250, pp. 165.

Any research work possesses three major components, selection of research topic, actual research work with due respect and reference to earlier work done by researchers in the same field and writing of thesis including bibliography consulted. On occasions, it may be of help or it is imperative to consult concept and materials and methods and findings to prove the novelty of the work done by a researcher. It is not worthwhile to mention or to explain the importance of bibliography to the researchers.

It is important to consult bibliography by searching through research journals, abstracting journals and through various search facilities available on internet. Present booklet is a useful addition towards the research work done or to be done especially on ethnobotany of West Bengal and plant science in general.

It is a fact that bibliographic work is never ending and is a continuous process. Authors of this booklet have added more references to former bibliographic accounts published by various authors. It contains more than 1250 entries involving more or less all the related branches of botany like, floristics, vegetation, taxonomy, systematics, morphological, economic botany, palynology, aerobiology, etc. arranged in 3 different chapters for easy consultation. All these references are compiled by perusal of more than hundred journals and proceedings etc. For easy consultation an index of all the names of the authors is given at the end of each chapter.

The specialty of this booklet is that, it is a compilation of references starting from the works of William Jones in 1790 to till date references of up to November 2010. Though this is a bibliography, in its starting 22 pages, it has provided an interesting reading material on West Bengal geography, vegetation, botanical and ethnobotanical history.

Presence of content page, which is missing in this booklet, would have been a handy tool to consult this small handy booklet.

Dr (Mrs.) Sunita Garg
Scientist/Editor
Indian Journal of Natural Products and Resources
(Formerly known as *Natural Product Radiance*)
NISCAIR
New Delhi-110012

Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. National Conference on Recent Trend in Environment and Development (RTED-2011), 6-7 August 2011, Srinagar Garhwal-246174, Uttarakhand, India;
Website: http://www.sedindia.org/index_files/rted.htm.
2. Agritech Asia, 6-8 September 2011, Mumbai, Maharashtra, India;
Website: <http://www2.kenes.com/agritech-asia/Pages/Home.aspx>.
3. 16th World Congress on Clinical Nutrition, 10-13 September 2011, New Delhi, India, Website:
<http://16thwccnindia.com>.
4. 6th International Congress on Cardiovascular Diseases (6th ICCD), 11-13 September 2011 New Delhi, Delhi, India; Website: <http://www.iccsc.org/events.htm>.
5. National Conference on Algae and Algal Products, 22-24 September 2011, Chennai, Tamil Nadu, India; Website: <http://ncaap.webs.com>.
6. International Conference on Tissue Engineering & Regenerative Medicine (ICTERM-2011), 27 September 2011 to 2 October 2011, Rourkela, Orissa, India;
Website: <http://www.nitrkl.ac.in/conference>.
7. Green Conclave, 13-14 October 2011, New Delhi, India; Website: <http://www.greenconclave.in>.
8. National Conference on Recent Advances in Plant Sciences, 15-16 October 2011, Aligarh, Uttar Pradesh, India;
Website:
https://docs.google.com/document/pub?id=1FJJEInqt_gMcnRtoxZnKcSyR4AWfwaYJQ7IInfC4lQ
9. 12th Annual Greentech Environemnt & CSR Conference, 20-21 October 2011, Srinagar, Kashmir, India Website: <http://www.greentech.org/ENVIRONMENTConference2011.html>.
10. International Conference on Bioresources and Human Sustenance, 20-22 October 2011, Guwahati, Assam, India; Website: http://www.zsa.org.in/RCR%20Seminar_final.pdf
11. International Conference on Chemistry of Phytopotentials: Health, Energy and Environmental perspectives (CPHEE 2011), 4-6 November 2011, Agra, Uttar Pradesh, India; Website: <http://www.dei.ac.in/ConferenceWeb/cphee2011/CPHEE/index.html>.
12. International Congress on Life Science, 10-13 November 2011, AMBAJI, Gujarat, India, Website: <http://lsic.blogspot.com/>.
13. World Congress for man and NatureGlobal Climate Change & Biodiversity Conservation ,11-13 November 2011, Haridwar, Utrtrkhand, India; Website: <http://wcmamu.com>.

Announcements

Original research Papers and Reviews on topics dealt within this repository are invited for publication in peer reviewed, quarterly journal (March, June, September and December), *Indian Journal of Natural Products and Resources* (Formerly known as *Natural Product Radiance*). For details visit nopr@niscair.res.in. 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