

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.

The National Institute of Science Communication And Information Resources (NISCAIR), is a constituent establishment of Council of Scientific and Industrial Research (CSIR), New Delhi which houses globally renowned publications such as, The Wealth of India–An Encyclopaedia of Indian Raw Materials, 17 scholarly research journals and 2 abstracting journals, *viz.* Medicinal and Aromatic Plants Abstracts (MAPA) and Indian Science Abstracts (ISA). Since, MAPA and ISA have vast coverage on Medicinal and Aromatic Plants and all science subjects, respectively, we have now decided to extend our services on all plant and animals based natural products in faster mode i.e. electronically. With immense pleasure we announce launching of **Natural Products and Resources Repository (NPARR)** with open access to adequately fulfill the information needs of teachers, scientists, scholars and entrepreneurs for research and commercial products development from natural resources. Another feature of this repository is that authors can be users and contributors to this repository at the same time by sending soft copies of abstracts of their published papers with full citation and address of corresponding authors and information on technologies/know-how developed at their institute/university for placing under respective group of products/technologies. I trust that this collection will also help researchers in searching core and non-core journals on specified products.

I welcome all experienced authors, editors and publishers of national and international journals for their creative cooperation and enthusiastic involvement in this new endeavor. The NPARR allows free access to its contents and hence will enhance citation/visibility of papers/ technological know-how included in this repository. We look forward to provide you a comprehensive collection of quality information on natural products in coming years.

Gangan Prathap

NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

This repository is produced by systematic survey of research and review papers published in primary journals and providing abstracts/summaries and bibliographic details of applied research. It is covering information on all aspects of natural products and resources of plants and animals. The abstracts are presented in various categories viz. Beverages, Cosmetics, Dyes, Essential oils, Fats/Oils, Feed/Fodder, Fibre, Flavour/Fragrance, Food, Fruits, Fuel, Gum/Rubber, Insecticides /Fungicides/Nematicides, Oils/Fats, Poultry, Pulp/Paper, Spices/Condiments, Therapeutics, Vegetables, Wood, etc. Title, journal, author(s), address of corresponding author (Asterisk marked) of the original paper are provided for scientific reference and citation. NPARR inserts new products and technologies developed forthcoming conferences or educational event, book reviews, projects completed and theses awarded.

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NAT PROD RESOUR REPOS, VOL. 3, NO. 1, 2012

For including in respective categories, we would like to ask you to contribute soft copies of: (i) Abstract of your excellent papers published during the last one year or current year in any journal; (ii) New technologies/ Know-how Developed at your Institute or University; (iii) Books for review or book reviews for publication; (iv) Forthcoming events and Theses awarded in recent past. We certainly hope that more ground will be covered in future issues. The librarians are requested to list NPARR among their library's electronic journal holdings. You may send your above contributions to Dr (Mrs) Sunita Garg, on E-mail Id: sunitag@niscair.res.in; nparr@niscair.res.in

NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

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January 2012

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

NPARR 3(1), 2012-01, Wet grinding characteristics of soybean for soymilk extraction

Wet grinding of hydrated soybean was carried out with mixer grinder, stone grinder and colloid mill which revealed that particle size had a profound effect on the protein recovery in the extracted milk with a maximum recovery of 89.3%. Greater reduction in particle size was achieved with mixer grinder (180 μm) with 5 min of grinding while reduction was not significant beyond 18 min (233 μm) in stone grinder. Specific energy consumption in colloid mill was only one-fourth of the mixer grinder while stone grinder required twice the energy. Although Kick's, Rittinger's and Bond's laws could not be applied for total grinding duration, all the three classical laws were found suitable after the initial grain break-up period (2 min). Temperature and duration of thermal treatment given during hot extraction influenced protein recovery and viscosity of soymilk. The results suggest that colloid mill is a potential device for industrial scale operation [K.H. Vishwanathan, Vasudeva Singh, and R. Subramanian* (Department of Food Engineering, Central Food Technological Research Institute, Council of Scientific and Industrial Research, Mysore 57020, India), *Journal of Food Engineering*, 2011, **106**(1), 28-34].

NPARR 3(1), 2012-02, Bioactive chemicals from Carrot (*Daucus carota* Linn.) juice extracts for the treatment of leukemia

Overwhelming evidence indicates that consumption of fruits and vegetables with antioxidant properties correlates with reduced risk for cancers, including leukemia. Carrots contain beneficial agents, such as β -carotene and polyacetylenes, which could be effective in the treatment of leukemia. This study investigated the effect of carrot juice extracts on myeloid and lymphoid leukemia cell lines together with normal hematopoietic stem cells. Leukemia cell lines and nontumor control cells were treated with

carrot juice extracts for up to 72 hours *in vitro*. Induction of apoptosis was investigated by using annexin V/propidium iodide staining followed by flow cytometric analysis, and results were confirmed by using 4'-6-diamidino-2-phenylindole morphology. Effects on cellular proliferation were investigated via cell cycle analysis and cell counts. Treatment of leukemia cell lines with carrot juice extract induced apoptosis and inhibited progression through the cell cycle. Lymphoid cell lines were affected to a greater extent than were myeloid cell lines, and normal hematopoietic stem cells were less sensitive than most cell lines. This study has shown that extracts from carrots can induce apoptosis and cause cell cycle arrest in leukemia cell lines. The findings suggest that carrots may be an excellent source of bioactive chemicals for the treatment of leukemia [Rana Zaini, Malcolm R. Clench, and Christine L. Le Maitre* (Sheffield Hallam University, Faculty of Health and Wellbeing, City Campus, Howard Street, Sheffield, S1 1WB, United Kingdom), *Journal of Medicinal Food*, 2011, **14**(11), 1303-1312].

NPARR 3(1), 2012-03, One hundred percent orange juice consumption is associated with better diet quality, improved nutrient adequacy, and no increased risk for overweight/obesity in children

The purpose of this study was to examine the association of 100% orange juice (OJ) consumption by children 2 to 18 years of age ($n = 7250$) participating in the 2003 to 2006 National Health and Nutrition Examination Survey with intakes of select nutrients, MyPyramid food groups, diet quality—measured by the Healthy Eating Index–2005, weight status, and associated risk factors. The National Cancer Institute method was used to estimate the usual intake of 100% OJ consumption, selected nutrients, and MyPyramid food groups. Percentages of the population below the Estimated Average Requirement were determined. Covariate adjusted logistic regression was used to determine if consumers had a lower odds ratio of being overweight or obese. Usual per capita intake of 100% OJ was 1.7 oz/d. Among consumers, the usual intake of 100% OJ for children ($n = 2183$; 26.2% of population) was 10.2

oz/d. Consumers had higher ($P < .05$) energy intakes than nonconsumers (9148 ± 113 vs 8625 ± 473 kJ). However, there were no differences in weight or body mass index in consumers and nonconsumers, and there was no significant difference in the risk of being overweight or obese between consumers and nonconsumers (odds ratio, 0.86; 95% confidence interval, 0.70-1.05). Compared with nonconsumers, consumers had a higher ($P < .01$) percentage ($\% \pm$ SE) of the population meeting the Estimated Average Requirement for vitamin A (19.6 ± 2.0 vs 30.2 ± 1.4), vitamin C (0.0 ± 0.0 vs 29.2 ± 1.2), folate (1.3 ± 0.3

vs 5.1 ± 0.6), and magnesium (25.5 ± 2.0 vs 39.0 ± 11). The Healthy Eating Index–2005 was significantly ($P < .01$) higher in consumers (52.4 ± 0.4 vs 48.5 ± 0.3). Consumers also had higher intakes of total fruit, fruit juice, and whole fruit. Moderate consumption of 100% OJ should be encouraged in children as a component of a healthy diet [Carol E. O'Neil*, Theresa A. Nicklas, Gail C. Rampersaud, Victor L. Fulgoni III (Class of 1941 Alumni Professor, Louisiana State University Agricultural Center, Baton Rouge, Louisiana 70803, USA), *Nutrition Research*, 2011, **31**(9), 673-682].

COSMECEUTICALS

NPARR 3(1), 2012-01, Formulation and comparative evaluation of poly herbal anti-acne face wash gels

Rauvolfia serpentina (L). Benth. ex Kurz. (Apocynaceae) possessing antibacterial properties are widely used in modern herbal medicines. *Curcuma longa* L. (Zingiberaceae), a readily available antiseptic, possess antioxidant, antibacterial, blood purifying and antiinflammatory properties and used in various skin creams. *Azadirachta indica* A. Juss. (Meliaceae) possess astringent, antiviral, discutient, stimulant and antibacterial properties and works excellently well against acne and keeps the skin healthy.

Acne is the common skin problem that 85% of the teenagers face today. In this study, poly herbal anti-acne face wash gels were prepared using two polymers Carbopol and hydroxy propyl methyl cellulose (HPMC) along with the extracts of plants *R. serpentina*, *C. longa*, and *A. indica*. The gel formulations were prepared in four different concentrations of 50, 100, 200 mg/ml as Gel-CRB 100, Gel-HPMC 50, Gel-HPMC 100, Gel-HPMC 200, respectively. The formulations were tested for the anti-acne activity by turbidimetric method. Results showed that the gels were non-irritant, stable and possess anti-acne activity. The efficacy when tested with a standard was almost same to that of Clindamycin gel. From this study, Gel-HPMC 100 was proved to be stable and considered as an effective herbal formulation for acne treatment [Arun Rasheed*, G. Avinash Kumar Reddy, S. Mohanalakshmi, C.K. Ashok Kumar (Department of Pharmaceutical Chemistry, Sree Vidyanikethan College of Pharmacy, A. Rangampet, Tirupati, Andhra Pradesh, India), *Pharmaceutical Biology*, 2011, **49**(8), 771-774].

NPARR 3(1), 2012-05, Evaluation of the efficacy of a topical cosmetic slimming product combining tetrahydroxypropyl ethylenediamine, caffeine, carnitine, forskolin and retinol, in vitro, ex vivo and in vivo studies

Three studies were performed to investigate the mechanism of action and evaluate the efficacy of a topical cosmetic slimming product combining tetrahydroxypropyl ethylenediamine, caffeine, carnitine, forskolin and retinol. The *Ex vivo* study on skin explants showed that caffeine and forskolin both stimulated

glycerol release and demonstrates for the first time that retinol and carnitine in combination synergistically stimulated keratinocyte proliferation, which leads to an increase epidermal thickness. The double-blind, randomized, placebo-controlled clinical study associating circumference measurements on five selected parts of the body, cutaneous hydration measurements as well as blinded expert grading of skin aspect was conducted on 78 women who applied the product or placebo twice daily for 12 consecutive weeks. After 4 weeks of twice-daily application of the product, significant reductions in circumference of abdomen, hips–buttocks and waist were already observed. Improvements concerned all the measured body parts after 12 weeks. Orange peel and stubborn cellulite decreased significantly from 4 weeks of treatment and tonicity improved from 8 weeks, demonstrating that the product improved skin aspect. At the end of the study, eight parameters of the thirteen evaluated were significantly improved in the active group and compared with placebo [Roure, R.*, Oddos, T., Rossi, A., Vial, F. and Bertin, C. ([Johnson & Johnson Consumer France, 1 rue Camille Desmoulins, 92787 Issy-Les-Moulineaux France), *International Journal of Cosmetic Science*, 2011, **33**(6), 519-526].

NPARR 3(1), 2012-06, A tomato stem cell extract, containing antioxidant compounds and metal chelating factors, protects skin cells from heavy metal-induced damages

Heavy metals can cause several genotoxic effects on cells, including oxidative stress, DNA sequence breakage and protein modification. Among the body organs, skin is certainly the most exposed to heavy metal stress and thus the most damaged by the toxic effects that these chemicals cause. Moreover, heavy metals, in particular nickel, can induce the over-expression of collagenases (enzymes responsible for collagen degradation), leading to weakening of the skin extracellular matrix. Plants have evolved sophisticated mechanisms to protect their cells from heavy metal toxicity, including the synthesis of metal chelating proteins and peptides, such as metallothioneins and phytochelatin (PC), which capture the metals and prevent the damages on the cellular structures. To protect human skin cells from heavy metal toxicity, we developed a new cosmetic active ingredient from *Lycopersicon esculentum* (tomato) cultured stem cells. This product, besides its high content of antioxidant

compounds, contained PC, effective in the protection of skin cells towards heavy metal toxicity. We have demonstrated that this new product preserves nuclear DNA integrity from heavy metal damages, by inducing genes responsible for DNA repair and protection, and neutralizes the effect of heavy metals on collagen degradation, by inhibiting collagenase expression and inducing the synthesis of new collagen [Tito, A., Carola, A., Bimonte, M., Barbulova, A., Arciello, S., de Laurentiis, F., Monoli, I., Hill, J., Gibertoni, S., Colucci, G. and Apone, F.* (Fabio Apone, Arterra Bioscience srl, via B. Brin 69, Napoli, Italy), *International Journal of Cosmetic Science*, 2011, **33**, 543-552].

NPARR 3(1), 2012-07, Lifting properties of the alkamide fraction from the fruit husks of *Zanthoxylum bungeanum*

The fruits of various *Zanthoxylum* species are used as a spice in the Chinese and Japanese cuisine because of their delicate flavour and tingling properties. The lipophilic hydroxyalkamides hydroxy α - and β -sanshools (1a, b) have been identified as the tingling principles of these plants, and previous studies have validated a sanshool-rich lipophilic extract from the fruit husks of *Z. bungeanum* Maxim. (Zanthalene[®]) as an anti-itching cosmetic ingredient. Because tingling is a sort of 'paralytic pungency' and Zanthalene[®] potentially inhibits synaptic transmission, we have investigated its capacity to relax subcutaneous muscles and act as a topical lifting agent for wrinkles. An anti-wrinkles extract rich in spilanthol (2), a lipophilic alkamide having sensory properties similar to those of Zanthalene[®], was used as a reference. Short-term (lifting effect) and long-term (anti-wrinkle) improvements of skin roughness parameters were evaluated by both objectives and subjective measurements. An immediate 'lifting' effect was observed with the sanshool-rich lipophilic extract, at dosages at which the reference alkamide extract was inactive in the objective assays. Limited desensitization after repeated application and good overall tolerability were observed, although a modest long-term anti-wrinkle effect was shown by both products. Taken together, these observations validate the use of sanshool-rich lipophilic extracts as an efficacious, immediate-action lifting agent, and exemplify the

relevance of sensory observations to foster the development of innovative cosmetic ingredients [C. Artaria*, G. Maramaldi, A. Bonfigli, L. Rigano and G. Appendino (Indena S.P.A., Viale Ortles, 12, 20139 Milan, Italy), *International Journal of Cosmetic Science*, 2011, **33**(4), 328-333].

NPARR 3(1), 2012-08, Standardized extract of *Syzygium aqueum*: a safe cosmetic ingredient

Syzygium aqueum, a species in the Myrtaceae family, commonly called the water jambu is native to Malaysia and Indonesia. It is well documented as a medicinal plant, and various parts of the tree have been used in traditional medicine, for instance as an antibiotic. In this study, we show *S. aqueum* leaf extracts to have a significant composition of phenolic compounds, protective activity against free radicals as well as low pro-oxidant capability. Its ethanolic extract, in particular, is characterized by its excellent radical scavenging activity of EC₅₀ of 133 $\mu\text{g mL}^{-1}$ 1,1-diphenyl-2-picrylhydrazyl (DPPH), 65 $\mu\text{g mL}^{-1}$ 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid) (ABTS) and 71 $\mu\text{g mL}^{-1}$ (Galvinoxyl), low pro-oxidant capabilities and a phenolic content of 585–670 mg GAE g⁻¹ extract. The extract also displayed other activities, deeming it an ideal cosmetic ingredient. A substantial tyrosinase inhibition activity with an IC₅₀ of about 60 $\mu\text{g mL}^{-1}$ was observed. In addition, the extract was also found to have anti-cellulite activity tested for its ability to cause 98% activation of lipolysis of adipocytes (fat cells) at a concentration of 25 $\mu\text{g mL}^{-1}$. In addition, the extract was not cytotoxic to Vero cell lines up to a concentration of 600 $\mu\text{g mL}^{-1}$. Although various parts of this plant have been used in traditional medicine, this is the first time it has been shown to have cosmeceutical properties. Therefore, the use of this extract, alone or in combination with other active principles, is of Importance [U. D. Palanisamy*, L. T. Ling, T. Manaharan, V. Sivapalan, T. Subramaniam, M. H. Helme and T. Masilamani (Jeffrey Cheah School of Medicine and Health Sciences, Monash University Sunway Campus, Jalan Lagoon Selatan, 46100 Bandar Sunway, Malaysia), *International Journal of Cosmetic Science*, 2011, **33**(3), 269-275].

DYES (incl. Food colorants)

NPARR 3(1), 2012-09, Extraction of antioxidant pigments from dye sorghum leaf sheaths

Extraction of antioxidant biocolorant pigments from leaf sheaths of dye sorghum was optimized. Effects of temperature and ethanol concentration of the extraction solvent on the concentrations of the 3-deoxyanthocyanidins, total phenolics and total anthocyanins, and the colour parameters of the biocolorant extract were evaluated using the response surface methodology. Extraction parameters affected the extraction rate of the biocolorant pigments and the colour characteristics of the extract. Maximum pigment yields were obtained at 50°C and an ethanol concentration of the solvent of 51 mL 100 mL₋₁. Addition of HCl (1 mL 100 mL₋₁) to the solvent significantly improved the extractability of the biocolorant pigments. The crude extract from the leaf sheaths showed high antioxidant capacity with a total antioxidant capacity of 1026 mg of Trolox equivalent (TE) g₋₁ of DM [A.P.P. Kayodé*, C.A. Bara, G. Dalodé-Vieira, A.R. Linnemann, M.J.R. Nout (Département de Nutrition et Sciences Alimentaires, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, 01 BP 526 Cotonou, Benin), *LWT-Food Science and Technology*, 2012, **46**(1), 49-55].

NPARR 3(1), 2012-010, Extracting natural dyes from wool—an evaluation of extraction methods

The efficiency of eight different procedures used for the extraction of natural dyes was evaluated using contemporary wool samples dyed with cochineal, madder, woad, weld, brazilwood and logwood. Comparison was made based on the LC-DAD peak areas of the natural dye's main components which had been extracted from the wool samples. Among the tested methods, an extraction procedure with Na₂EDTA in water/DMF (1:1, v/v) proved to be the most suitable for the extraction of the studied dyes, which presented a wide range of chemical structures. The identification of the natural dyes used in the making of an eighteenth century Arraiolos carpet was possible using the Na₂EDTA/DMF extraction of the wool embroidery samples and an LC-DAD-MS methodology. The effectiveness of the Na₂EDTA/DMF extraction method was particularly

observed in the extraction of weld dye components. Nine flavone derivatives previously identified in weld extracts could be identified in a single historical sample, confirming the use of this natural dye in the making of Arraiolos carpets. Indigo and brazilwood were also identified in the samples, and despite the fact that these natural dyes were referred in the historical recipes of Arraiolos dyeing, it is the first time that the use of brazilwood is confirmed. Mordant analysis by ICP-MS identified the widespread use of alum in the dyeing process, but in some samples with darker hues, high amounts of iron were found instead [Ana Manhita, Teresa Ferreira, António Candeias and Cristina Barrocas Dias*(Chemistry Department and Évora Chemistry Centre, University of Évora, Rua Romão Ramalho 59, 7000-671, Évora, Portugal), *Analytical and Bioanalytical Chemistry*, 2011, **400**(5), 1501-1514].

NPARR 3(1), 2012-011, Reusing wastewater of madder natural dye for wool dyeing

Natural dye is environment-friendly which is usually extracted from vegetative material. In this work, the wastewater of madder dyebath is reused for wool dyeing. Initially, the madder absorption behavior on wool fiber is determined by new methods based on spectroscopic information of dye solution. The absorbance spectra change is explained in terms of absorbability of chemical components of madder on wool by using several techniques such as principal component analysis, colorimetry, statistical and derivative spectroscopy techniques. The obtained results indicate that the chemical components of the initial dye solution are different from those remaining in the exhausted dye solution. In reusing wastewater of wool dyeing with madder, the exhausted dyebath is reconstructed by adding madder and water. The analyzing color parameter and fastness properties of samples indicate that the quality of samples dyed in reconstructed dyebath is the same as initial wool dyeing. The economic analysis shows that the reusing wastewater caused 19.91% cost saving in wool dyeing with madder [Ali Shams-Nateri (Textile Engineering Department, University of Guilan, P.O. Box: 41635-3756, Rasht, Iran), *Journal of Cleaner Production*, 2011, **19**, 775-781].

NPARR 3(1), 2012-012, UV protection properties of silk fabric dyed with eucalyptus leaf extract

A natural dye extracted from eucalyptus leaves was applied to a silk fabric using two padding techniques, namely the pad - batch and pad - dry techniques, under different conditions. It was observed that with an increase in the dye concentration, the ultraviolet (UV) protection factor (UPF) values ranged between good and excellent for the silk fabric. In addition, a darker colour, such as that provided by a FeSO₄ mordant, gave better protection because of higher UV absorption. A silk fabric dyed in a solution containing the eucalyptus leaf extract showed a shade of pale yellowish - brown. The exception was when the fabric was dyed with the FeSO₄ mordant, resulting in a shade of dark greyish - brown. The colour fastness to washing and rubbing of the silk fabrics treated with the mordant after dyeing was investigated and the results showed good fastness, whereas colour fastness to light was at a fair level. The results confirmed that natural dyes from eucalyptus leaf extract with metal mordants have potential applications in fabric dyeing and in producing UV - protective silk fabrics. Journal of the Textile Institute [Rattanaphol Mongkhorrattanasit*, Jiří Kryštůfek Jakub Wiener and Martina Viková (Department of Textile Chemistry, Faculty of Textile Engineering, Technical University of Liberec, Liberec, Czech Republic), 2011, **102** (3), 272-279].

NPARR 3(1), 2012-013, Indigenous plants in Uganda as potential sources of textile dyes

Natural dyes derived from plant-based materials have proved to be important alternatives to the use of synthetic dyes in the textile industry. A large plant resource base for natural dyes exists in Uganda but remains in the wild and largely unexploited. Forty (40) plant species with potential to produce natural dye compounds for textile applications belonging to twenty two (22) families were identified in this study. *Harungana madagascariensis*, *Bixa orellana* Linn, *Syzygium cordatum*, *Indigofera arrecta*, *Curcuma longa* Linn, *Albizia coriaria* and *Justicia betonica* were the most common plants identified having the ability to dye local vegetable and craft materials and for other decoration purposes while *Lawsonia inermis* Linn, *Vitex doniana*, *Indigofera arrecta* and *Morinda lucida* were the least known plants as potential source of dye. Mimosaceae was widespread in several communities with seven species, followed by Myrtaceae and Caesalpianaceae, each with four species and Rubiaceae, Bignoniaceae, Moraceae, Guttiferae, Anarcardiaceae and Papilionaceae, each with two species. The thirteen families remaining each had one species. From the results, some of the plants studied are promising dye-yielding plants and could be exploited as sources of textile dyes and important economic plants. The paper provides information on the botanical names of forty potential dye-yielding plant species, their families, local names, vegetation (growth form), habitat, plant parts used and colour produced on 100% cotton fabrics [P. A. G. Wanyama*, B. T. Kiremire, P. Ogwok and J. S. Murumu, (Department of Chemistry, Kyambogo University, P. O. Box 1, Kampala, Uganda), *African Journal of Plant Science*, 2011, **5**(1), 28-39].

ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 3(1), 2012-014, Identification of key aroma compounds from bitter orange (*Citrus aurantium* L.) products: essential oil and macerate–distillate extract

The volatile compounds of bitter orange (*Citrus aurantium* L.) products, essential oil (EO) and the heart cut (HC) of the distillate were detected and quantified using gas chromatography (GC) coupled with a mass spectrometer and flame ionization detector. The flavour compounds were characterized using GC–olfactometry by nine trained panellists by the frequency of detection method. In total, 53 molecules were detected in the EO and 40 in the HC. The EO was characterized by 19 major odour compounds (frequency of detection from 6/9 to 9/9) with different aromatic notes among which α -pinene (floral), octanal (green), limonene (citrus), linalool (floral), α -terpineol (indeterminate: ‘ND’, green), linalyl acetate (floral), (*E,E*) or (*E,Z*)-2,4-decadienal (frying), dodecanal (ND), caryophyllene (green) and an unknown compound ($I^T \square = \square 1678$, plastic note). The HC presented a complex mixture of several molecules in low concentrations, which characterize the bitter orange flavour. The HC was characterized by seven high FD odour compounds, three of them (myrcene, α -phellandrene, and limonene) with citrus and mint aromatic notes, and the other four ((*Z*)-linalool oxide, α -terpinolene, linalool and neral) with floral notes. The comparison of these two products brought to light that the overall process of maceration/distillation could induce the loss of 15 strong odours previously found in simple essential oil and characterized by plastic and metal notes. These results show that macerating–distilling bitter orange peels and EO makes it possible to select the most pleasant odour compounds while eliminating some off-odours present in the EO. This is the first time that the characterization of odour-active compounds has been carried out on bitter orange products. This valuable information could help for further investigation on process/product optimization [Sophie Deterre, Barbara Rega, Julien Delarue, Martine Decloux, Marc Lebrun, Pierre Giampaoli* (Pierre Giampaoli, AgroParisTech, UMR1145 Ingénierie Procédés Aliments, 1 av. des Olympiades, F-91300

Massy, France), *Flavour and Fragrance Journal*, 2012, **27**(1), 77-88].

NPARR 3(1), 2012-015, Antipathogenic activities and chemical composition of *Cinnamomum osmophloeum* and *Cinnamomum zeylanicum* leaf essential oils

In this study, inhibitory activities of leaf essential oils from *Cinnamomum osmophloeum* and *Cinnamomum zeylanicum* and their major constituents (*trans*-cinnamaldehyde and eugenol) against *Rhizoctonia solani* were investigated. Furthermore, the relationship between the antipathogenic activity and the chemical structure of *trans*-cinnamaldehyde and eugenol is discussed. Results demonstrated that leaf essential oils and their major constituents from *C. osmophloeum* and *C. zeylanicum* had strong antipathogenic activities against *R. solani*. Results obtained from the chemical structure–antipathogenic activity relationship study suggested that *trans*-cinnamaldehyde or (*E*)-cinnamic acid with an aldehyde (\square CHO) or an acid (\square COOH) group, a conjugated double bond, and a Length of CH chain outside the ring affect their antipathogenic activity. Furthermore, the presence of the methyl moiety in the *ortho* position may have a considerable influence on the inhibitory action against *R. solani*. In addition, compounds with a free phenolic hydroxyl (\square OH) group and a double bond at the C7 position of the phenylpropenes also exhibited potent antipathogenic activity [Sen-Sung Cheng^a, Min-Jay Chung^a, Ying-Ju Chen^b and Shang-Tzen Chang* (School of Forestry and Resource Conservation, National Taiwan University, Taipei, Taiwan), *Journal of Wood Chemistry and Technology*, 2011, **31**(1), 73-84].

NPARR 3(1), 2012-016, Studies on the components of essential oil of *Zanthoxylum armatum* by GC-MS

The essential oil of *Zanthoxylum armatum* was extracted through hydro distillation and analyzed by GC-MS. Hydrocarbon fraction (17.35%) of the oil was much lower and oxygenated compounds comprised fairly high portion of essential oil (39.21%). Percentages of monoterpenes and sesquiterpenes found were 47.33% and 10.83% respectively. Oxygenated monoterpenes comprised major profile of chromatogram of essential oil of *Zanthoxylum armatum* i.e. 37.23% where as

monoterpene hydrocarbons were 10.09%. Alcoholic percentage was much higher *i.e.* 26.76% and 15-hexadecanoloide (6.58%) the only cyclic ester was found in relatively high percentage [Amran Waheed*, Shahid Mahmud, Mubeen Akhtar, Tanzeela Nazir (Applied Chemistry Research Centre PCSIR Laboratories Complex, Lahore, Pakistan), *American Journal of Analytical Chemistry*, 2011, **2**, 258-261].

NPARR 3(1), 2012-017, Chemical diversity in curry leaf (*Murraya koenigii*) essentialoils

Wild and cultivated *Murraya koenigii* leaf essentialoils collected from ten Indian locations were investigated for their chemical diversity. The essentialoil yields ranged from 1.2-2.5ml/kg biomass. GC and GC-MS analyses revealed ninety compounds, constituting 93.8-99.9% of the essentialoils. The highest concentrations of α -pinene (55.7%) and β -

pinene (10.6%) were found in the essentialoil of wild plants. α -Pinene (13.5-35.7%) and/or β -phellandrene (14.7-50.2%) were the dominant essentialoil constituents of seven locations. (E)-Caryophyllene (26.5%, 31.5%) and α -selinene (9.5%, 10.4%) were the principal essentialoil components of two locations. The odour profiles of the essentialoils were distinctly different. Tetradecanoic acid, hexadecanoic acid, piperitone, cada-1,4-diene, 1,10-di-epi-cubenol, γ -eudesmol, α -muurolol, (Z,E)-farnesol and (Z, Z)-farnesol are identified for the first time in curry leaf essentialoil. The chemical diversity of the oils offers opportunity to flavourists to choose curry leaves and essentialoils with preferential flavour composition [B.R. Rajeswara Rao*, D.K. Rajput, G.R. Mallavarapu (Central Institute of Medicinal and Aromatic Plants (CIMAP) Research Centre, Boduppal, Uppal Post, Hyderabad 500 039, India), *Food Chemistry*, 2011, **126**(3), 989-994].

FEED/FODDER

NPARR 3(1), 2012-018, Effects of harvest date, wilting and inoculation on yield and forage quality of ensiling safflower (*Carthamus tinctorius* L.) biomass

Safflower (*Carthamus tinctorius* L.), usually grown as a source of oil crop, can be used as fodder either for hay or ensiling purposes, particularly in semi-arid regions. A 2-year trial was conducted in southern Italy to evaluate the production and forage quality of safflower biomass cv. Centennial, harvested at three different stages: 1, at complete appearance of primary buds (PB); 2, at complete appearance of secondary and tertiary buds (STB); and 3, at 25% of flowering stage (FS). For each stage of growth, 50% of the biomass was ensiled in 4 L glass jars without and with inoculation (*Lactobacillus plantarum*, LAB), and the other 50% was field wilted for 24 h before ensiling. Dry matter (DM) content and yield (DMY), pH, buffering capacity (BC) and water soluble carbohydrates (WSC) were determined on fresh forage. On safflower silages were also evaluated ammonia-N, crude protein (CP), fibre fractions, fat, lactic and acetic acids, Ca and P, and gas losses. DMY ranged from 4.5 t ha⁻¹ (PB harvesting) to 11.6 t ha⁻¹ (FS harvesting). DM content varied from 129 g kg⁻¹ (PB not wilted) to 630 g kg⁻¹ (FS wilted). The WSC in forage before ensiling with not wilting ranged from 128 (PB stage) to 105 and 100 g kg⁻¹ DM at STB and FS stages, respectively. The wilted safflower forage showed a lower WSC compared to wilted forage. The high sugar substrate allowed lactic acid fermentation and a good conservation quality in all the harvesting stages. Silages quality was strongly influenced by the treatment performed. Wilting practice increased DM, pH and NDF contents but reduced lactic acid, acetic acid and NH₃-N values. Inoculation reduced DM, pH and NDF contents, but increased lactic and acetic acids, CP and ash. As result, wilting the forage for 1 day was very effective in the early harvesting stage because this practice significantly increased DM, reducing on the same time the intensive fermentation and proteolysis processes of silage. When harvesting is performed at the beginning of the flowering stage wilting is not necessary [Eugenio Cazzato, Vito Laudadio, Antonio Corleto and Vincenzo Tufarelli* (Vincenzo Tufarelli,

Department of Animal Production, University of Study of Bari, Strada Prov. le per Casamassima, km 3, 70010 Valenzano, Ba, Italy.), *Journal of the Science of Food and Agriculture*, 2011, **91**(12), 2298-2302].

NPARR 3(1), 2012-019, The estimation of the chemical composition of silages from potatoes steamed with addition of whole and kibbled bitter lupin seeds.

For a long time potatoes were a basic constituent in swine fattening. The changes in market expectations caused changes in the animal production and domination of swine races with high meat yield. This caused marginalization of the potato-fattening. However for native races of swine with lower meat yield and weight gain applying in the fattening the appropriate amount of potatoes has a positive effect on a quality of the meat. Growing interest with the traditional fattening of pigs from the side of breeders induces the prospectings of new solutions in applying and the preservation of potatoes as fodder. During fattening swine with raw potatoes one observes frequent poisonings likewise they are poorly digested. Freshly steamed potatoes are the best form of applying as fodder. Ensiling of steamed potatoes is an alternative. The silaging of potatoes improves the tastiness and the bio-availability of nutrients. Moreover steamed and silaged potatoes enable supplying sufficient amount of fodder to pigs during all the year at slight losses in the storage. Labour incurred for preparing such fodder is smaller than in case of every steaming. In a dry mass of potato tubers of starch varieties starch constitutes from 70 to 75% depending on the variety. Crude protein constitutes 9% and a half of it is the true protein. Such content causes, that silaging of potatoes is a very effective method of preservation for the long period of time. The potatoes silage has a low nutritional value because of the low protein content. It is recommended to make combined silages, with the addition of green fodder from papilionaceae plants. Bitter lupin seeds can be also an addition enriching potato silages with protein. The high alkaloids content in seeds and their inattractive taste makes possible the cultivation of bitter lupin in the areas with high intensity of wild animals damages. The main purpose of this work was determination of possibility of potatoes silaging with the addition of bitter lupin (*Lupinus angustifolius* cv. Mirela) seeds with 2, 85% alkaloid content in the

destination of increasing the protein content. Obtained silage of steamed potatoes with 15% addition of the lupin seeds had the higher crude protein content (3,56%) than the control silage (2,54%). Similarly silages with 7.5% and the 15% addition of kibbled seeds had the higher crude protein content (respectively 3, 57 i 5,06%) than the control silage. However kibbled bitter lupin seeds addition negatively affected on the potato silage, since a content of the butyric acid increased in compare with control silage and silage with the addition of unkibbled lupin seeds [Gulewicz, P.; Mikołajczak, J.; Górski, A.; Nyske, P.; Gulewicz, K., *Biologia i Hodowla Zwierząt*, 2011, **62**(580), 177-188].

NPARR 3(1), 2012-020, The cactus effect: an alternative to the lupin effect for increasing ovulation rate in sheep reared in semi-arid regions?

The present study evaluated the effects of supplementation with cactus cladodes on follicular dynamics and ovulatory response of sheep reared in semi-arid areas. A total of 76 ewes were distributed into two equal groups supplemented with either concentrated feed or cactus cladodes. After 30 days of supplementation, no differences were found between feeding regimens on the final live weight (LW; $41.5 \pm$

0.6 and 42.1 ± 0.7 kg in the Concentrate and Cactus groups respectively) and body condition score (BCS; 1.8 ± 0.3 and 1.8 ± 0.4 for Concentrate and Cactus group respectively). Moreover, no differences were found between the initial and the final values of both LW and BCS; thus, there were no effects of supplementation on any of both parameters. Analysis of follicular population showed that, during the follicular phase induced by ram effect, the number of follicles reaching ovulatory size increased in both groups. However, the number was always higher in Cactus ewes and, at oestrus, Cactus ewes had 1.6 ± 0.2 and Concentrate sheep had 1.2 ± 0.2 large follicles ($p < 0.05$). Thereafter, ovulation rate was affected by duration of supplementation; being higher in sheep fed with cactus for 6-10 days (1.7 ± 0.1) than in ewes supplied with cactus for more than 11 days (1.3 ± 0.1 ; $p < 0.05$), in sheep fed with concentrate for 6-10 days (1.2 ± 0.1 ; $p < 0.01$) and even than in individuals subjected to classical flushing with concentrate (1.3 ± 0.1 ; $p < 0.05$) [M. Rekik, A. Gonzalez-Bulnes, N. Lassoued, H. Ben Salem, A. Tounsi, I. Ben Salem* and A. Gonzalez-Bulnes (Departamento de Reproduccion Animal, INIA, Avda, Puerta de Hierro s/n. 28040, Madrid, Spain), *Journal of Animal Physiology and Animal Nutrition*, 2012, **96** (2), 242-249].

FIBRES (incl. Textile and other utility fibres)

NPARR 3(1), 2012-021, Could oleaginous flax fibers be used as reinforcement for polymers?

Many works deal with the mechanical properties of flax fibers cultivated for textile applications and today used for the reinforcement of polymers. Nevertheless, quantities of oleaginous flax fiber are obtained each year and not promoted. The aim of this work is to study the mechanical properties of single linseed flax fiber as a function of variety, culture year, dew-retting degree and agronomic factors. Five varieties of oleaginous flax have been characterized by tensile tests on elementary fibers and compared to four varieties of textile flax. These tensile experiments have been carried out on with the same equipment, experimental protocol and environmental conditions.

The results show that interesting mechanical properties were obtained with the oleaginous variety and are close of those of textile varieties, such as Agatha or Electra. Considering the diameters and specific properties of these oleaginous fibers, we evidenced that they are good candidates for the substitution of glass fibers in composite materials. To increase the development of flax fibers, it is important to have a better control of the spread of their mechanical properties. This point could be observed with the Everest variety cultivated for 4 years and no conclusion could be made. It has been observed that the retting degree has no influence on the diameters and mechanical properties of the fibers; the same conclusion is obtained with agronomic factors such as seeding rate and plant height [Isabelle Pillin*, Antoine Kervoelena, Alain Bourmauda, Jérémy Goimardb, Nicolas Montrelaya and Christophe Baleya (Université de Bretagne Sud, Laboratoire d'Ingénierie des MATériaux de Bretagne, Rue de St Maudé, BP 92116, 56321 Lorient Cedex, France), *Industrial Crops and Products*, 2011, **34** 1556-1563].

NPARR 3(1), 2012-022, Comparative study of pulping of banana stem

Banana stem has no use after harvesting the fruit, which is used for manufacturing of pulp for the

production of fiber, film and paper. Pulping is done to liberate the fibers from lignin and hemicelluloses, which can be accomplished chemically or mechanically or by combining these two type of treatment. Chemical pulping is characterized by the use of chemicals to separate the lignin fraction of lignocelluloses materials from the cellulose. Chemical separation results in little or no effect on the fiber length. Kappa number, yield, viscosity limit index (cm³/gm) is used to describe the extent of lignin removal in the cooking process. There are five pulping techniques, namely kraft process, sulphite process, soda process, formic acid /acetic acid solvent and Urea/NaOH solvent system were studied [Manish Kumar* and Deepak Kumar (Department of Textile Chemistry D.K.T.E. Society"s Textile & Engineering Institute "Rajwada", Ichalkaranji, Dist-Kolhapur), *International Journal of Fiber and Textile Research*, 2011, **1**(1), 1-5].

NPARR 3(1), 2012-023, Mechanical properties of randomly oriented short *Sansevieria trifasciata* fibre/epoxy composites

The tensile, flexural and impact properties of randomly oriented short *Sansevieria trifasciata* fiber/epoxy (STFE) composites were evaluated. Composites were fabricated using raw *Sansevieria trifasciata* fiber (STFs) with varying lengths (mm) and weight (%) percents of fibers viz. 10(30), 20(35), 30(40) and 40 (45). When the length of the STFs was increased, the tensile, flexural and impact strength properties of the composites were increased up to a 30mm fiber length, and then curtailment of properties occurred when fiber length was further increased. All the fibers were treated with alkali solution and yet composites were prepared by hand lay-up method. STFE composites showed a regular trend of an increase in properties with fiber weight percent until 40% and afterwards a decrease in properties of composites with greater fiber weight percent. Tensile tests revealed that the tensile strength was about 75.22 MPa, the Young's modulus was 1.05 GPa and the elongation at the break was 10.07%. The flexural strength and modulus were estimated around 82.33MPa, 3GPa, respectively. Impact tests exhibited strength of approximately 8.97J/cm². The analysis of the tensile, flexural and impact properties of short STFE composites displayed a critical fiber length and

optimum fiber weight percent of 30mm and 40%, respectively. Scanning electron microscope (SEM) studies were carried out to evaluate the fiber/matrix interactions when fiber weight increased. FTIR studies indicated functional groups could engage in the covalent and hydrogen bonds formation. Chemical resistances of the STFE composites were significantly improved for all chemical except for Toluene. These results indicate that high performance all natural products composite materials can be developed from the resources that are readily available locally [M. Ashok Kumar*, G. Ramachandra Reddy, G. Harinatha Reddy, K. V. P. Chakradhar, Bh. Nanjunda Reddy and N. Subbarami Reddy (Saint Mark Group of Institutions, Department of Mechanical Engineering Rachanapalli, Ballary Road, Anantapur, Andhra Pradesh, India), *International Journal of Fiber and Textile Research*, 2011, **1**(1), 6-10].

NPARR 3(1), 2012-024, Fabrication and performance of natural fibers: *Sansevieria cylindrica*, waste silk, jute and drumstick vegetable fibres (*Moringa Oleifera*) reinforced with rubber/polyester composites

Aim of this work was to investigate the tensile, flexural and dielectric properties of composites made by reinforcing *Sansevieria cylindrica* as a new natural fibre into a rubber based polyester matrix. The fibres extracted by retting and manual processes were used to fabricate the composites. These composites were tested for the properties which mentioned above and compared with those of established composites like waste silk, drumstick vegetable fiber and jute made under the ASTM conditions. The composites were fabricated up to a maximum volume fraction of fibre of 0.35 for impact testing, tensile, flexural and dielectric testing. It was observed that the tensile properties were increased with respect to volume fraction of fibre for *Sansevieria cylindrica* fibre composite and are also more than those of silk and drumstick composites and comparable to those of jute composites. The flexural strength of *Sansevieria cylindrica* fibre composite is more than that of waste silk composite and is closer to drumstick fibre composite with respect to the volume fraction of fibre, where as the flexural modulus is much higher than

those of jute, drumstick vegetable fibre composites and also very much closer to silk fibre composites. The dielectric strength of *Sansevieria cylindrica* fibre composite was increased with increase in volume fraction of fibre in the composite unlike the case of waste silk, jute and drumstick tree vegetable fibre composites. The dielectric strength being a unique feature of *Sansevieria cylindrica* fibre composite can be suggested for electrical insulation applications [Ashok Kumar*, G. Ramachandra Reddy, K. R. Vishnu Mahesh, Thimmapuram Hemanth Babu, G. Vasanth Kumar Reddy, H. Dasaratha and Y. V. Mohana Reddy (Principal, Saint Mark Group of Institutions, Department of Mechanical Engineering, Rachanapalli, Ballary Road, Anantapur-515003, Andhra Pradesh, India), *International Journal of Fiber and Textile Research*, 2011, **1**(1) 15-21].

NPARR 3(1), 2012-025, Performance of *Zea mays* fiber reinforced epoxy composites

The tensile properties of unidirectional and randomly oriented short fibre lengths from agricultural based plant stems *Zea mays* (Poaceae) fibre/ epoxy composites (ZMFE) are described for the first time in this work. Composites were fabricated using raw *Zea mays* fiber (ZMF's) with varying fibre weight percents viz. 25, 30, 35, 40 and 45wt %. The tensile parameter such as maximum stress, Young's modulus and elongation at break were determined using the universal testing machine (UTM). Wet hand lay-up technique was used for the preparation of the composite. Effect of alkali treatment (with and without 10 % NaOH solution) of ZMFE composites were also studied on the tensile properties. ZMFE composites showed a regular trend of an increase in properties with fibre weight percent until 40% and afterwards a decrease in properties for composites with greater fibre weight percent. It was observed that the increased performance was attributed for unidirectional fabric was due to the narrow interface between the fabric and matrix, there by stress transfer between increased. The analysis of the tensile parameters of short ZMFE composites displayed an optimum fibre weight percent at 40 wt %. Scanning electron microscope (SEM) studies were carried out

to evaluate the fibre/matrix interactions. DSC, TGA and FT-IR spectra of treated and untreated ZMFE composites were also studied [M. Ashok Kumar*, G. Ramachandra Reddy, K. R. Vishnu Mahesh, K.V. P. Chakradhar and Y. V. Mohana Reddy (Saint Mark

Group of Institutions, Department of Mechanical Engineering, Rachanapalli, Ballary Road, Anantapur-515003, Andhra Pradesh, India), *International Journal of Fiber and Textile Research* 2011, **1**(1), 22-27].

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

NPARR 3(1), 2012-026, Processing of mungbean products and its nutritional and organoleptic evaluation

Four mungbean products namely, whole fried namkeen, dehusked fried namkeen, roasted namkeen and salad were formulated using three different cultivars of mungbean viz. UPM 98-1, Pant Mung-5 and Pant Mung-2 and the effect of different processing methods on texture and nutrient composition were studied. All the products were found to be acceptable by the panel. Salad was found to be the most acceptable product with overall acceptability of 8.31 out of 10 followed by dehusked fried namkeen (7.80), whole fried namkeen (7.61) and roasted namkeen (7.02). Moisture and protein content increased significantly after germination for 24h. Fat content increased significantly for deep fried products. Total ash, crude fibre and mineral content decreased significantly after processing whereas in-vitro iron bioavailability and in-vitro protein digestibility increased significantly after processing. Texture analysis revealed that dehusked fried namkeen of Pant Mung-5 and roasted namkeen of Pant Mung-2 had maximum crispness and hardness, respectively, which are preferred attributes [Raghuvanshi, R.S., Singh, S., Bisht, K. and Singh, D.P. (Department of Foods and Nutrition, Department of Genetics and Plant Breeding, G.B. Pant University of Agriculture and Technology, Pantnagar-263 145, Uttarakhand, India), *International Journal of Food Science and Technology*, 2011, **46**(7), 1378-1387].

NPARR 3(1), 2012-027, Chemical properties and sensory quality of ice cream fortified with fish protein

Fish protein powder is a functional ingredient that can be used for enhancing the nutritional value of food products. In this study the effect of fortification with different levels of fish protein powder (FP) on chemical properties and sensory quality of Persian ice cream with 0, 30 and 50 g kg⁻¹ FP during storage at -18 °C for 4 months was investigated. Ice creams fortified with 50 and 30 g kg⁻¹ FP had significantly higher protein and solid-non-fat content than ice

cream with 0% FP or 83, 69 and 51 g kg⁻¹ protein and 215, 204 and 181 g kg⁻¹ solid non-fat, respectively. All products had the same levels of fat, lactose, acidity and pH. They had similar sensory quality after production except for colour, but sensory properties of fortified samples changed significantly after 2 months of storage. Colour faded, cohesiveness decreased, sandiness/coarseness increased, sweetness decreased and fish flavour and off-odour increased. The control ice cream scored highest for additives odour and flavour.

Development of ice cream fortified with fish protein powder could be an effective way to enhance nutritional and functional value of ice cream. But studies on storage stability, consumers' acceptance and attitudes are recommended if companies are planning to do so. [Gholam Reza Shaviklo*, Gudjon Thorkelsson, Kolbrun Sveinsdottir and Fereidon Rafipour (Correspondence: Gholam Reza Shaviklo, Iran Fisheries Research Organization, No. 325, West Fatemi, Tehran, Iran), *Journal of the Science of Food and Agriculture*, 2011, **91**(7), 1199-1204].

NPARR 3(1), 2012-028, The allenic carotenoid fucoxanthin, a novel marine nutraceutical from brown seaweeds – A review

Obesity and type 2 diabetes are pathologies with rapidly growing prevalence throughout the world. A few molecular targets offer the most hope for anti-obesity and anti-diabetic therapeutics. One of the keys to success will be the induction of uncoupling protein 1 (UCP1) in abdominal white adipose tissue (WAT) and the regulation of cytokine secretions from both abdominal adipose cells and macrophage cells infiltrated into adipose tissue. Anti-obesity and anti-diabetic effects of fucoxanthin, a characteristic carotenoid found in brown seaweeds, have been reported. Nutrigenomic studies reveal that fucoxanthin induces UCP1 in abdominal WAT mitochondria, leading to the oxidation of fatty acids and heat production in WAT. Fucoxanthin improves insulin resistance and decreases blood glucose levels through the regulation of cytokine secretions from WAT. The key structure of carotenoids for the expression of anti-obesity effect is suggested to be the carotenoid end of the polyene chromophore, which contains an allenic bond and two hydroxyl groups [Kazuo Miyashita*, Sho Nishikawa, Fumiaki Beppu,

Takayuki Tsukui, Masayuki Abe and Masashi Hosokawa (Correspondence: Kazuo Miyashita, Faculty of Fisheries Sciences, Hokkaido University, 3-1-1 Minato, Hakodate, Hokkaido 041-8611, Japan), *Journal of the Science of Food and Agriculture*, 2011 **91**(7), 1166-1174].

NPARR 3(1), 2012-029, Preliminary characterization of food tablets from date (*Phoenix dactylifera* L.) and spirulina (*Spirulina* sp.) powders

In this work, some physical properties (hardness, friability, disintegration time and erosion) of food tablets containing various food powders obtained from dates (*Phoenix dactylifera* L.), spirulina (*Spirulina* sp.) and oranges (juice and zest) were investigated. Also, experimental data related to the release kinetic of phycocyanin (antioxidant substance of spirulina) into different liquid mediums correctly fit the Korsmeyer–Peppas model since the coefficient of determination R^2 ranged from 0.84 (HCl 0.1N solution) to 0.98 (distilled water). So, the date and spirulina powder-based food tablets could be of various uses: 1) consumption as such by all categories of consumers, 2) feeding of patients for whom it is difficult to chew or swallow food, knowing that these tablets can be either sucked or swallowed, and 3) as natural and cheap drug delivery carriers [Benahmed Djilali Adiba, Benamara Salem*, Saidi Nabil and Meksoud Abdelhakim (Department of Food Technology (FSI), Laboratory of Soft Technologies, Valorization, Physico-chemistry of Biological Materials and Biodiversity (LTDVPMB), FS, University of Boumerdès, 35000, Algeria), *Powder Technology*, 2011, **208**(3), 725-730].

NPARR 3(1), 2012-030, 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 and Muhammad Al-u'datt (Taha M. Rababah, 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 3(1), 2012-031, Development and storage study of reduced sugar soy containing compound chocolate

Possibility of using full fat soy flour (FFSF) for replacer for whole milk powder (WMP), stevia-mannitol blend as replacer for sugar and soybean oil (SBO) as replacer for cocoa butter in chocolate manufacture without impairing the sensory quality characteristics of chocolate was explored. Data on the sensory evaluation of WMP, sugar and cocoa butter substituted chocolates revealed that 40% (w/w) of WMP, sugar and cocoa butter can be successfully substituted by FFSF, stevia-mannitol blend and SBO, respectively in the preparation of high protein and low sugar chocolate without impairing the sensory attributes. Lecithin was found to be optimum at 0.32% (w/w) level of chocolate mix. Protein content of optimized formulation increased by 21.8% over control. Storage study of the product indicated an increase in hardness, free fatty acid content, peroxide value, total plate count, yeast and mold count, whereas a decrease in moisture content, pH value and sensory scores. The optimized chocolate was found acceptable (score ≥ 7.0) after 90 days of storage at 16±1°C and ~65% RH [Pandey, A.* and, Singh, G.

(Department of Food Science and Technology, G.B. Pant University of Agriculture and Technology, Pantnagar 263145, India), *Journal of Food Science and Technology*, 2011, **48**(1), 76-82].

NPARR 3(1), 2012-032, Physicochemical and functional properties of a protein isolate produced from safflower (*Carthamus tinctorius* L.) meal by ultrafiltration

The protein isolate obtained from safflower meal by aqueous extraction and ultrafiltration was evaluated for its physicochemical and functional properties. Protein, ash and moisture contents of the safflower protein isolate were 901, 51 and 45 g kg⁻¹, respectively. Its water and oil absorption capacities were 2.22 mL H₂O g⁻¹ protein and 2.77 mL oil g⁻¹ protein, respectively. Least gelation concentration was 20 g kg⁻¹ at pH 2, 6, 8 and 10 but 100 g kg⁻¹ at pH 4. Emulsifying properties were also affected by the pH: emulsifying activity and emulsion stability at pH 6 were 82.5 and 100% respectively. The highest foaming capacity (126%) occurred at pH 2; however, it increased by 104% with the addition of 0.25 g glucose g⁻¹ protein to the foam system. In the light of its functional properties found in this study, safflower protein isolate produced by ultrafiltration is recommended for use as an ingredient in food products such as salad dressing, meat products, mayonnaise, cakes, ice cream and desserts [Ulloa, J.A.*, Rosas-Ulloa, P. and Ulloa-Rangel, B.E. (Centro de Tecnología de Alimentos, Universidad Autónoma de Nayarit, Ciudad de la Cultura Amado Nervo, 63190 Tepic, Nayarit, Mexico), *Journal of the Science of Food and Agriculture*, 2011, **91**(3), 572-577].

NPARR 3(1), 2012-033, Kinetics of colour change of bamboo shoot slices during microwave drying

The effect of microwave power on colour change kinetics of bamboo shoot slices was investigated during microwave drying. Colour changes were quantified by tri-stimulus Hunter L (whiteness/darkness), a (redness/greenness), and b (yellowness/blueness) system. These values were also used for calculation of total colour change (ΔE), chroma, hue angle, and browning index (BI). Microwave drying as expected changed colour parameters because of browning. The values of L and

b decreased, while values of a and ΔE increased during drying. Mathematical modelling of colour change kinetics indicated that L, b, chroma and BI could be defined using a first-order kinetic model, while a, ΔE and hue angle could be defined using a zero-order kinetic model. Considering together colour deterioration and quality of dried bamboo shoot slices at higher power reveals the need of process standardisation for getting good quality product [Bal, L.M.*, Kar, A., Satya, S. and Naik, S.N. (Centre for Rural Development and Technology, Indian Institute of Technology, Hauz Khas, New Delhi 110016, India), *International Journal of Food Science and Technology*, 2011, **46**(4), 827-833].

NPARR 3(1), 2012-034, Characterization and sensorial evaluation of cereal bars with jackfruit

The objective of this study was to elaborate a homemade and alternative cereal bar using dehydrated jackfruit and seed meal as fiber source, due to the availability of this fruit in the region, without reducing the nutritional values if comparing to those already existent in the market. In order to evaluate the centesimal content and the acceptance of the homemade bars, both light and traditional bars were used as reference. The results showed that the elaborated bar presented protein values very close with products already found in the market. However, the new bars presented higher content of fibers. Formulations of 30 and 40% of seed meal were the ones with the best acceptance [Santos, C.T., Bonomo, R.F., Da Costa Ilhéu Fontan, R., Bonomo, P., Veloso, C.M. and Fontan, G.C.R.* (Laboratório de Engenharia de Processos, Universidade Estadual Do Sudoeste da Bahia, Praça Primavera, 40, 45700-000, Itapetinga, Bahia, Brazil), *Acta Scientiarum - Technology*, 2011, **33**(1), 81-85].

NPARR 3(1), 2012-035, Bamboo shoot based fermented food products: A review

This paper reviews fermented bamboo shoots as a brilliant fixing to numerous delicious dishes, of not only the Indian subcontinent but also China, Thailand, Nepal and Bhutan. Low in calorie and high in carbohydrate, proteins and minerals, bamboo shoots are consumed in raw, canned, boiled, fermented, and stir fried forms. It is anticipated that process optimization with further validation will help to grow

an independent bamboo shoot based food industry [Choudhury, D., Sahu, J.K.* and Sharma, G.D. (Biological Systems Engineering, Virginia Poly. Insti. and State Univer, Blacksburg 24061, VA, United States), *Journal of Scientific and Industrial Research*, 2011, **70**(3), 199-203].

NPARR 3(1), 2012-036, Effect of incorporation of corn byproducts on quality of baked and extruded products from wheat flour and semolina

The effect of blending level (0, 5, 10, 15 and 20%) of corn bran, defatted germ and gluten with wheat flour on the physico-chemical properties (protein, crude fiber, phosphorus, iron and calcium), baking properties of bread, muffins and cookies, and extrusion properties of noodles and extruded snacks prepared from semolina were examined. Blending of wheat flour and corn byproducts significantly increased the protein, crude fiber, phosphorus, iron and calcium contents. Breads from gluten blends had higher loaf volume as compared to bran and germ breads. Among corn byproducts, gluten cookies were rated superior with respect to top grain. Muffins from germ blends and gluten blends had higher acceptability scores than the bran muffins. Blending of corn bran, defatted germ and gluten at 5 and 10% with wheat flour resulted in satisfactory bread, cookie, and muffin score. Quality of noodles was significantly influenced by addition of corn byproducts and their levels. Corn byproducts blending had significant influence on cooking time, however, gruel solid loss affected non-significantly in case of noodles. Expansion ratio and density of extruded snacks was affected non significantly by blending source and blending level. However, significant effect was observed on amperage, pressure, yield and overall acceptability of extruded snacks. Acceptable extruded products (noodles and extruded snacks) could be produced by blending corn byproducts with semolina

upto 10% level [Sharma, S.*, Gupta, J.P., Nagi, H.P.S. and Kumar, R. (Department of Food Science and Technology, Punjab Agricultural University, Ludhiana-141004, India), *Journal of Food Science and Technology*, 2011, **48**, 1-7].

NPARR 3(1), 2012-037, Quality of products containing defatted groundnut cake flour

Defatted groundnut cake obtained from commercial oil processing units and that prepared in laboratory oil expeller (LOE) were analyzed for quality parameters. Defatted groundnut cake flour (DGCF) was incorporated at 15-100% levels in laddoo, chutney powder, fryums (deep fried crisp and crunchy item), biscuits, noodles and extruded snacks. The products were studied for sensory, physico-chemical and shelf-life quality. DGCF was creamish white with bulk density of 0.55 ± 0.03 g/ml, water absorption capacity 135.6 ± 1.97 ml %, oil absorption capacity 100.3 ± 1.16 ml % and foam capacity $33\pm 1\%$. Protein, fat and ash contents were 51.6 ± 0.06 , 4.5 ± 0.05 and $4.2\pm 0.11\%$, respectively. Tannins and aflatoxin B1 were not detected. The increase of protein due to incorporation of DGCF into the products ranged from 5.5 to 21.9%. Shelflife studies indicated the maximum storability for 90 days for all the products except laddoo, which could be stored for 30 days at ambient temperature ($28\pm 2^\circ\text{C}$). All the products were acceptable and the order of preference for the products as indicated by adults (fryums, chutney powder, extruded snacks, noodles, biscuits and laddoo) and children (biscuits, laddoo, extruded snacks, fryums, noodles and chutney powder) varied [Purohit, C. and Rajyalakshmi, P. * (Department of Foods and Nutrition, Post-graduate and Research Centre, Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad 500 030, India), *Journal of Food Science and Technology*, 2011, **48**(1), 26-35].

FRUITS

NPARR 3(1), 2012-038, Effects of vacuum frying on structural changes of bananas

Effects of oil temperature, frying time, and ripeness on dimensional changes of vacuum fried bananas were studied. Banana slices with cross section diameters of 25-30 mm and a thickness of 3.5–4.5 mm were fried at temperatures of 100, 110, and 120°C and 8 kPa for 20 min to determine which temperature produced the highest degree of expansion. Using this temperature, the width and thickness of the product were measured at 0, 5, 10, 15, and 20 min to model the dimensional changes as a function of moisture ratio. Sensory evaluation was conducted using a 7-point hedonic scale test to determine the effect of ripeness on acceptability of the product. Scanning electron microscopy (SEM) was used to analyze the structure of the vacuum fried bananas.

The experimental results under this vacuum pressure revealed that frying temperature of 110°C on bananas at the second day of ripeness yielded the highest volume expansion. Sensory evaluations did not unveil any significant difference ($p > 0.05$) in acceptability of the products based on ripeness. From SEM exhibited, as a function of frying time, a dramatic increase in the pore size of the bananas, while the Heywood shape factor indicated an overall increase in the product volume [Ram Yamsaengsung*, Thaworn Ariyapuchai and Kulchanat Prasertsit (Department of Chemical Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand), *Journal of Food Engineering*, 2011, **106**(4), 298-305].

NPARR 3(1), 2012-039, Effect of acid concentration and treatment time on acid–alcohol modified jackfruit seed starch properties

The properties of starch extracted from jackfruit (*Artocarpus heterophyllus* Lam.) seeds, collected from west Assam after acid-alcohol modification by short term treatment (ST) for 15-30 min with concentrated hydrochloric acid and long term treatment (LT) for 1-15 days with 1 M hydrochloric acid, were investigated. Granule density, freeze thaw

stability, solubility and light transmittance of the treated starches increased. A maximum decrease in the degree of polymerisation occurred in ST of 30 min (2607.6). Jackfruit starch had $27.1 \pm 0.04\%$ amylose content (db), which in ST initially decreased and then increased with the severity of treatment; in LT the effect was irregular. The pasting profile and granule morphology of the treated samples were severely modified. Native starch had the A-type crystalline pattern and crystalline structure increased on treatment. FTIR spectra revealed slight changes in bond stretching and bending. Colour measurement indicated that whiteness increased on treatment. Acid modified jackfruit seed starch can have applications in the food industry [Himjyoti Dutta, Sanjib Kumar Paul, Dipankar Kalita, Charu Lata Mahanta*(Department of Food Processing Technology, School of Engineering, Tezpur University, Assam, India), *Food Chemistry*, 2011, **128**(2), 284-291].

NPARR 3(1), 2012-040, Strawberry consumption improves plasma antioxidant status and erythrocyte resistance to oxidative haemolysis in humans

Significant increases in the plasma total antioxidant capacity (TAC) have already been reported after acute intake of strawberries. In addition, antihaemolytic effects of strawberry extracts have been recently demonstrated *in vitro*, revealing that part of the antioxidant properties of strawberry bioactive compounds could lie in their localisation within cell membranes. However, there is a lack of research evidence from *in vivo* protracted strawberry consumption studies. We carried out a 16-day pilot study where 12 healthy subjects ingested 500 g of antioxidants-rich strawberries daily, and we evaluated the potential effects of fruit consumption on biomarkers of plasma and cellular antioxidant status. A significant increase in fasting plasma TAC and in serum vitamin C concentrations were progressively observed during the period of strawberry supplementation. An enhanced resistance to haemolysis was also observed in both AAPH-treated and untreated erythrocytes, collected during and after the period of strawberry consumption. The results obtained in this work suggest that regular consumption of antioxidant-rich strawberries may exert an improvement on the plasma antioxidant

status and an increase on the antihaemolytic defenses of human erythrocytes [Sara Tulipani, Josè M. Alvarez-Suarez, Franco Busco, Stefano Bompadre, Josè L. Quiles, Bruno Mezzetti, Maurizio Battino*(Department of Biochemistry, Biology & Genetics, Faculty of Medicine, Marche Polytechnic University, Ancona, Italy), *Food Chemistry*, 2011, **128**(1), 180-186].

NPARR 3(1), 2012-041, Effect of cooking on total vitamin C contents and antioxidant activity of sweet chestnuts (*Castanea sativa* Mill.)

In this work the total vitamin C contents (ascorbic acid + dehydroascorbic acid) and antioxidant activity of raw and cooked chestnuts was evaluated. The vitamin C contents of raw chestnuts varied significantly between the different cultivars (cv) studied and it varied from 400 mg/kg dry weight (cv Lada) to 693 mg/kg dry weight (cv Martafinha). The different cultivars behave differently during the cooking process concerning the loss of vitamin C. A significant decrease in the vitamin C content of the chestnuts was observed, 25-54% for the boiling process and 2-77% for the roasting process. Boiled and roasted chestnuts can be good sources of vitamin C since it may represent 22.4%, 16.2%, 26.8% and 19.4%, respectively, of the recommended dietary intake for an adult man and woman. The cooking process significantly changed the antioxidant activity of the chestnuts. A difference was observed between the cultivars during the cooking processes, concerning the antioxidant activity. For the raw chestnuts the variation in vitamin C content of the chestnuts explains 99% of the antioxidant activity variation but for the roasted and boiled chestnuts this percentage significantly decreases to 51% and 88%, respectively. Although a high antioxidant activity is still present in the cooked chestnuts, the cause for this antioxidant activity is less dependent on the vitamin C content of the chestnuts, probably due to the conversion of ascorbic acid to dehydroascorbic acid. The increase in gallic acid during the cooking process, presumably transferred from the peels to the fruit, also contributes to the high antioxidant activity observed for the cooked chestnuts [Ana I.R.N.A. Barros*, Fernando M. Nunes, Berta Gonçalves, Richard N. Bennett, Ana Paula Silva (CQ – Chemistry Research Centre, Chemistry Department, University of Trás-os-Montes

e Alto Douro, 5000-801 Vila Real, Portugal), *Food Chemistry*, 2011, **128**(1), 165-172].

NPARR 3(1), 2012-042, Rheological, textural and spectral characteristics of sorbitol substituted mango jam

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

NPARR 3(1), 2012-043, Gamma irradiation of sun-dried apricots (*Prunus armeniaca* Linn.) for quality maintenance and quarantine purposes

The study is aimed at the optimization of gamma irradiation treatment of sun-dried apricots for quality maintenance and quarantine purposes. Sun-dried apricots pre-treated with potassium meta-bisulphite (KMS) at 2.5% w/v were procured from progressive apricot grower of district Kargil, Ladakh region of Jammu and Kashmir state. The sun-dried apricots were packed in 250 gauge polyethylene packs and gamma irradiated in the dose range 1.0-3.0. kGy. The gamma irradiated fruit including control was stored under ambient ($15\pm 2-25\pm 2^{\circ}\text{C}$, RH 70-80%) conditions and periodically evaluated for physico-chemical, sensory and microbial quality parameters. Radiation treatment at dose levels of 2.5 and 3.0. kGy proved significantly ($p\leq 0.05$) beneficial in retention of higher levels of B-carotene, ascorbic acid, total sugars and color values without impairing the taste as perceived by the sensory panel analysis. The above optimized doses retained the B-carotene content of

sun-dried apricots to the extent of 71.2% and 72.6% compared to 63.9% in control samples after 18 months of storage. Irradiation treatment facilitated the release of residual sulfur dioxide in KMS pre-treated sun-dried apricots significantly ($p \leq 0.05$) below the prescribed limit for dried products. During storage, two-fold decrease in sulfur dioxide content was recorded in irradiated samples (3.0. kGy) as compared to 16.9% in control. The above optimized doses besides maintaining the higher overall acceptability of sun-dried apricots resulted in 5 log reductions in microbial load just after irradiation and 1.0 and 1.3. log reductions in yeast and mold and bacterial count after 18 months of ambient storage [Hussain, P.R.*, Meena, R.S., Dar, M.A. and Wani A.M. (Astrophysical Science Division, Nuclear Research Laboratory, Bhabha Atomic Research Centre, Zakura, Srinagar, Kashmir-190006, India), *Radiation Physics and Chemistry*, 2011, **80**(7), 817-827].

NPARR 3(1), 2012-044, Nutritional evaluation of date palm (*Phoenix dactylifera*) seeds and fruit as source of feeds in aquaculture

The present study was conducted to find out the nutritional values of *Phoenix dactylifera* (Date palm) flesh and seeds to be used as components in fish feeds for enhanced feed utilization efficiency. Dried (DD) and Semi-dried (SD) date fruits were purchased from Lafia main market. The samples were separated, milled and analyzed for proximate components and mineral elements using standard methods of the

AOAC. Physical assessment of the samples showed that the weight (%) of flesh was found to be higher than weight of seed for both dried (DD) and semidried (SD) dates (90.38 ± 2.58 , 9.62 ± 1.80 and 94.69 ± 2.15 , 5.31 ± 1.60), respectively. Proximate analysis showed that dry matter contents were higher in flesh of DD and SD ($95.90 \pm 0.12\%$ and $96.93 \pm 0.07\%$ respectively) while their respective seeds yielded 94.82 ± 0.4 and $94.22 \pm 0.30\%$. Results further showed that the crude protein and carbohydrate were found to be higher in the flesh of both DD and SD than their seeds ($P < 0.05$) while ash, crude fibre and crude lipids were significantly higher ($P < 0.05$) in the seeds than flesh of the dates. The estimated energy value was significantly higher ($P < 0.05$) in the seeds { 1198.70 ± 2.20 and 1007.58 ± 1.00 (KJ/100g)} than the flesh { 1183.45 ± 3.10 and 992.67 ± 2.10 (KJ/100g)} of DD and SD respectively. Mineral analysis indicated that both seeds and flesh of dates contain appreciable concentrations (mg/100g) of Ca; Mg; P; K; Na; Fe; Cu and Zn. However, moisture level affects mostly mineral composition of date and other nutrients. It could be inferred from the present study generally, that date flesh would serve a good source of fish feed additives while its seeds would best be used as a source of energy for improved feed utilization efficiency [Sotolu, A.O., Kigbu, A.A., Oshinowo, J.A. (Department of Forestry, Wildlife and Fisheries, Nasarawa State University, Shabu-Lafia campus, Lafia, Nigeria), *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 2011, **10**(5), 2279-2285].

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

NPARR 3(1), 2012-045, Thin-layer drying kinetics and quality changes of sweet sorghum stalk for ethanol production as affected by drying temperature

The chopped sweet sorghum stalk was thin-layer-dried for long-term storage and ethanol production. The drying kinetics and the effects of drying temperature on the qualities of sweet sorghum stalk were investigated in this work. The results showed that the drying process could be simulated well by Wang and Singh's model. The diffusivity constant (D_0) and active energy (E_a) were estimated as $4.4 \times 10^{-5} \text{m}^2/\text{s}$ and $21.4 \text{ kJ}/(\text{mol K})$ for drying the chopped fresh stalk. According to the sugar composition, browning degree, and fermentability of the dried stalk obtained at various temperatures, the approximate drying temperature could be suggested as $50\text{-}60^\circ\text{C}$ for application. In this range, the moisture of the chopped fresh stalk could drop below the safe moisture for storage in $7\text{-}5.5 \text{ h}$ with $12.1\text{-}9.7\%$ total sugar loss during the drying process [Fei Shen, Lin Peng, Yanzong Zhang, Jun Wu, Xiaohong Zhang, Gang Yang, Hong Peng, Hui Qi, Shihuai Deng (Provincial Key Laboratory of Agricultural Environmental Engineering, College of Resource and Environment, Sichuan Agricultural University-Chengdu Campus, Chengdu, Sichuan-611130 PR China), *Industrial Crops and Products*, 2011, **34**, 1588-1594].

NPARR 3(1), 2012-046, High quality biodiesel from yellow oleander (*Thevetia peruviana*) seed oil

Yellow oleander (*Thevetia peruviana* Schum.) seed oil has been investigated to produce biodiesel. Transesterification of the oil to biodiesel was carried out in methanol by batch reaction using a heterogeneous catalyst derived from the trunk of *Musa balbisiana* Colla (one variety of banana plant). $96 \text{ wt } \%$ of the oil is converted to biodiesel at 32°C in 3 h . The $\text{wt } \%$ composition of the biodiesel is methyl oleate 43.72, methyl palmitate 23.28, methyl linoleate 19.85, methyl stearate 10.71 and methyl arachidate 2.41. Fuel properties conform to standards set for ASTM D6751, EN 14214, BS II and BS III, and in

certain aspects better. The biodiesel is free from sulfur and has exhibited a high cetane number of 61.5 [Deka, D.C.* and Basumatary S. (Department of Chemistry, Gauhati University, Guwahati 781 014, Assam, India), *Biomass and Bioenergy*, 2011, **35**(5), 1797-1803].

NPARR 3(1), 2012-047, Ethanol production from banana peels using statistically optimized simultaneous saccharification and fermentation process

Dried and ground banana peel biomass (BP) after hydrothermal sterilization pretreatment was used for ethanol production using simultaneous saccharification and fermentation (SSF). Central composite design (CCD) was used to optimize concentrations of cellulase and pectinase, temperature and time for ethanol production from BP using SSF. Analysis of variance showed a high coefficient of determination (R^2) value of 0.92 for ethanol production. On the basis of model graphs and numerical optimization, the validation was done in a laboratory batch fermenter with cellulase, pectinase, temperature and time of nine cellulase filter paper unit/gram cellulose (FPU/g-cellulose), 72 international units/gram pectin (IU/g-pectin), 37°C and 15 h , respectively. The experiment using optimized parameters in batch fermenter not only resulted in higher ethanol concentration than the one predicted by the model equation, but also saved fermentation time. This study demonstrated that both hydrothermal pretreatment and SSF could be successfully carried out in a single vessel, and use of optimized process parameters helped achieve significant ethanol productivity, indicating commercial potential for the process. To the best of our knowledge, ethanol concentration and ethanol productivity of 28.2 g/l and 2.3 g/l/h , respectively from banana peels have not been reported to date [Oberoi, H.S.*, Vadlani, P.V., Saida, L., Basal, S., Hughes, J.D. (Department of Grain Science and Industry, Kansas State University, Manhattan, KS 66506, United States), *Waste Management*, 2011, **31**(7), 1576-1584].

NPARR 3(1), 2012-048, Weedy lignocellulosic feedstock and microbial metabolic engineering: Advancing the generation of 'Biofuel'

Lignocellulosic materials are the most abundant renewable organic resources (~200 billion tons annually) on earth that are readily available for conversion to ethanol and other value-added products, but they have not yet been tapped for the commercial production of fuel ethanol. The lignocellulosic substrates include woody substrates such as hardwood (birch and aspen, etc.) and softwood (spruce and pine, etc.), agro residues (wheat straw, sugarcane bagasse, corn stover, etc.), dedicated energy crops (switch grass, and *Miscanthus* etc.), weedy materials (*Eichhornia crassipes*, *Lantana camara* etc.), and municipal solid waste (food and kitchen waste, etc.). Despite the success achieved in the laboratory, there are limitations to success with lignocellulosic substrates on a commercial scale. The future of lignocellulosics is expected to lie in improvements of plant biomass, metabolic engineering of ethanol, and cellulolytic enzyme-producing microorganisms, fullest exploitation of weed materials, and process integration of the individual steps involved in bioethanol production. Issues related to the chemical composition of various weedy raw substrates for bioethanol formation, including chemical composition-based structural hydrolysis of the substrate, need special attention. This area could be opened up further by exploring genetically modified metabolic engineering routes in weedy materials and in biocatalysts that would make the production of bioethanol more efficient [Chandel A.K* and Singh O.V. (Centre for Biotechnology, Jawaharlal Nehru Technological University, Hyderabad 500 085, India), *Applied Microbiology and Biotechnology*, 2011, **89**(5), 1289-1303]

NPARR 3(1), 2012-049, Biofuels from algae for sustainable development

Microalgae are photosynthetic microorganisms that can produce lipids, proteins and carbohydrates in large amounts over short periods of time. These products can be processed into both biofuels and useful chemicals. Two algae samples (*Cladophora fracta* and *Chlorella protothecoid*) were studied for

biofuel production. Microalgae appear to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels. Microalgae can be converted to biodiesel, bioethanol, bio-oil, biohydrogen and biomethane via thermochemical and biochemical methods. Industrial reactors for algal culture are open ponds, photobioreactors and closed systems. Algae can be grown almost anywhere, even on sewage or salt water, and does not require fertile land or food crops, and processing requires less energy than the algae provides. Microalgae have much faster growth-rates than terrestrial crops. the per unit area yield of oil from algae is estimated to be from 20,000 to 80,000 liters per acre, per year; this is 7-31 times greater than the next best crop, palm oil. Algal oil can be used to make biodiesel for cars, trucks, and airplanes. The lipid and fatty acid contents of microalgae vary in accordance with culture conditions. The effect of temperature on the yield of hydrogen from two algae (*C. fracta* and *C. protothecoid*) by pyrolysis and steam gasification was investigated in this study. In each run, the main components of the gas phase were CO₂, CO, H₂, and CH₄. The yields of hydrogen by pyrolysis and steam gasification processes of the samples increased with temperature. The yields of gaseous products from the samples of *C. fracta* and *C. protothecoides* increased from 8.2% to 39.2% and 9.5% to 40.6% by volume, respectively, while the final pyrolysis temperature was increased from 575 to 925K. The percent of hydrogen in gaseous products from the samples of *C. fracta* and *C. protothecoides* increased from 25.8% to 44.4% and 27.6% to 48.7% by volume, respectively, while the final pyrolysis temperature was increased from 650 to 925K. The percent of hydrogen in gaseous products from the samples of *C. fracta* and *C. protothecoides* increased from 26.3% to 54.7% and 28.1% to 57.6% by volume, respectively, while the final gasification temperature was increased from 825 to 1225K. In general, algae gaseous products are higher quality than gaseous products from mosses [Demirbas, M.F. (Sila Science, University Mahalleli, Mekan Sokak No. 24, Trabzon, Turkey), *Applied Energy*, 2011, **88**(10), 3473-3480]

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

NPARR 3(1), 2012-050, Applications of inulin and mucilage as stabilizers in yoghurt production

The present study aimed to test some of natural products as stabilizers for yoghurt containing inulin and mucilage for enhancement its properties as a functional foods. Yoghurt containing natural stabilizers was manufactured and mucilage was added to yoghurt with ratio of 0.2% but inulin was added to yoghurt with ratio of 4 and 6%. Chemical compositions such as pH value, titratable acidity, wheying off, ash, protein, lactose, total carbohydrate, total solid, acetaldehyde and diacetyl of the tested yoghurt with and without stabilizers were carried out using the official methods. The data concluded that the pH values of tested yoghurt showed significant changes and decreased with the increasing of the storage period in the all of yoghurt treatments. On the other hand, titratable acidity values of tested yoghurt showed significant changes and increased with the increasing of the storage period in the all of yoghurt treatments. The wheying off of the set yoghurt was significantly lower in the yoghurt containing inulin at 4, 6% and mucilage at 0.2% compared with control yoghurt. The reduction percentages in the wheying-off were 30, 58 and 50%, respectively compared to control. None of the stabilizers used in ($p = 0.05$) affect on the ash content of yoghurt. However, a decrease in lactose content was observed with the increase in the storage period. There was a substantial decrease in lactose content from 2 to 0.78% on the 10th day of storage. The protein content of yoghurt treated with inulin 6%, mucilage 0.2% and control were significantly different ($p = 0.05$) and gave value of 4.56, 4.37 and 4.19%, respectively. Based on the findings of this study, mucilage and inulin are potential stabilizers to be used in yoghurt processing [Khalifa, M.E.A., Elgasim, A.E., Zaghoul, A.H., Mahfouz, M.B.* (Department of Dairy Science, National Research Centre, Giza, Egypt), *American Journal of Food Technology*, 2011, **6**(1), 31-39].

NPARR 3(1), 2012-051, Extraction of mucilage from *Ocimum americanum* linn & its role as disintegrant in tablets formulation

Plant products serve as an alternative to synthetic products because of local accessibility, eco-friendly nature and lower prices compare to important synthetic products. Natural gums and mucilage have been widely explored as pharmaceutical excipients. The present study was undertaken to separate mucilage from the seeds of *Ocimum americanum* Linn. and explore its use as a tablet disintegrant. Method for extraction of mucilage from the seeds was developed and it was separated. The separated mucilage was evaluated for various parameters as per Indian pharmacopoeia. The disintegrating efficiency of separated mucilage was compared with that of the starch in tablets prepared using lactose, Paracetamol and poly vinyl pyrrolidone as model diluent, drug and binder, respectively. The disintegration time for tablet formulations prepared using mucilage was less than that was prepared by using starch as a disintegrant [Sheth, N.S., Shah, N.V. and Shah, N.C. (Sigma Institute of Pharmacy, Baroda, Gujarat, India), *Journal of Global Pharma Technology*, 2010, **2**(12), 26-31].

NPARR 3(1), 2012-052, Pectin from *Passiflora edulis* shows anti-inflammatory action as well as hypoglycemic and hypotriglyceridemic properties in diabetic Rats

Flour made from *Passiflora edulis* fruit peel has been used in Brazil to treat diabetes. This study evaluated the effects of pectin from *P. edulis* on rats with alloxan-induced diabetes, on myeloperoxidase release from human neutrophils, and on carrageenan-induced paw edema. In the experiments on carrageenan-induced paw edema, paws were dissected for hematoxylin-eosin staining and immunohistochemistry determinations of tumor necrosis factor- α and inducible nitric oxide synthase. Male Wistar rats were divided into the following groups: diabetic controls and diabetic treated with pectin daily for 5 days (0.5-25 mg/kg orally). Glibenclamide and metformin were used as reference drugs. Forty-eight hours after alloxan administration, blood measures were determined (before treatment) and again 5 days later (after treatment). Pectin decreased blood glucose and triglyceride levels in

diabetic rats. Pectin also decreased edema volume and release of myeloperoxidase (0.1–100 $\mu\text{g/mL}$). It also significantly decreased neutrophil infiltration and partially decreased immunostaining for tumor necrosis factor- α and inducible nitric oxide synthase. In conclusion, these data indicated that pectin, a bioactive compound present in *P. edulis*, has potential as a useful alternative treatment for type 2 diabetes. Its anti-inflammatory properties are probably involved in its antidiabetic action [Draulio C. Silva, Ana L.P. Freitas, Carla D.S. Pessoa, Regina C.M. Paula, Jacilane X. Mesquita, Luzia K.A.M. Leal, Gerly A.C. Brito, Danilo O. Gonçalves, and Glauce S.B. Viana* (Viana, Rua Cel. Nunes de Melo, 1127, Fortaleza, CEP 60431-270, Brazil), *Journal of Medicinal Food*, 2011, **14**(10), 1118-1126].

NPARR 3(1), 2012-053, The effect of rice husk powder on standard Malaysian natural rubber grade 1 (SMR 1) and epoxidized natural rubber (ENR 50) composites

The effects of rice husk powder (RHP) loading and two types of natural rubber matrix (SMR L and ENR 50) on curing characteristics and mechanical properties were studied. The scorch time and cure time decreased with increasing RHP loading whereas maximum torque showed an increasing trend. SMR L composites possessed longer scorch time and cure time than ENR 50 composites. Incorporation of RHP into both rubbers improved tensile modulus significantly but decreased tensile strength and elongation at break. SMR L composites exhibited the lower tensile modulus and higher tensile strength and elongation at break than ENR 50 composites [Supalak Attharangsarn, Hanafi Ismail*, Mohamad Abu Bakar and Jamil Ismail (School of Materials and Mineral Resources Engineering, Universiti Sains Malaysia, Engineering Campus, Penang, Malaysia), *Polymer-Plastics Technology and Engineering*, 2012, **51**(3), 231-237].

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

NPARR 3(1), 2012-054, **Efficacy of essential oils of *Lippia alba* (Mill.) N. E. Brown and *Callistemon lanceolatus* (Sm.) Sweet and their major constituents on mortality, oviposition and feeding behaviour of pulse beetle, *Callosobruchus chinensis* L.**

Pulse beetle, *Callosobruchus chinensis* L., is the most destructive insect pest of pulses under storage in Asia and Africa. Keeping in view the negative impacts of synthetic insecticides and the demands of botanical pesticides, the present investigation explores the repellents, antifeedants, ovicidal, larvicidal and pupaecidal activity of two plant essential oils (EOs) and their major components, geranial and 1,8-cineole, when applied as fumigants for the management of the pulse beetle. EO of *Callistemon lanceolatus* (Sm.) Sweet caused 100% repellency of pulse beetle in a Y-shaped olfactometer at a dose of 150 μL , while *Lippia alba* (Mill.) N.E. Brown EO and 1, 8-cineole showed 76 and 74.7% repellency at the same dose. At 0.1 $\mu\text{L mL}^{-1}$, both the oils and 1,8-cineole provided 100% insect mortality. The EO of *C. lanceolatus* was recorded as the most effective fumigant, showing 96.03% oviposition deterrence and 100% antifeedant activity at 0.1 $\mu\text{L mL}^{-1}$. The LD_{50} of *L. alba* (11049.2 $\mu\text{L kg}^{-1}$) and *C. lanceolatus* (14 626.3 $\mu\text{L kg}^{-1}$) exhibited their favourable safety profiles when recorded on mice. EOs of *L. alba* and *C. lanceolatus* exhibited significant biological activity on the mortality and reproductive behaviour of pulse beetle. Based on their high LD_{50} values, the oils could be safely recommended as non-mammalian toxic fumigants in management strategies for pulse beetle [Ravindra Shukla, Priyanka Singh, Bhanu Prakash, Ashok Kumar, Prashant Kumar Mishra and Nawal Kishore Dubey* (Laboratory of Herbal Pesticides, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi-221005, India), *Journal of the Science of Food and Agriculture*, 2011, **91**(12), 2277-2283].

NPARR 3(1), 2012-055, **Toxic effects of neem-based insecticides on *Pieris brassicae* (Linn.)**

Four neem-based insecticides, Neemix[®] (0.25% EC @ 20 mg azadirachtin/liter), Ecozin[®] (3% EC @ 20 mg azadirachtin/liter), Agroneem[®] (0.15% EC @ 4.8 mg azadirachtin/liter) and Neem oil (0.25% EC azadirachtin @ 20 mg azadirachtin/liter) and a non-commercial neem leaf powder, were evaluated for oviposition deterrence, antifeedant effect to larvae and toxicity to eggs and larvae of *Pieris brassicae* (Linn.) on cabbage leaves in the laboratory. The concentrations tested were within the ranges of recommended field rates. Oviposition deterrence in no-choice, two-choice and six-choice assays, was observed for all the treatments. They exhibited significant ($P < 0.01$) oviposition deterrence on *P. brassicae* when compared with a non-treated control. Cabbage leaves treated with the neem-based insecticides were used as an egg-laying substrate. Numbers of eggs oviposited by *P. brassicae* adults on treated cabbage leaves were significantly lower than those treated with water, but no significant differences were detected among the neem insecticides. They also deterred feeding by *Pieris* larvae and exhibited significant antifeedant effects. Larvae of *P. brassicae* on treated leaves stopped feeding and dropped from the leaf, resulting in no or minimal damage. Direct contact with neem-based insecticides decreased the survival of eggs. Survival of larvae fed for 9 days on leaves treated with neem-based insecticides was reduced to 51%, 49%, 48%, 24% and 18% in the Neem oil, Neemix, Agroneem, Ecozin and neem leaf powder treatments, respectively. Therefore, it can be concluded from the present investigations that neem-based insecticides had oviposition deterrence, antifeedant and toxic effect to *P. brassicae* [Hasan, F.* and Shafiq Ansari, M. (Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh-202002, India), *Crop Protection*, 2011, **30**(4), 502-507].

NPARR 3(1), 2012-056, **Toxicity of *Acalypha indica* (Euphorbiaceae) and *Achyranthes aspera* (Amaranthaceae) leaf extracts to *Aedes aegypti* (Diptera: Culicidae)**

Alternative control strategies for the dengue vector *Aedes aegypti* L. (Diptera: Culicidae) include botanical insecticides. They are believed to pose little threat to the environment or to human health and may provide practical substitutes for synthetic insecticides. In this study, we determined the biological activities

of methanol extracts of *Acalypha indica* L. (Euphorbiaceae) and *Achyranthes aspera* L. (Amaranthaceae) leaves individually and in combination as botanical insecticides against *Ae. aegypti*. Based on LC₅₀ values for 4th instar *Ae. aegypti*, the combined extracts showed the strongest larvicidal activity (277ppm). *A. aspera* and *A. indica* extracts individually gave similar results (409 and 420ppm, respectively). Respective LC₅₀ values for pupae were 326ppm, 456ppm, and 467ppm. In studies of smoke toxicity, 64% of females exposed to negative control smoke (no extract) blood fed on chicken, whereas 17% blood fed when exposed to smoke containing *A. aspera* extract and to positive control smoke (0.2% d-allethrin). In the field, treatment of water storage tanks ($\approx 0.5\text{m}^3$) with combined plant extract reduced larval and pupal populations by 97% and 81%, respectively, after 5 days. Given the results of this study, further evaluation of the combined (*A. indica* + *A. aspera*) extract as a mosquito larvicide is warranted. Mosquito coils with *A. aspera* extract also show promise as a practical and potentially economical means for mitigating mosquito blood feeding [Kamalakkannan, S.*, Murugan, K. and Barnard, D.R. (Division of Entomology, Department of Zoology, School of Life Sciences, Bharathiar University, Coimbatore - 641 046, Tamil Nadu, India), *Journal of Asia-Pacific Entomology*, 2011, **14**(1), 41-45].

NPARR 3(1), 2012-057, Extraction of natural insecticide azadirachtin from neem (*Azadirachta indica* A. Juss.) seed kernels using pressurized hot solvent

Plant-derived pesticides are gaining popularity on account of the increasing sustainable farming practices and also due to the environmental and health hazards resulting from excessive usage of their synthetic counterparts. The neem (*Azadirachta indica* A. Juss.) tree, belonging to the Meliaceae family, is a storehouse of insecticidal azadirachtin, which possess antifeedant, growth disrupting and larvicidal properties against an array of agricultural insect pests. Pressurized Hot Solvent Extraction (PHSE) is fast emerging as an efficient means for recovering valuable active ingredients from natural plant matrices at an accelerated rate and with a reduced solvent consumption. The technique employing heated organic solvents at elevated pressures is a

potential green substitute for conventional solvent extractions. The present study deals with the extraction of azadirachtin from defatted neem seed kernels (NSK) using pressurized methanol. Important operating variables like temperature, pressure, extraction time, solvent flow rate and particle size influencing the extraction efficiency were investigated in detail. The azadirachtin content in the extracts was determined by HPLC. The optimum conditions for maximizing azadirachtin yield were found to be 50 C temperature, 50 bar pressure, -60 + 80 mesh particle size and 5mL/min extractant flow rate. Under optimal conditions, 210.93 mg azadirachtin was extracted per 100g defatted NSK within an extraction time of 100 min. Moreover, the proposed method resulted in 1.5 fold reduction in solvent consumption as compared to conventional maceration [G.C. Jadeja, R.C. Maheshwari and S.N. Naik* (Centre for Rural Development & Technology, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India), *The Journal of Supercritical Fluids*, 2011, **56**(3), 253-258].

NPARR 3(1), 2012-058, Effect of insecticides alone and in combination with fungicides on nitrification and phosphatase activity in two groundnut (*Arachis hypogea* L.) soils

The effect of selected pesticides, monocrotophos, chlorpyrifos alone and in combination with mancozeb and carbendazim, respectively, was tested on nitrification and phosphatase activity in two groundnut (*Arachis hypogea* L.) soils. The oxidation of ammonical nitrogen was significantly enhanced under the impact of selected pesticides alone and in combinations at 2.5 kg ha⁻¹ in black soil, and furthermore, increase in concentration of pesticides decreased the rate of nitrification, whereas in the case of red soil, the nitrification was increased up to 5.0 kg ha⁻¹ after 4 weeks, and then decline phase was started gradually from 6 to 8 weeks of incubation. The activity of phosphatase was increased in soils, which received the monocrotophos alone and in combination with mancozeb up to 2.5 and 5.0 kg ha⁻¹, whereas the application of chlorpyrifos singly and in combination with carbendazim at 2.5 kg ha⁻¹ profoundly increased the phosphatase activity after 20 days of incubation, in both soils. But higher concentrations of pesticides were either innocuous or inhibitory to the phosphatase

activity [M. Srinivasulu*, G. Jaffer Mohiddin, K. Subramanyam and V. Rangaswamy (Department of Microbiology, Sri Krishnadevaraya University, Anantapur, Andhra Pradesh, 515055, India), Environ Geochem Health, Published online 20 July 2011].

MANURE/FERTILIZERS

NPARR 3(1), 2012-059, Heavy metals in liquid pig manure in light of bacterial antimicrobial resistance

Heavy metals are regularly found in liquid pig manure, and might interact with bacterial antimicrobial resistance. Concentrations of heavy metals were determined by atomic spectroscopic methods in 305 pig manure samples and were connected to the phenotypic resistance of *Escherichia coli* ($n=613$) against 29 antimicrobial drugs. Concentrations of heavy metals (/kg dry matter) were 0.08-5.30 mg cadmium, 1.1-32.0 mg chrome, 22.4-3387.6 mg copper, <2.0-26.7 mg lead, <0.01-0.11 mg mercury, 3.1-97.3 mg nickel and 93.0-8239.0 mg zinc. Associated with the detection of copper and zinc, resistance rates against β -lactams were significantly elevated. By contrast, the presence of mercury was significantly associated with low antimicrobial resistance rates of *Escherichia coli* against β -lactams, aminoglycosides and other antibiotics. Effects of subinhibitory concentrations of mercury on bacterial resistance against penicillins, cephalosporins, aminoglycosides and doxycycline were also demonstrated in a laboratory trial. Antimicrobial resistance in the porcine microflora might be increased by copper and zinc. By contrast, the occurrence of mercury in the environment might, due to co-toxicity, act counter-selective against antimicrobial resistant strains [Christina S. Hölzel*, Christa Müller, Katrin S. Harms, Sabine Mikolajewski, Stefanie Schäfer, Karin Schwaiger and Johann Bauer (Chair of Animal Hygiene, Technische Universität München, Weihenstephaner Berg 3, 85354 Freising, Germany), *Environmental Research*, 2012, **113**, 21-27].

NPARR 3(1), 2012-060, Cadmium distribution in rice plants grown in three different soils after application of pig manure with added cadmium

A glasshouse pot experiment was conducted to investigate Cd concentrations in the aboveground parts of two consecutive crops of rice and Cd availability in three different soils (loam, silt loam, and sandy loam) after application of pig manure with added Cd. Soil pH tended to increase with increasing

application rate of pig manure from 1 to 3% (w/w, oven dry basis). Soil diethylene triamine pentaacetic acid (DTPA) extractable Cd showed a clear positive correlation with soil total Cd content and increased with increasing Cd amendment of the manure but showed no difference between the two manure application rates. Cd concentrations in the grain, husk, and straw were significantly and positively correlated with soil DTPA-extractable Cd ($p < 0.001$). Within each level of manure Cd, the higher rate (3%) of manure produced lower Cd concentrations in the grain, husk, and straw on all three soils than did the lower rate (1%) after the first crop, but this no longer occurred after the growth of the second crop. Grain Cd concentrations exceeded the Chinese National Food Quality Standard (0.2 mg kg^{-1}) most often on the loam, with intermediate frequency on the silt loam, and least often on the sandy loam, the soil with the highest pH and lowest organic carbon content and cation exchange capacity [Cunliang Han, Longhua Wu*, WeinaTan¹, Daoxu Zhong, Yujuan Huang, Yongming Luo and Peter Christie (Key Laboratory of Soil Environment and Pollution Remediation, Institute of Soil Science, Chinese Academy of Sciences, Nanjing, 210008, China), *Environmental Geochemistry and Health*, Published online 22Dec 2011].

NPARR 3(1), 2012-061, Performance of spring barley varieties and variety mixtures as affected by manure application and their order in an organic crop

In order to obtain a high and stable yield of organic spring barley, production should be optimized according to the specific environment. To test the performance of spring barley varieties under varying cropping conditions, a field experiment was carried out in 2003 and 2004 in a six-field mixed organic crop rotation. We investigated the choice of variety, the order in a rotation, and the application of manure (slurry and farmyard manure; 0 to $120 \text{ total-N ha}^{-1}$) on grain yields of six selected varieties with different characteristics grown in either pure stands or in two spring barley mixtures, each consisting of three varieties.

Average grain yield of the barley varieties varied between 3.3 t DM ha^{-1} and 4.1 t DM ha^{-1} . Grain yields of the two mixtures were 4.0 and 3.6 t DM

ha⁻¹, respectively. The varieties/mixtures interacted with crop order and year. Foliar diseases were more severe in the barley following grass-clover with large annual differences in the individual diseases. Despite different rooting depths and nutrient uptake patterns, there was no interaction between variety/mixture and the manure input regarding grain yield.

In the 1st year after grass-clover, one of the two mixtures gave higher grain yield than the average yield of the individual varieties in the mixture. This was not the case in the 4th year after grass-clover and for the second variety mixture. Thus, although the present results did not indicate that some barley varieties were better adapted to conditions with low manure input than others, variety mixtures that give a robust and stable organic production may potentially be developed [Margrethe Askegaard^a, Ingrid K. Thomsen^{a*}, Jørgen Berntsen^a, Mogens S. Hovmøller^b & Kristian Kristensen (Unisense A/S, Brendstrupgaardsvej 21 F, DK-8200 Aarhus N, Denmark), *Acta Agriculturae Scandinavica, Section B - Soil & Plant Science*, 2011, **61**(5), 421-430].

NPARR 3(1), 2012-062, Natural ¹⁵N abundance of paddy rice (*Oryza sativa* L.) grown with synthetic fertilizer, livestock manure compost, and hairy vetch

Nitrogen isotope abundance ($\delta^{15}\text{N}$) of paddy rice (*Oryza sativa* L.) grown for 110 days after transplanting (DAT) under field conditions with ammonium sulfate (AS with -0.4% as a synthetic

fertilizer), pig manure compost (PMC with 15.3% as a livestock manure compost), and hairy vetch (HV with -0.5‰ as a green manure) was investigated to test the possible use of $\delta^{15}\text{N}$ technique in discriminating organically grown from conventionally grown rice. At 15 DAT, the $\delta^{15}\text{N}$ of whole rice decreased ($P < 0.05$) in the order of 10.5‰ for PMC > 5.5‰ for control (without N input) > 4.0‰ for HV > 1.8‰ for AS. This difference seemed to reflect primarily the $\delta^{15}\text{N}$ signal of N sources. Although differences in $\delta^{15}\text{N}$ of rice grown with isotopically distinct N inputs (i.e. PMC vs. AS and PMC vs. HV) became smaller over time, the difference (2.8 and 3.0‰ difference at harvest on 110 DAT, respectively) was still significant ($P < 0.05$). However, there was no distinguishable difference between AS and HV treatment after 42 DAT. Such effect of N inputs on $\delta^{15}\text{N}$ of whole rice was also observed for root, shoot, and grain at harvest. Therefore, our study suggests that it is possible to distinguish rice grown with manure composts from that grown with synthetic fertilizers. However, if green manure of preceding N₂-fixing plants is used as the N source, $\delta^{15}\text{N}$ of rice may not be a good surrogate of N sources [Soek-In Yun, Sang-Sun Lim, Gwang-Sung Lee, Sang-Mo Lee, Han-Yongim, Hee-Myong Ro* and Woo-Jung Choi (Department of Agricultural Biotechnology and Research Institute of Agriculture and Life Sciences, Seoul National University, Seoul, Republic of Korea), *Biology and Fertility of Soils*, Published online 12 April 2011.]

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

NPARR 3(1), 2012-063, **Effect of refining processes on antioxidant capacity, total contents of phenolics and carotenoids in palm oils**

Antioxidant capacity (AC), total phenolic content (TPC) and total carotenoid content (TCC) in palm oils at various stages of the refining process from two technological modes were determined. The obtained mean FRAP and DPPH values for the methanolic extracts of palm oils from mode 1 (19.5-102.8 $\mu\text{mol TE}/100\text{ g}$ and 18.8-103.0 $\mu\text{mol TE}/100\text{ g}$) were lower than for oils from mode 2 (25.6-134.8 $\mu\text{mol TE}/100\text{ g}$ and 25.4-135.4 $\mu\text{mol TE}/100\text{ g}$). The total phenolics (4.1-12.4 mg GA/100g) and carotenoids (0.18-45.8 mg/100 g) in the studied oils were correlated with their antioxidant capacities determined by FRAP and DPPH methods ($r=0.6623-0.9878$). During the refining process, for both technological modes resulted in a loss of AC by 80%, TPC by 26-55% and TCC by 99%. The bleaching step caused the highest losses of AC as determined by FRAP 41% and 46%, DPPH by 43% and 48%, while TPC loss was 45% and 23% and loss of carotenoids was 49% and 56%, in mode 1 and mode 2, respectively [Aleksandra Szydłowska-Czerniak*, Konrad Trokowski, György Karlovits, Edward Szyk (Faculty of Chemistry, Nicolaus Copernicus University, ul. Gagarina 7, 87-100 Toruń, Poland), *Food Chemistry*, 2011, **129**(3), 1187-1192].

NPARR 3(1), 2012-064, **Linseed oil stabilisation with pure natural phenolic compounds**

Linseed has been used for a very long time in human and animal nutrition. Currently, there is an increasing interest in linseed oil because of its particularly high content in α -linolenic acid (ALA), an omega-3 fatty acid (FA). Unfortunately, ALA turns also the oil extremely sensitive to oxidation. This study aimed at assessing four pure representative phenolic compounds, myricetin (flavonol), (+)-catechin (flavonol), genistein (isoflavone), and caffeic acid (hydroxycinnamic acid) at a concentration of 555 $\mu\text{mol}/\text{kg}$ as antioxidants in refined linseed oil (RLO). Their protective effect was assessed by monitoring the hydroperoxide formation, the FA

profile and the residual antioxidant concentration in RLO, along its storage at 60 °C according to the Schaal oven test procedure. Caffeic acid, (+)-catechin and myricetin were found to be more efficient than butylated hydroxyanisole (BHA), a synthetic antioxidant. Interestingly, myricetin strongly reduced ALA oxidation. These results confirm that the chemical structure of the phenolic compounds plays a major role in their antioxidant properties [D. Michotte, H. Rogez, R. Chirinos, E. Mignolet, D. Campos and Y. Larondelle* (Institut des Sciences de la Vie, UCLouvain, Croix du Sud, 2/8, B-1348 Louvain-la-Neuve, Belgium), *Food Chemistry*, 2011, **129**(3), 1228-1231].

NPARR 3(1), 2012-065, **Optimisation of lipase-catalysed interesterification reaction for modulating rheological and heat transfer properties of frying oil**

The present work reports the optimisation of enzyme interesterification reaction of rice bran oil (RBO) and refined, bleached, deodorized, palm olein (RBDPO) blend using immobilized 1,3-specific lipase, to improve the kinematic viscosity and heat transfer coefficient of oil, important for characterising heat transfer during the frying process. Four variables, namely RBO (20-80%) in RBO-RBDPO blend, reaction temperature (25-65°C), enzyme concentration (1-13%, w/w) and reaction time (1-13h) were selected and optimised using response surface methodology (RSM) coupled with central composite rotatable design (CCRD). The optimisation results predicted that optimum reaction conditions for preparing enzyme interesterified oil, having minimum kinematic viscosity ($2.63 \times 10^{-6} \text{ m}^2 \text{ s}^{-1}$) and maximum heat transfer coefficient ($262.0 \text{ Wm}^{-2} \text{ }^\circ\text{C}^{-1}$) were at 62% RBO, temperature 65 °C, enzyme concentration 10% (w/w) and time 6.4h. The predicted values were validated experimentally and corroborated with DSC melting profile and triacylglycerol molecular species data. This investigation could help snack food industries to develop suitable oils for frying operations [Sukumar Debnath, R. Ravi and Belur R. Lokesh*(Department of Lipid Science and Traditional Foods, Central Food Technological Research Institute, Council of Scientific and Industrial Research, Mysore 570 020, India), *Food Chemistry*, 2011, **129**(4), 1444-1452].

NPARR 3(1), 2012-066, Effects of caffeic acid and bovine serum albumin in reducing the rate of development of rancidity in oil-in-water and water-in-oil emulsions

The antioxidant properties of caffeic acid and bovine serum albumin in oil-in-water and water-in-oil emulsions were studied. Caffeic acid (5 mmol/kg emulsion) showed good antioxidant properties in both 30% sunflower oil-in-water (OW) and 20% water-in-sunflower oil emulsions (WO), pH 5.4, during storage at 50 °C. Although bovine serum albumin (BSA) (0.2%) had a slight antioxidant effect, the combination of caffeic acid and BSA showed a synergistic reduction in the rate of development of rancidity, with significant reductions in concentration of total volatiles, peroxide value (PV) and *p*-anisidine

value (PA) for both emulsion types. The synergistic increase in stability of the OW and WO emulsions containing BSA and caffeic acid was 102.9% and 50.4% respectively based on total oxidation (TOTOX) values, which are calculated as $2PV + PA$, with greater synergy calculated if based on formation of headspace volatiles. The OW emulsion was more susceptible to the development of headspace volatiles by oxidation than the WO emulsion, even though the degree of oxidation assessed by the TOTOX value was similar [Enma Conde, Michael H. Gordon*, Andrés Moure, Herminia Dominguez (Hugh Sinclair Unit of Human Nutrition, Department of Food and Nutritional Sciences, The University of Reading, Whiteknights P.O. Box 226, Reading RG6 6AP, United Kingdom), *Food Chemistry*, 2011, **129**(4), 1652-1659].

PHYTOCHEMICALS

*NPARR 3(1), 2012-067, The blue anthocyanin pigments from the blue flowers of *Heliophila coronopifolia* L. (Brassicaceae)*

Six acylated delphinidin glycosides (pigments **1–6**) and one acylated kaempferol glycoside (pigment **9**) were isolated from the blue flowers of cape stock (*Heliophila coronopifolia*) in Brassicaceae along with two known acylated cyanidin glycosides (pigments **7** and **8**). Pigments **1–8**, based on 3-sambubioside-5-glucosides of delphinidin and cyanidin, were acylated with hydroxycinnamic acids at 3-glycosyl residues of anthocyanidins. Using spectroscopic and chemical methods, the structures of pigments **1**, **2**, **5**, and **6** were determined to be: delphinidin 3-*O*-[2-*O*-(β -xylopyranosyl)-6-*O*-(acyl)- β -glucopyranoside]-5-*O*-[6-*O*-(malonyl)- β -glucopyranoside], in which acyl moieties were, respectively, *cis-p*-coumaric acid for pigment **1**, *trans*-caffeic acid for pigment **2**, *trans-p*-coumaric acid for pigment **5** (a main pigment) and *trans*-ferulic acid for pigment **6**, respectively. Moreover, the structure of pigments **3** and **4** were elucidated, respectively, as a demalonyl pigment **5** and a demalonyl pigment **6**. Two known anthocyanins (pigments **7** and **8**) were identified to be cyanidin 3-(6-*p*-coumaroyl-sambubioside)-5-(6-malonyl-glucoside) for pigment **7** and cyanidin 3-(6-feruloyl-sambubioside)-5-(6-malonyl-glucoside) for pigment **8** as minor anthocyanin pigments. A flavonol pigment (pigment **9**) was isolated from its flowers and determined to be kaempferol 3-*O*-[6-*O*-(*trans*-feruloyl)- β -glucopyranoside]-7-*O*-cellobioside-4'-*O*-glucopyranoside as the main flavonol pigment.

On the visible absorption spectral curve of the fresh blue petals of this plant and its petal pressed juice in the pH 5.0 buffer solution, three characteristic absorption maxima were observed at 546, 583 and 635 nm. However, the absorption curve of pigment **5** (a main anthocyanin in its flower) exhibited only one maximum at 569 nm in the pH 5.0 buffer solution, and violet color. The color of pigment **5** was observed to be very unstable in the pH 5.0 solution and soon decayed. In the pH 5.0 solution, the violet color of pigment **5** was restored as pure blue color by addition of pigment **9** (a main flavonol in this flower) like its fresh flower, and its blue solution exhibited the same

three maxima at 546, 583 and 635 nm. On the other hand, the violet color of pigment **5** in the pH 5.0 buffer solution was not restored as pure blue color by addition of deacyl pigment **9** or rutin (a typical flower copigment). It is particularly interesting that, a blue anthocyanin-flavonol complex was extracted from the blue flowers of this plant with H₂O or 5% HOAc solution as a dark blue powder. This complex exhibited the same absorption maxima at 546, 583 and 635 nm in the pH 5.0 buffer solution. Analysis of FAB mass measurement established that this blue anthocyanin-flavonol complex was composed of one molecule each of pigment **5** and pigment **9**, exhibiting a molecular ion [M+1]⁺ at 2102 *m/z* (C₉₃H₁₀₅O₅₅ calc. 2101.542). However, this blue complex is extremely unstable in acid solution. It really dissociates into pigment **5** and pigment **9** [Norio Saito, Fumi Tatsuzawa*, Kenjiro Toki, Koichi Shinoda, Atsushi Shigihara, Toshio Honda (Laboratory of Olericultural and Floricultural Science, Faculty of Agriculture, Iwate University, Morioka, Iwate 020-8550, Japan), *Phytochemistry*, 2011, **72**(17), 2219-2229].

*NPARR 3(1), 2012-068, Carboxylesterases from the seeds of an underutilized legume, *Mucuna pruriens*, isolation, purification and characterization*

Two carboxylesterases (ME-III and ME-IV) have been purified to apparent homogeneity from the seeds of *Mucuna pruriens* employing ammonium sulfate fractionation, cation exchange chromatography on CM-cellulose, gel-permeation chromatography on Sephadex G-100 and preparative PAGE. The homogeneity of the purified preparations was confirmed by polyacrylamide gel electrophoresis (PAGE), gel-electrofocussing and SDS-PAGE. The molecular weights determined by gel-permeation chromatography on Sephadex G-200 were 20.89 kDa (ME-III) and 31.62 kDa (ME-IV). The molecular weights determined by SDS-PAGE both in the presence and absence of 2-mercaptoethanol were 21 kDa (ME-III) and 30.2 kDa (ME-IV), respectively, suggesting a monomeric structure for both the enzymes. The enzymes were found to have Stokes radius of 2.4 nm (ME-III) and 2.7 nm (ME-IV). The isoelectric pH values of the enzymes, ME-III and ME-IV, were 6.8 and 7.4, respectively. ME-III and ME-IV were classified as carboxylesterases employing PAGE in conjunction with substrate and inhibitor specificity.

The K_m of ME-III and ME-IV with 1-naphthyl acetate as substrate was 0.1 and 0.166 mM while with 1-naphthyl propionate as substrate the K_m was 0.052 and 0.0454 mM, respectively. As the carbon chain length of the acyl group increased, the affinity of the substrate to the enzyme increased indicating hydrophobic nature of the acyl group binding site. The enzymes exhibited an optimum temperature of 45°C (ME-III) and 37 °C (ME-IV), an optimum pH of 7.0 (ME-III) and 7.5 (ME-IV) and both the enzymes (ME-III and ME-IV) were stable up to 120 min at 35 °C. Both the enzymes were inhibited by organophosphates (dichlorvos and phosphamidon), but resistant towards carbamates (carbaryl and eserine sulfate) and sulphhydryl inhibitors (p-chloromercuribenzoate, PCMB) [K.S. Chandrashekharaiah*, N. Ramachandra Swamy and K.R. Siddalinga Murthy (Department of Biotechnology, PES Institute of Technology, BSK III Stage, Hosakerahalli, Bangalore 560 085, Karnataka, India), *Phytochemistry*, 2011, **72**(18), 2267-2274].

NPARR 3(1), 2012-069, Characterization of phytochemicals and antioxidant activities of a Purple Tomato (*Solanum lycopersicum* L.)

A newly developed nongenetically modified purple tomato V118 was investigated for its phytochemical compositions and antioxidant activities. A highly efficient and sensitive UPLC method was developed for both the phenolics and carotenoids, which showed that in addition to the phytochemicals commonly known for tomatoes, V118 had a unique composition of anthocyanins. The total carotenoid content of V118 was 234.78 µg/g dry weights (DW), and the total phenolic content was 659.11 mg GAE/100 g DW. The antioxidant activities of the lipophilic extract as measured by the PCL and ORAC-L assays were 30.11 µmol TE/g DW and 11.97 µmol TE/g DW, respectively, while the hydrophilic extracts as determined by the ORAC-H and FRAP assays were 323.23 µmol TE/g DW and 54.95 µmol AAE/g DW, respectively. The LC-MS study showed three major anthocyanins, which were mainly acylglycosides of petunidin and malvidin. This study showed that purple tomatoes such as V118 possess additional phytochemicals like anthocyanins, which can potentially have added health benefits [Hongyan Li, Zeyuan Deng, Ronghua Liu, J. Christopher Young, Honghui Zhu, Steven Loewen

and Rong Tsao* (State Key Lab of Food Science and Technology, Institute for Advanced Study, Nanchang University, Nanchang 330047, Jiangxi, China), *Journal of Agriculture and Food Chemistry*, 2011, **59** (21), 11803-11811].

NPARR 3(1), 2012-070, Identification of Chrysoplenetin from *Vitex negundo* as a Potential Cytotoxic Agent against PANC-1 and a Panel of 39 Human Cancer Cell Lines (JFCR-39)

Human pancreatic cancer is known to be the most deadly disease with the lowest 5-year survival rate and is resistant to well known conventional chemotherapeutic drugs in clinical use. Screening of medicinal plants from Myanmar utilizing antiausterity strategy led to the identification of *Vitex negundo* as one of the medicinal plants having potent preferential cytotoxic activity against PANC-1 human pancreatic cancer cells. Bioactivity-guided phytochemical investigation led to the isolation of chrysoplenetin (1) and chrysosplenol D (2) as the active constituents with a PC_{50} value of 3.4 µg/mL and 4.6 µg/mL, respectively, against PANC-1 cells. Both these compounds induced apoptosis-like morphological changes in PANC-1 cells. Chrysoplenetin was further tested against a panel of 39 human cancer cell lines (JFCR-39) at the Japanese Foundation for Cancer Research, and 25 cell lines belonging to lung, breast, CNS, colon, melanoma, ovarian, prostate cancer and stomach cancer cell lines were found to be highly sensitive to chrysoplenetin at a submicromolar range. In the JFCR-39 panel, lung NCI-H522, ovarian OVCAR-3 and prostate PC-3 cells were found to be most sensitive with GI_{50} of 0.12, 0.18 and 0.17 µM, respectively. The COMPARE analysis suggested that the molecular mode of action of chrysoplenetin was unique compared with the existing anticancer drugs [Suresh Awale*, Thein Zaw Linn, Feng Li, Yasuhiro Tezuka, Aung Myint, Akihiro Tomida, Takao Yamori, Hiroyasu Esumi and Shigetoshi Kadota (Institute of Natural Medicine, University of Toyama, 2630-Sugitani, Toyama 930-0194, Japan), *Phytotherapy Research*, 2011, **25**(12), 1770-1775]

NPARR 3(1), 2012-071, Antiproliferative alkaloids from *Crinum zeylanicum*

Crinum zeylanicum is used in folk medicine as a rubefacient in rheumatism, a treatment for malaria or

as a poison. Complex alkaloid profiles in *C. zeylanicum* plant organs were revealed by GC-MS analysis, including several bioactive compounds. Crinine, lycorine, 11-*O*-acetoxyambelline, ambelline, 6-hydroxybuphanidrine and 6-ethoxybuphanidrine (an artefact of the isolation procedure) were isolated. Crinine, 6-hydroxybuphanidrine and 6-ethoxybuphanidrine showed antiproliferative effects against human tumor cell lines, crinine being the most active (IC_{50} 14.04 μ m against HL-60/Dox). The latter compound induced apoptosis in a dose-dependent manner in HL-60 and MDA-MB-231 cell

lines. Structure-activity relationships in the studied molecules indicated that the hydrogenation of the double bond at C1-C2 leads to a loss of activity, whereas substitutions at C6, C8 and C11 affect their cytotoxicity [Strahil Berkov, Stefania Romani, Maria Herrera, Francesc Viladomat, Carles Codina, Georgi Momekov, Iliana Ionkova, Jaume Bastida*(Departament de Productes Naturals, Biologia Vegetal i Edafologia, Facultat de Farmàcia, Universitat de Barcelona, Av. Joan XXIII s/n, 08028 Barcelona, Spain), *Phytotherapy Research*, 2011, **25** (11), 1686-1692].

SPICES/CONDIMENTS

NPARR 3(1), 2012-072, **Screening of selected Asian spices for anti obesity-related bioactivities**

The potential health effects of 30 spices, commonly used for daily consumption, were submitted to bioactivity screening with several anti-obesity related bioassays: adenosine A1 receptor binding, cannabinoid CB1 receptor binding, TNF- α and 3T3-L1 adipocytes differentiation induction. Sesame seed and red chilli exhibited high binding activity to the adenosine A1 receptor and nutmeg, mace, black pepper and turmeric to the cannabinoid CB1 receptor, while piment and turmeric showed high inhibition of TNF- α accumulation. Black onion seed proved to be the only spice with high 3T3-L1 adipocyte differentiation induction activity. Several well known major compounds found in these active spices were tested with the respective bioassays but did not show activity. Thus, it appears that other minor compounds or the synergistic effects of different constituents are responsible for the observed activity [Nancy Dewi Yuliana, Muzamal Iqbal, Muhammad Jahangir, Christofora Hanny Wijaya, Henrie Korthout, Marijke Kottenhage, Hye Kyong Kim*and Robert Verpoorte (Dept. Pharmacognosy, Sect. Metabolomics, Institute of Biology, Leiden University, Einsteinweg 55 2300 RA, Leiden, The Netherlands), *Food Chemistry*, 2011, **126**(4), 15 1724-1729].

NPARR 3(1), 2012-073, ***Coriandrum sativum*: a daily use spice with great medicinal effect.**

Coriandrum sativum Linn. has been credited with many medicinal properties. The green leaves of coriander are known as "asotu" in the Eastern Anatolian region or "cilantro" in the United States and are consumed as fresh herb. The essential oil obtained from its fruits at amounts ranging from approximately 0.5 to 2.5% is used both in flavours and in the manufacture of perfumes and soaps. The plant is grown widely all over the world for seed, as a spice, or for essential oil production. It is one of the earliest spices used by mankind. It has been used as a flavouring agent in food products, perfumes and cosmetics. It is used for various purposes such as for flavouring sweets, beverages, tobacco products and

baked goods and as a basic ingredient for curry powder. It has been used as an analgesic, carminative, digestive, anti-rheumatic and antispasmodic agent [Poonam Mahendra and Shradha Bisht, *Pharmacognosy Journal*, 2011, **3**(21), 84-88].

NPARR 3(1), 2012-074, **Microwave drying characteristics of coriander (*Coriandrum sativum* L.) leaves**

Effect of microwave power output on effective moisture diffusivity, colour parameters and rehydration characteristics of coriander leaves (*Coriandrum sativum* L.) was investigated by using a microwave drier. Within the range of microwave power values, 180–360 W, effective moisture diffusivities were found to be 6.3×10^{-11} – 2.19×10^{-10} m²/s and the result could successfully be presented with the model suggested by Midilli et al. No significant differences in the colour parameters were obtained between the fresh and dried samples and the changes in their values were not dependent on the power outputs of the microwave drier. The highest rehydration capacity was recorded for the samples dried at 180 W and lowest at 900 W [Ayse Sarimeseli*(Department of Chemical Engineering, Inonu University, 44069 Malatya, Turkey), *Energy Conversion and Management*, 2011, **52**(2), 1449-1453].

NPARR 3(1), 2012-075, **Effect of vermicompost and chemical fertilizers on growth, yield and quality of coriander (*Coriandrum sativum* L.) in a semi-arid tropical climate.**

Field experiments were conducted at Bangalore (semi-arid tropical climate) to study the influence of vermicompost and chemical fertilizers (NPK and sulphur) on growth, seed and oil yield and oil quality of coriander (*Coriandrum sativum*). The results of the study showed that application of vermicompost (7.5 t ha⁻¹) +25% recommended NPK (25:12.5:12.5 kg ha⁻¹) produced maximum biomass (28.2 q ha⁻¹), seed (10.82 q ha⁻¹) and oil yield (6.53 kg ha⁻¹) of coriander which was at par with other treatments except full organic manure and control which indicated that 75% NPK requirement can be supplemented through vermicompost without loss of yield. The oil content and quality were not influenced by the treatments

tested Munnu Singh, *Journal of Spices and Aromatic Crops*, 2011, **20**(1), 30-33].

NPARR 3(1), 2012-076, Fertigation studies on leaf NPK content in coriander (*Coriandrum sativum* L.).

The present investigation was carried out to find the optimum level of fertigation for higher yield besides quality in coriander. Two genotypes (Co CR-4, CS 11) were used for this study Drip fertigation with water soluble fertilizer at 75%, 100%, 125% RDF along with the recommended normal fertilizer applied to soil with furrow irrigation. The variety Co CR-4 (V₁) had maximum leaf N content than CS 11 (V₂). Regarding the interaction effect, the maximum leaf N content was recorded in Co CR-4 with 125 per cent of fertigation (T₁V₁) followed by T₁V₂ in both two seasons. Application of 125 per cent water soluble fertilizer registered the highest NPK content in leaf [Rajaraman, G.; Paramaguru, P.; Aruna, P.; Sudagar, I. P., *Asian Journal of Horticulture*, 2011, **6**(1), 8-10].

NPARR 3(1), 2012-077, Effect of foliar application of chemicals and growth regulator on growth and seed yield in coriander (*Coriandrum sativum* L.).

The effect of foliar application of chemicals and growth regulator was studied on Coriander (*Coriandrum sativum* L.) cv. CO.3, under rainfed culture. Single spray of the chemicals and growth regulator was given to a field grown crop one month after sowing. Cycocel (250ppm) reduced the plant height and improved the field survival and crop stand. Cycocel also promoted the primary and secondary branching of the plants. Higher values for relative water content, chlorophyll stability and leaf proline were also obtained in this treatment. The spray has also promoted the yield contributing factors like umbel number, umbellet number and seed number. The 27.42 per cent seed yield increase was recorded [Vijaya Kumar A (Seed Science, Tamil Nadu Agricultural University, Coimbatore-641 003, Tamil Nadu), *Progressive Horticulture*, 2011, **43**(2), 193-195].

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

NPARR 3(1), 2012-078, Carbohydrate composition of Spanish unifloral honeys

As part of a research project aiming to characterise the most important Spanish floral honeys, the carbohydrate analysis of 109 honey samples was carried out. The main unifloral sources, identified by pollen analysis, were *Citrus*, heather, *Eucalyptus*, rosemary, *Echium* and Rosaceae. A high proportion of multifloral samples were also present.

A GC method based on the use of two different stationary phases allowed the analysis of a high number of carbohydrates. A quantitation procedure which takes into account the possible errors caused by unidentified overlapping compounds was employed: two monosaccharides, 14 disaccharides and 21 trisaccharide peaks were quantitatively determined. Although qualitative results were similar for all samples, a wide range of quantitative variability was found, even within each source.

Multivariate statistical techniques were applied to the carbohydrate concentration data in order to study possible relationships among the floral sources and sugar composition. Several carbohydrates were found to be characteristic of the most important honey types, although their concentrations in honey do not allow an unambiguous classification of the main unifloral sources [E. de la Fuente, A.I. Ruiz-Matute, R.M. Valencia-Barrera, J. Sanz and I. Martínez Castro*(Instituto de Química Orgánica General (CSIC), Juan de la Cierva 3, 28006 Madrid, Spain), *Food Chemistry*, 2011, **129**(4), 1483-1489].

NPARR 3(1), 2012-079, Economics of sugarcane production using ecofriendly technology in cuddalore district, Tamil Nadu

A study was undertaken in Annagramam block in Cuddalore District, Tamil Nadu, India, to work out the costs and returns associated with sugarcane cultivation and identify the factors determining the adoption of bio-inputs. The study included conventional analysis, costs and returns, decomposition analysis, and adoption model. The collected data was analyzed using econometric tools

and the results discussed. The results show that the subsidies, tax exemption on bio-inputs, institutional credit and insurance, and awards/recognition to bio-input adopting farmers are some factors that will influence non-adopters to adopt bio-inputs. To promulgate widespread bio-inputs adoption, the extension system should document the success stories and widely publicize their improved benefit-cost ratios and also develop local leadership to motivate the farmers for effective participation in the bio-input programs. Since a major portion of sugarcane production is used in domestic consumption, the government must create awareness and health consciousness among domestic consumers that include creating a market for pesticide free products [Thennarasu, R. and Banumathy, V. (Department of Agricultural Economics, Faculty of Agriculture, Annamalai University, Annamalainagar-608 002, Tamil Nadu, India), *Indian Journal of Agricultural Economics*, 2011, **66**(1), 88-96].

NPARR 3(1), 2012-080, Impact of cut to crush delay and bio-chemical changes in sugarcane

In the present era of economic liberalization, sugar has become an important commodity for human consumption as well as trade. The global importance of this versatile sweetener could be judged by the fact that its consumption is expected to go much high upto 2020 AD as compared to the present level. Sugarcane plant, once detached from ground loses its machinery to synthesize sucrose. Thus a well ripened harvested crop may lose its sugar within a few days, which tends to increase further due to high ambient temperature. These losses tend to increase during processing, especially in those units where hygienic conditions are rather unsatisfactory. The post harvest sugar loss is one of the most vexing problems of sugar industry and has attracted widespread attention in the recent years. A study was carried out to examine the effect of staling h on three early and three mid-late maturing varieties in view of biochemical changes occurred in staled cane juice from 0 h-96 h. The ambient temperature ranged around 40-42°C. TSS, sucrose, purity coefficient, dextran, proteins, free amino acid contents, acid and neutral invertases were assayed. The sucrose content rapidly deteriorated after 24 h staling. The invert sugar and dextran content increased rapidly after 48 h. free amino acid contents increased rapidly up to 72 h.

Free amino acid contents were higher in early group of varieties than mid-late group of varieties. Findings indicated that both the group of varieties fastly deteriorated sucrose content after 24 h. Higher dextran formation was observed after 48 h in most of the early varieties due to higher concentration of sucrose thereby TSS increased during staling periods. It may be inferred that the early maturing varieties should be crushed within 24 h and mid-late maturing varieties within 48 h after harvest under high ambient temperature. Mid-late maturing varieties showed lower values of dextran, free amino acid content, protein and invertase activities. Therefore, these varieties were found capable in retaining quality characters up to longer durations after harvest. It has also been observed that mid-late varieties having lower sucrose content than early varieties deteriorated less during staling. In the cane juice of early maturing varieties, where sucrose and brix values were higher than mid-late, produced relatively higher invertase activities, dextran, free amino acid content and proteins in the late staling h possibly due to higher microbial infestation [Saxena, P., Srivastava R.P.* and Sharma, M.L. (Department of Molecular Biology, U.P. Council of Sugarcane Research, Shahjahanpur-242001, India), *Australian Journal of Crop Science*, 2010, 4(9), 692-699].

NPARR 3(1), 2012-081, Residue from sugarcane juice filtration (filter cake): Energy use at the sugar factory

Sugar from sugarcane represents 65-70% of the world production of sugar and its production is

mainly located in developing countries. The production process requires high amounts of steam and electricity at the different stages, and generates important quantities of residues. A major residue of the sugar production is filter cake (in Cuba: Cachaza), the residue from cane juice filtration. Filter cake causes significant pollution, and in several sugar factories it is considered a waste, posing problems of management and final disposal. This paper reviews recycling and recovery opportunities of filter cake (and bagasse) and experimentally studies the use of filter cake as fuel at the sugar factory. Filter cake may e.g. be used as a fertilizer/soil improver directly applied on the fields or after composting. During its decomposition, it generates, however, an acid leachate and emits significant amounts of greenhouse gases. Moreover, the experimental part of the paper shows that blends of filter cake with bagasse can be combusted in industrial boilers in sugar factories, and that loose, non-vitrified ashes with a similar appearance as bagasse ash are obtained. This results in lower volumes and masses of residues to be transported, so that transportation costs are reduced. Moreover, it gives a new economic value to the filter cake, and reduces its environmental impact. When all filter cake would be combusted blended with bagasse, about 25% more ash would be obtained than for bagasse and the trace element composition would comply with the regulatory limits for use as fertilizer/soil improver [George, P.A.O., Eras, J.J.C.*, Gutierrez, A.S., Hens, L. and Vandecasteele, C. (Universidad de Cienfuegos, Carretera a Rodas, Cienfuegos, Cuba), *Waste and Biomass Valorization*, 2010, 1(4), 407-413].

THERAPEUTICS

NPARR 3(1), 2012-082, Antihyperglycemic and hypolipidemic activities of *Setaria italica* seeds in STZ diabetic rats

Setaria italica is commonly known as Foxtail millet. In India it is chiefly cultivated in Andhra Pradesh and Tamilnadu. It can be eaten as a sweet or savory food in all ways that rice is used. Due to the presence of high fiber content, it is suggested as a food for diabetic patients in India. To evaluate the antihyperglycemic and hypolipidemic potential of *S. italica* seeds in streptozotocin induced diabetic rats. Anti hyperglycemic activity of different doses of *S. italica* seed aqueous extract (SISAE) was evaluated by oral administration of SISAE in streptozotocin induced diabetic rats and it was compared with that of Glibeclamide, a standard oral hypoglycemic agent. The effect of long-term treatment with 300 mg of SISAE/kg. b.w./day on blood glucose, glycemic control and serum lipids was evaluated in normal and diabetic rats. Results: The dose of 300 mg of SISAE/kg b.w. produced a significant fall (70%) in blood glucose in diabetic rats after 6 h of administration of the extract. None of the doses of the SISAE could produce any change in blood glucose levels of normal rats. After 30 days of treatment with 300 mg of SISAE/kg b.w./day there was a significant decrease in fasting blood glucose associated with a significant improvement in glycemic control as evidenced by lower levels of HbA1c in diabetic treated rats when compared to those in untreated diabetic rats. The aqueous extract also exhibited significant hypolipidemic effect which is evident from lower levels of triglycerides, total, LDL and VLDL cholesterol and increase in the levels of HDL cholesterol in diabetic treated rats compared to those in diabetic untreated rats. The antihyperglycemic and hypolipidemic activities of the aqueous extract could be due to the presence of alkaloids or glycosides as active principles. Conclusion: These findings demonstrate that the aqueous extract of *S. italica* seeds have excellent antihyperglycemic and hypolipidemic activities and thus have great potential as a source for natural health products [Sireesha, Y., Kasetti, R.B., Nabi, S.A., Swapna, S. and Apparao, C.* (Department of Biochemistry, Sri Venkateswara

University, Tirupati-517502, AP, India), *Pathophysiology*, 2011, **18**(2), 159-164].

NPARR 3(1), 2012-083, Coconut (*Cocos nucifera* L.: Areaceae): In health promotion and disease prevention

Coconut, *Cocos nucifera* L., is a tree that is cultivated for its multiple utilities, mainly for its nutritional and medicinal values. The various products of coconut include tender coconut water, copra, coconut oil, raw kernel, coconut cake, coconut toddy, coconut shell and wood based products, coconut leaves, coir pith etc. Its all parts are used in some way or another in the daily life of the people in the traditional coconut growing areas. It is the unique source of various natural products for the development of medicines against various diseases and also for the development of industrial products. The parts of its fruit like coconut kernel and tender coconut water have numerous medicinal properties such as antibacterial, antifungal, antiviral, antiparasitic, antidermatophytic, antioxidant, hypoglycemic, hepatoprotective, immunostimulant. Coconut water and coconut kernel contain microminerals and nutrients, which are essential to human health, and hence coconut is used as food by the peoples in the globe, mainly in the tropical countries. The coconut palm is, therefore, eulogised as 'Kalpavriksha' (the all giving tree) in Indian classics, and thus the current review describes the facts and phenomena related to its use in health and disease prevention [Deb Mandal, M. and Mandal, S.* (Department of Physiology and Biophysics, KPC Medical College and Hospital, 1F Raja S C Mallick Road, Jadavpur, Kolkata-700 032, India), *Asian Pacific Journal of Tropical Medicine*, 2011, **4**(3), 241-247]

NPARR 3(1), 2012-084, An ethnomedicinal, phytochemical and pharmacological profile of *Desmodium gangeticum* (Linn.) DC. and *Desmodium adscendens* (Sw.) DC

Desmodium gangeticum (L.) DC. and *Desmodium adscendens* (Sw.) DC. are two important and well explored species of genus *Desmodium* (Fabaceae (alt. Leguminosae) subfamily: Faboideae). *Desmodium gangeticum* is used as a tonic, febrifuge, digestive, anticatarrhal, antiemetic, in inflammatory

conditions of chest and in various other inflammatory conditions in the Ayurvedic System of Medicine while *Desmodium adscendens* is widely used for the treatment of asthma in Ghana, Africa. Aim of the review: The aim of this review is to provide comprehensive information on the botany, traditional uses, phytochemistry, pharmacological research and toxicology of *Desmodium gangeticum* and *Desmodium adscendens* to explore their therapeutic potential and future research opportunities. All the available information on *Desmodium gangeticum* and *Desmodium adscendens* was collected via electronic search (using Pubmed, SciFinder, Scirus, Google Scholar, JCCC@INSTIRC and Web of Science) and a library search for articles published in peer-reviewed journals. About 25 different species of *Desmodium* including *Desmodium gangeticum* and *Desmodium adscendens* are used ethnomedicinally all over the world. Phytochemical research on *Desmodium gangeticum* and *Desmodium adscendens* has led to the isolation of alkaloids, pterocarpanes, phospholipids, sterols, flavones and flavonoid glycosides from *Desmodium gangeticum* and triterpenoid saponins, phenylethylamines and indole-3-alkyl amines from *Desmodium adscendens*. Crude extracts, fractions and isolated components of *Desmodium gangeticum* and *Desmodium adscendens* showed a wide spectrum of in vitro and in vivo pharmacological activities like antileishmanial, immunomodulatory, antiasthmatic, smooth muscle relaxant, anti-inflammatory, anti-ulcer, cardio-protective, antidiabetic, anti-amnesic, antiviral, antioxidant and hepatoprotective activities. *Desmodium gangeticum* and *Desmodium adscendens* have emerged as a good source of traditional medicine. *Desmodium gangeticum* possesses the ability to scavenge the free radicals generated during ischaemia and ischaemia reperfusion thereby preserving the mitochondrial respiratory enzymes that eventually lead to cardio-protection and has potential prophylactic and therapeutic efficacy against Leishmania infection. *Desmodium adscendens* is useful against chronic bronchitis and asthma. However, there is a need to search for individual secondary metabolites responsible for these actions and study their mode of actions, bioavailability, pharmacokinetics and physiological pathways in sufficient detail. The promising results should be further substantiated by clinical trials [Rastogi, S. *, Pandey, M.M., Rawat, A.K.S (Pharmacognosy and

Ethnopharmacology Division, National Botanical Research Institute, Rana Pratap Marg, Lucknow 226 001, India), *Journal of Ethnopharmacology*, 2011, **136**(2), 283-296].

NPARR 3(1), 2012-085, *Cynodon dactylon* (L.) Pers.: A valuable medicinal plant

Cynodon dactylon (L.) Pers. is a perennial grass. The plant is a rich source of metabolites such as proteins, carbohydrates, mineral constituents, P-sitosterol, flavanoids, alkaloids, glycosides and triterpenoids. The plant has been long used in the traditional medicines to treat various ailments such as anasarca, cancer, convulsions, cough, cramps, diarrhea, dropsy, dysentery, epilepsy, headache, hemorrhage, hypertension, hysteria, measles, rubella, snakebite, sores, stones, tumors, urogenital disorders, warts and wounds. The plant shows biological activities such as antiviral and antimicrobial properties. This study provides a comprehensive detail of the pharmacognostical characteristics, biological effects and medicinal uses of *Cynodon dactylon*. A review of some important patents on *Cynodon dactylon* is presented [Nagori, B.P. and Solanki, R.* (Lachoo Memorial College of Sciences and Technology, Pharmacy Wing, Shastri Nagar, Jodhpur-342003, Rajasthan, India), *Research Journal of Medicinal Plant*, 2011, **5**(5), 508-514].

NPARR 3(1), 2012-086, **Evaluation of phytochemical, antimicrobial and GC-MS analysis of extracts of *Indigofera trita* L.f. spp. *subulata* (Vahl ex Poir)**

Indigofera trita L.f. spp. *subulata* (Vahl ex Poir) distributed in the southern part of India particularly in Tamilnadu and it has potential medicinal properties and used in the treatment of tumours and liver disorders. The work carried out in the plant is much less, the present work was designed to investigate the preliminary phytochemical, antibacterial and GCMS analysis of various parts of the plant. The medicinally compounds from crude extracts of leaf, stem and root portions were fractionated in different solvents (aqueous, chloroform, petroleum ether and ethanol) subjected to preliminary phytochemical and antibacterial activities. The potential extracts were analysed through FTIR and GCMS. Phytochemical screening of leaves, stem and root extracts of

Indigofera subulata revealed the presence of alkaloids, Quinones, reducing sugars, saponins, terpenoids and tannins. The ethanol extract of leaves and stem was found to exhibit activity against *Pseudomonas aeruginosa*. Fourteen compounds were identified by GC-MS analysis. Phytomedicines avenues for the identifications of medicinally significant compounds with potential activity [Vinoth, S., Rajesh Kanna, P., Gurusaravanan, P., Jayabalan, N.* (Department of Plant Biotechnology, Bharathidasan University, Tiruchirappalli-620 024, Tamilnadu, India), *International Journal of Agricultural Research*, 2011, **6**(4), 358-367].

NPARR 3(1), 2012-087, *In vivo* hepatoprotective effect of *Trianthema decandra* extracts on carbon tetrachloride induced rats

In the present investigation, an attempt has been made to test the hepatoprotective efficacy of the herbal plant, *Trianthema decandra* on carbon tetrachloride induced toxic hepatitis. The carbon tetrachloride induced rats showed higher level of total protein (TP), total cholesterol (TC), triglycerides (TG), Alkaline Phosphatase (ALP), Aspartate transaminase (AST), Alanine transaminase (ALT) and bilirubin in serum. The leaf extract of *T. decandra* was treated with hepatitis rats showed remarkable reduction in the activity of TP, TC, TG, ALP, AST, ALT and bilirubin when compared to the normal rats. This research suggests that the crude extract of *T. decandra* could be control the carbon tetrachloride induce hepatitis [Priya, G. and C. Chellaram, C. (Department of Biomedical Engineering, Vel Tech Multi Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai, Tamilnadu, India), *Journal of Chemical and Pharmaceutical Research*, 2011, **3**(3), 154-158].

NPARR 3(1), 2012-088, Determination of antibacterial, antioxidant and cytotoxicity effect of *Indigofera tinctoria* on lung cancer cell line NCI-H69

The present study has been under taken with an objective to determine the antibacterial, antioxidant and cytotoxic activity of the leaf extract *Indigofera tinctoria*. The selected medicinal plant was collected from near by region of Coimbatore. Antibacterial, activity was carried against gram positive and gram

negative bacteria. Antioxidant property was determined both quantitatively and qualitatively. Determination of cytotoxic activity of leaf extract was carried out on lung cancer cell line. The compound present in the extract were identified by GC-MS analysis. The extract screened for photochemical analysis was found to contain bioactive compounds like flavonoids, saponins, tannins, steroidal terpenes, phenols and anthroquinone. The leaf extract had shown the ability to inhibit the growth of gram positive bacteria namely *Bacillus pumilus*, *Staphylococcus aureus* and *Streptococcus pyogenes* and zone of inhibition of 16 and 17 mm, respectively but not shown growth of inhibition on gram negative bacteria *Escherichia coli* and *Pseudomonas aeruginosa*. Strong antioxidant activity was observed both qualitatively and quantitatively. The strong antioxidant was observed at 250 $\mu\text{g mL}^{-1}$ with an IC_{50} value of 51.66 which is higher than that of standard ascorbic acid. The cytotoxic effect of leaf extract on lung cancer cell line NCI-H69 was studied. The percentage cell viability of cells was found to decrease at increasing concentration. GC-MS analysis of the leaf extract shows 6 compounds. This study suggests that ethanol extract of *Indigofera tinctoria* have profound antibacterial, antioxidant and cytotoxic effect [Renukadevi, K.P., Suhani Sultana, S* (School of Biotechnology, Dr. G.R. Damodaran College of Science, Coimbatore-641014, India), *International Journal of Pharmacology*, 2011, **7**(3), 356-362].

NPARR 3(1), 2012-089, Anti-diabetic effects of aqueous ethanolic extract of *Hibiscus rosasinensis* L. on streptozotocin-induced diabetic rats and the possible morphologic changes in the liver and kidney

Medicinal plants play a major role in the management of Diabetes mellitus especially in developing countries. The present study investigated the possible therapeutic effects of *Hibiscus rosasinensis* (*H. rosasinensis*) extract on certain biochemical markers in Streptozotocin (STZ)-induced diabetes mellitus in rats. The effects of an aqueous ethanolic extract of *H. rosasinensis* Aerial part on blood glucose, albumin, albumin/globulin ratio, urea, insulin, C-peptide, uric acid and creatinine and the activities of diagnostic marker enzymes aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase and gamma-glutamyl transpeptidase

were examined in the plasma, liver and kidney tissues of control and experimental groups. Oral administration of *H. rosasinensis* (500 mg kg⁻¹) aqueous extract to diabetic rats for 4 weeks significantly reduced blood glucose, urea, uric acid and creatinine but increased the activities of insulin, C-peptide, albumin, albumin/globulin ratio and restored all marker enzymes to near control levels. The present results shown that *H. rosasinensis* extract has an antihyperglycaemic effect and consequently may alleviate liver and renal damage associated with STZ-induced diabetes mellitus in rats [Mandade, R. and Sreenivas, S.A.* (Guru Nanak Institute of Pharmacy, Ibrahimpatnam, Hyderabad, India), *International Journal of Pharmacology*, 2011, 7(3), 363-369].

NPARR 3(1), 2012-090, Antidiarrhoeal activity of *Dichrostachys cinerea* (L.) Wight & Arn

Dichrostachys cinerea (L.) Wight & Arn belongs to Mimosaceae, is commonly known as 'Vidathalai' in Tamil. Earlier folklore claims reveals that the plant is used in diarrhoea and dysentery. The whole plant has been used for antidiarrhoeal activity in Indian traditional medicine. So the leaf, stem bark and root of the plant were screened separately for their antidiarrhoeal activity by castor oil induced model and small intestinal transit model. In the present study vacuum dried ethanolic extract of leaf, bark and root of the plant were used at two dose level (200 mg / kg and 400 mg / kg p.o). All the extracts showed significant antidiarrhoeal activity by both the tested models. Hence the present study supports the traditional claim of *Dichrostachys cinerea* (L.) Wight & Arn as an antidiarrhoeal drug in the Indian System of Medicine [Jayakumari, S. *, Srinivasa Rao, G.H., Anbu, J., Ravichandiran, V. (Department of Pharmacognosy, Old Pallavaram, School of Pharmaceutical Sciences, Vels University, Old Pallavaram, Chennai, Tamilnadu, India), *International Journal of Pharmacy and Pharmaceutical Sciences*, 2011, 3(3), 61-63]

NPARR 3(1), 2012-091, Phytochemical screening, antibacterial activity and physicochemical evaluation of leaves of *Butea monosperma*

The purpose of present work is to study medicinally active substances present in solvent-

extracts obtained from leaves of *Butea monosperma*. The active substances were isolated by Soxhlet extractor and identified by phytochemical test. The Soxhlet extraction of leaves, in powdered form, was performed using petroleum ether and followed by chloroform and methanol. The results of analyses of each extract confirm the active substance were sterols, triterpenes, glycosides flavonoids and proteins. The evaluation of leaves powder was supported by physico-chemical analysis. The microbial tests of isolated substances were performed with microorganisms like *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Staphylococcus aureus*, *Proteus vulgaris* and *Klebsiella pneumonia*. The observation of microbial test of methanol-extract supports to antibacterial activity to the greater extent than petroleum ether and chloroform-extract [Rajput, A., Pal, S.C. and Patil, B.* (G.M.C.Polytechnic, Shahada, Dist Nandurbar, Maharashtra-425409, India), *International Journal of Pharmacy and Pharmaceutical Sciences*, 2011, 3(3), 189-191].

NPARR 3(1), 2012-092, Antimicrobial activity of *Coccinia grandis* against biofilm and ESBL producing uropathogenic *E. coli*

Uropathogenic organisms have evolved numerous defense mechanisms against antimicrobial agents, hence resistance to old and newly available drugs are increasing at an unprecedented level. The events of antibiotic resistance have lead for screening of several medicinal plants for their potential antimicrobial activity. The aim of this study was to evaluate the antimicrobial efficacy of *Coccinia grandis* against biofilm and Extended Spectrum of Beta Lactamase (ESBL) producing Uropathogenic *Escherichia coli* (UPEC). *C. grandis* is a widespread medicinal plant traditionally used in India to treat infectious diseases. Aqueous, acetone and ethanol extracts of leaves of *C. grandis* were tested for antimicrobial activity in vitro by the agar well diffusion method. Ethanol extract of leaves exhibited antimicrobial activity against biofilm producing strains UPEC 17 and 82, whereas the aqueous and acetone extracts showed antibacterial activity only against UPEC 57. Ethanol extract of leaves exhibited inhibitory action against ESBL producing UPEC 87 and 96, whereas the aqueous extract inhibited the growth of only UPEC 85. Similarly, the acetone extract inhibited the growth of UPEC 42 and 96.

These antimicrobial properties seem to be related to the presence of tannin, alkaloids and tri-terpenoids in *C. grandis*. It can be concluded that *C. grandis* can be used to discover natural products that may serve as lead for the development of new pharmaceuticals, addressing the major therapeutic needs especially for biofilm and ESBL producing uropathogenic strains [Poovendran, P., Vidhya, N., Murugan, S * Department of Microbiology, Dr. N. G.P Arts and Science College, Coimbatore-641 048, Tamil Nadu, India), *Global Journal of Pharmacology*, 2011, **5**(1), 23-26].

NPARR 3(1), 2012-093, A detailed study on the antioxidant activity of the stem bark of *Dalbergia sissoo* Roxb., an Indian medicinal plant

A detailed study was performed on the antioxidant activity of the aqueous and methanol extracts (AED and MED respectively) of the stem bark of the plant, *Dalbergia sissoo* Roxb. (Fam.

Fabaceae), also known as Indian Rosewood. The antioxidant activity of the extracts was measured by in vitro chemical analyses involving the assays of (1) 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity (2) ferric ion reducing power (3) ferrous ion chelating activity and (4) Au nanoparticle formation potential. A simplified method was developed based on Au nanoparticles formation to assess the antioxidant activity of any plant extract, and was used for the first time to assay the antioxidant activity of AED and MED. In all the assays, AED showed significantly greater activity over MED. This work provides a scientific support for the high antioxidant activity of this plant and thus it may find potential applications in the treatment of the diseases caused by ROS [Roy, N., Laskar, R.A., SK, I., Kumari, D., Ghosh, T., Begum, N.A*(Bio-Organic Chemistry Lab, Department of Chemistry, Visva-Bharati University, Santiniketan 731 235, India), *Food Chemistry*, 2011, **126**(3), 1115-1121].

VEGETABLES

NPARR 3(1), 2012-094, Chemical composition and antinutritional factors of field peas (*Pisum sativum*), chickpeas (*Cicer arietinum*), and faba beans (*Vicia faba*) as affected by extrusion preconditioning and drying temperatures

Legumes are valuable plant sources of protein and energy and extrusion is one of the most common processing methods for manufacturing both human food and animal feeds. In the present study, three different legumes (field peas, chickpeas, and faba beans) were ground and processed in a pilot-scale extrusion line. Various preconditioning and dryer temperatures were applied to each legume separately that reflected or differed from standard manufacturing conditions. Although literature exists regarding the effects of extrusion temperature and moisture on legume antinutrients, no data are available on the respective effects of preconditioning and drying. The aim of the study was to evaluate the effects of processing on both nutritional and antinutritional factors for each processing combination. Proximate composition, starch, oligosaccharides, total nonstarch polysaccharides (NSP), soluble (S-NSP), and insoluble (I-NSP) levels were evaluated. The antinutritional factors phytic acid, tannins, and trypsin inhibitors were also determined. Chickpea and field pea NSP values were not drastically affected by processing, while for most processing conditions, total NSP, S-NSP, and I-NSP were slightly reduced in faba beans. Preconditioning before extrusion processing generally improved the nutritional value of the ingredients by significantly reducing trypsin inhibitor level. Phytate and total tannin levels were greatly reduced irrespective of the preconditioning and drying treatment. Wet preconditioning can be used in combination with extrusion to improve the nutritional value of legumes, while drying at 90-150°C does not significantly further reduce antinutritional factor levels [S. Adamidou*, I. Nengas, K. Grigorakis, D. Nikolopoulou and K. Jauncey (Hellenic Centre for Marine Research, Institute of Aquaculture, Ag. Kosmas, 166 77, Athens, Hellas), 2011, **88**(1), 80-86].

NPARR 3(1), 2012-095, Post-harvest management of vegetables in Kumaon division of Uttarakhand

The present study is undertaken to examine the present status of post-harvest management practices of vegetables. The Kumaon division of Uttarakhand was purposively selected for the present study. Multistage sampling was used for selection of vegetable growers. The sample size consists of 80 vegetable growers comprising 40 farmers from the hilly region and 40 farmers from the bhabhar region. Twelve major vegetables were selected for the study. The post-harvest management of sample vegetables was analysed in terms of grading, packing, transport and sale pattern. Simple statistical tools were employed to accomplish the objective of the study. On overall basis 78 per cent of the sample farmers were found grading vegetables. The percentage was higher in Bhabhar region than in hilly region. The convenience in marketing was the main reason of grading given by farmers. The analysis reveals that out of the seven criteria for grading vegetables size/shape and free from insect and pest were given higher priority by the farmers of both hilly and bhabhar region. It may be noted that the labour was the only cost of grading for all the vegetables which ranged from Rs. 18.31 per quintal (cauliflower) to Rs. 7.43 per quintal (cabbage). The farmers were found using gunny bags, basket, crates and palli as the packaging material. The per quintal cost of packaging was found varying from Rs 23.63 (onion) to Rs 163.59 (tomato). The transportation cost of Rs 81.22 per quintal was found to be maximum in tomato whereas the minimum of Rs 7.86 per quintal in radish. It was revealed that most of the sample farmers were selling their produce to wholesaler cum commission agent of near market i.e. Haldwani mandi followed by wholesaler cum commission agent of distant market i.e. Azadpur, Delhi [Gaurav Sharma and Singh, S. R. (Department of Agricultural Economics, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar- 263145, U.S. Nagar, Uttarakhand), *Pantnagar Journal of Research*, 2011, **9**(1), 1-7].

NPARR 3(1), 2012-096, Antioxidant capacity and total phenol content of commonly consumed selected vegetables of Bangladesh

The purpose of the study was to determine the antioxidant capacity (AC) and total phenolic content (TPC) of selected commonly consumed Bangladeshi vegetables and herbs. Hydrophilic extracts from

edible portions of ten vegetables and two herbs were analysed. The total phenolic amount ranged from 27.65 ± 1.45 mg to 1.08 ± 0.15 Gallic Acid Equivalent (GAE)/g on a fresh weight (FW) basis. Contents of total phenol were determined spectrophotometrically according to the Folin-Ciocalteu method and the antioxidant capacity was determined by 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity (DPPH-RSA). Antioxidant capacity varied from 8328.80 ± 29.15 to 0.61 ± 0.19 μmol Trolox Equivalent (TE)/g of FW. Ipomoea leaves showed the highest AC (8328.80 ± 29.15 μmol TE/g), while the lowest AC (0.61 ± 0.19 μmol TE/g) was seen in radish. A linear relationship was observed between Trolox Equivalent Antioxidant Capacity (TEAC) values and total phenol. Antioxidant capacity of the assayed samples correlated significantly and positively with total phenolic content ($R^2=0.814$, $p<0.01$). Vegetables with high polyphenol like Ipomoea leaves and mint showed high AC with the exception of raw banana which demonstrated moderate AC though it contained high TPC. Moderate TPC vegetables like amaranths and coriander leaves did not show substantial AC. Conclusion: The data indicates that indigenous vegetables containing high polyphenols may be a potential source of dietary antioxidants [Sharmin, H.; Nazma, S.; Mohiduzzaman, M. and Cadi, P. B., *Malaysian Journal of Nutrition*, 2011, **17**(3), 377-383].

NPARR 3(1), 2012-097, **Comparative characterization of dietary fibre enriched frozen/thawed mashed potatoes**

The potential use of commercial fibres (pea fibre (PF), inulin (I) and their blends (PFI)), as fibre-enriching agents in frozen/thawed mashed potatoes (F/TM potatoes), was reported. PF and I supplementations conferred hardness and softness to the product respectively. Differences were attributed to the relationship of the fibre with the potato starch matrix. The association of PF at low concentration (< 15 g/kg mashed potatoes) and I at high concentration (> 45 g/kg) is strongly encouraged to fortify the diet without promoting negative effects on textural and rheological properties of F/TM potatoes or colour and overall acceptability of the resulting products [Maria Dolores Alvarez*, Cristina Fernandez, María Dolores Olivares and Wenceslao Canet (Department of Plant Foods Science and Technology, Instituto del

Frío/ICTAN-CSIC, José Antonio Novais 10, E-28040, Madrid, Spain), *International Journal of Food Properties*, Available online: 07 Apr 2011].

NPARR 3(1), 2012-098, **Taxonomy of cultivated potatoes (*Solanum* section *Petota*: Solanaceae)**

Solanum tuberosum, the cultivated potato of world commerce, is a primary food crop worldwide. Wild and cultivated potatoes form the germplasm base for international breeding efforts to improve potato in the face of a variety of disease, environmental and agronomic constraints. A series of national and international genebanks collect characterize and distribute germplasm to stimulate and aid potato improvement. Knowledge of potato taxonomy and evolution guides collecting efforts, genebank operations and breeding. Past taxonomic treatments of wild and cultivated potato have differed tremendously among authors with regard to both the number of species recognized and the hypotheses of their interrelationships. In total, there are 494 epithets for wild and 626 epithets for cultivated taxa, including names not validly published. Recent classifications, however, recognize only about 100 wild species and four cultivated species. This paper compiles, for the first time, the epithets associated with all taxa of cultivated potato (many of which have appeared only in the Russian literature), places them in synonymy and provides lectotype designations for all names validly published where possible. We also summarize the history of differing taxonomic concepts in cultivated potato, and provide keys and descriptions for the four cultivated species [Anna Ovchinnikova, Ekaterina Krylova, Tatjana Gavrilenko, Tamara Smekalova, Mikhail Zhuk, Sandra Knapp and David M. Spooner, *Botanical Journal of the Linnean Society*, 2011, **165**(2), 107-155].

NPARR 3(1), 2012-099, **Comparative study of the mineral composition of several varieties of potatoes (*Solanum tuberosum* L.) from different countries cultivated in Canary Islands (Spain)**

Potatoes are a basic component of human diets worldwide being an excellent source of minerals linked the maintenance of health. Contents of calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), copper (Cu), iron (Fe), manganese (Mn), zinc (Zn), nickel (Ni) and chromium (Cr) in seventy-four fresh

potato samples from different varieties consumed in Tenerife Island (Canary Islands, Spain) were determined by flame atomic absorption spectrometry (FAAS). The mean concentrations were 60.1 mg kg^{-1} , 222 mg kg^{-1} , 5047 mg kg^{-1} , 125 mg kg^{-1} , 1.69 mg kg^{-1} , 8 mg kg^{-1} , 1.70 mg kg^{-1} , 3.88 mg kg^{-1} , $62.7 \text{ } \mu\text{g kg}^{-1}$ and $19.9 \text{ } \mu\text{g kg}^{-1}$ for Ca, Mg, K, Na, Cu, Fe, Mn, Zn, Ni and Cr, respectively. The varieties of local potatoes presented higher mineral contents than imported potatoes. Potassium presented the highest contents in all varieties of potatoes. Iron was the most abundant microelement. Local potatoes offer greater

nutritional contributions to the recommended intakes than imported varieties. Within the macrominerals, the highest contribution to the intakes was observed for K, while Fe was the trace element with the largest contribution to the proposed intake [Gara Luis, Carmen Rubio, Dailos González-Weller, Angel J. Gutiérrez*, Consuelo Revert and Arturo Hardisson (Department of Toxicology, University of La Laguna, La Laguna, Tenerife, Canary Islands 38071, Spain), *International Journal of Food Science & Technology*, 2011, **46**(4), 774-780].

WOOD

NPARR 3(1), 2012-0100, Natural decay resistance of *Acacia auriculiformis* Cunn. ex. Benth. and *Dalbergia sissoo* Roxb.

Natural decay resistance of two fast growing timber species, *Acacia auriculiformis* Cunn. ex. Benth. and *Dalbergia sissoo* Roxb. grown in Bangladesh was evaluated by adopting an accelerated decay test method. The wood specimens were exposed to a white rot fungus, *Schizophyllum commune* for 12 weeks. The natural decay resistance was determined by the weight loss percentage of the tested wood specimens. The weight losses were found 2.0% and 4.37% in heartwood, and 22.19% and 13.61% in sapwood of *A. auriculiformis* and *D. sissoo*, respectively. In both the species, the weight loss was significantly higher in sapwood than heartwood. This means that heartwood was more resistant than sapwood. The weight loss significantly increased from bottom to top. Significant variation has been observed in weight loss between *A. auriculiformis* and *D. sissoo* both in heartwood and sapwood. The wood of *A. auriculiformis* and *D. sissoo* were classified as naturally durable following the standard classification of natural durability [M Ashaduzzaman*, AK Das, I Kayes and MI Shams (Department Of Applied Chemistry And Chemical Technology, Dhaka-1000, Bangladesh), *Bangladesh Journal of Scientific and Industrial Research*, 2011, **46** (2), 225-230].

NPARR 3(1), 2012-0101, Wood specific gravity of some tree species in the Garhwal Himalayas, India

Estimation of terrestrial biomass depends critically on reliable information about wood specific gravity of forest trees. In recent years, wood specific gravity has become more important when exploring the universality of functional traits of plants and estimating their global carbon stocks. To estimate their specific gravity, wood samples were collected from a total of 34 tree species, 30 from lower elevations and 4 from upper elevations in the Garhwal Himalayas, India. The results show that the average wood specific gravity was 0.631 (ranging between 0.275 ± 0.01 and 0.845 ± 0.03) for the species at lower elevations and 0.727 (ranging between $0.628 \pm$

0.02 and 0.865 ± 0.02) for the upper elevations. The average wood specific gravity for the upper elevation species was 9.6% greater than that for the species at lower elevations. *Aegle marmelos* among the lower elevation species and *Quercus leucotrichophora* among the upper elevation species had the highest wood specific gravity, which were 0.845 ± 0.03 and 0.865 ± 0.02 , respectively [Mehraj A. Sheikh, Munesh Kumar and Jahangeer A. Bhat (Garhwal University, Srinagar, Garhwal), *Forestry Studies in China*, 2011, **13**(3), 225-230].

NPARR 3(1), 2012-102, Variation in Wood Properties and Growth in Some Clones of *Populus deltoides* Bartr. ex Marsh.

The present paper deals with within ramet radial, intra- and inter-clonal variations in the wood element's dimensions and specific gravity of 10 clones of *Populus deltoides* Bartr. ex Marsh. The growth parameters namely ramet height and DBH were also considered for the study. Study material was collected from the 10 clones of *Populus deltoides* raised by WIMCO Plantations Ltd. at Rudrapur (Udhamsingh Nagar), India. Three clones were parent viz. G48, S7C8 (female) and G3 (male). Other clones represent hybrids of F1 generation. Inter- and intra-clonal variations were significant for all the wood traits except vessel element length for intra-clonal variations. Within ramet variations due to radial location were significant for fiber length and specific gravity with increasing trend from pith to periphery. Interaction of clone replication was also significant for all the wood traits. Variations were significant for the DBH for the clones. Fiber length and specific gravity was significantly higher in female while wall thickness and vessel element length was in male clones ($P < 0.01$). Female parents (G48 and S7C8) showed higher fiber length and specific gravity than of the male parent (G3) while vessel element diameter and wall thickness was higher in male parent (G3). Fiber length was higher in offspring than the parent clones which may be the reflection of hybrid vigor for the trait. The clones of F1 offspring followed the similar patterns for the other wood traits as in the parent clones. *Hierarchical* cluster analysis showed that W/A 39 (male) and W 39 (female) clones of F1 generation were highly divergent than of the other clones [P. K. Pande (Wood Anatomy Discipline, Botany Division, Forest Research Institute, Dehradun,

India), *American Journal of Plant Sciences*, 2011, **2**, 644-649].

NPARR 3(1), 2012-0103, **Clonal and planting density effects on some properties of rubber wood (*Hevea brasiliensis* Muell.-Arg.)**

Inter-clonal and intra-clonal wood properties and their variations from pith to bark were evaluated for wood density and anatomical features on rubber wood (*Hevea brasiliensis* Muell.-Arg.) from a 9-year-old plantation with planting densities of 500 and 2000 trees per hectare comprised of clones RRIM 2020 and RRIM 2025. Planting density had uneven effects on wood density and wood cell features. Intra-clonal and inter-clonal variations were significant for wood density in both clones and planting densities. Wood

density demonstrated an increasing trend in the radial direction. However, at the lower planting density wood density near the bark decreased slightly. Fiber diameter, lumen diameter, and cell wall thickness showed an increasing trend from pith to bark. Best average fiber characteristics were observed at the lower planting density in clone RRIM 2025. Vessel frequency had a direct relationship with planting density in that it was higher in the higher planting density of 2000 trees per hectare. Overall, planting density had a significant effect on wood quality. The properties of clone RRIM 2025 were found to be comparatively better with longer fiber length and higher wood density than those of RRIM 2020 [Hamid Reza Naji, Mohd. Hamami Sahri, Tadashi Nobuchi, Edi Suhaimi Bakar, *BioResources*, 2012, 7(1)].

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

CULTIVATION

NPARR 3(1), 2012-0104, Effects of auxins and thiamine on the efficacy of techniques of clonal propagation in *Jatropha curcas* L.

Effect of auxins (IAA, IBA, NAA) and vitamin-B₁ (thiamine) on rooting response of branch cuttings and air-layers of *Jatropha curcas* in relation to spring and monsoon seasons was investigated. Spring season was found best for clonal multiplication of genetically superior material in jatropha. Cuttings treated with 600 and 800 mg L⁻¹ thiamine showed 100% sprouting in both seasons. The average sprout growth was also found maximum in thiamine treated cuttings. Auxins enhanced rooting of cuttings in spring season but showed very poor response or even failed to root during monsoon. Among different growth regulators; thiamine triggered highest rooting during monsoon and was comparable during spring season. Average percent rooting was also recorded maximum in air-layers treated with thiamine (75, 150, 300, 600 mg L⁻¹) in comparison to auxins in both the seasons. However, number of roots per layer increased with increasing concentration of NAA and IBA in spring but decreased in monsoon season. Cleft grafting was found more promising in terms of success in rainy season however; the growth of the grafted plants was quite slow as compared to spring season. This technique can be practically applied on commercial scale in the areas where *Jatropha gossypifolia* grows as weed [R.S. Dhillon*, M.S. Hooda, J.S. Pundeer, K.S. Ahlawat and I. Chopra (Department of Forestry, CCS Haryana Agricultural University, Hisar 125004, India), *Biomass and Bioenergy*, 2011, **35**(4), 1502-1510].

NPARR 3(1), 2012-0105, Relationship between gibberellin, ethylene and nodulation in *Pisum sativum*

Gibberellin (GA) deficiency resulting from the *na* mutation in pea (*Pisum sativum*) causes a reduction in nodulation. Nodules that do form are aberrant, having poorly developed meristems and a lack of enlarged cells. Studies using additional GA-biosynthesis double mutants indicate that this results from severe GA deficiency of the roots rather than simply dwarf shoot stature. Double mutants isolated from crosses between *na* and three supernodulating pea mutants exhibit a supernodulation phenotype, but the nodule structures are aberrant. This suggests that severely reduced GA concentrations are not entirely inhibitory to nodule initiation, but that higher GA concentrations are required for proper nodule development. *na* mutants evolve more than double the amount of ethylene produced by wild-type plants, indicating that low GA concentrations can promote ethylene production. The excess ethylene may contribute to the reduced nodulation of *na* plants, as application of an ethylene biosynthesis inhibitor increased *na* nodule numbers. However, these nodules were still aberrant in structure. Constitutive GA signalling mutants also form significantly fewer nodules than wild-type plants. This suggests that there is an optimum degree of GA signalling required for nodule formation and that the GA signal, and not the concentration of bioactive GA *per se*, is important for nodulation [Brett J. Ferguson, Eloise Foo, John J. Ross and James B. Reid* (School of Plant Science, University of Tasmania, Private Bag 55, Hobart, Tasmania 7001, Australia), *New Phytologist*, 2011, **189**(3), 829-842].

NPARR 3(1), 2012-0106, Effect of incorporated cowpea stover on succeeding cauliflower curd yield and N, P, K status in soil

An investigation was carried out at Regional Agricultural Research Station, Assam Agricultural University, Gossaigaon during *Rabi* season of 2004, 2005 and 2006 to assess the influence of cowpea stover incorporation with five levels of N (0, 20, 40, 60 and 80 kg/ha) on succeeding cauliflower curd yield production and residual available N, P, K status and economic feasibility. Stover incorporation into the soil increased the curd yield of cauliflower by 10.1 q/ha (6.09%) and 18.4 q/ha (11.68%) as compared to stover removed and fallow land, respectively. Stover incorporation into the soil increased leaf N (%) by 0.71 and 0.82 and curd N (%) by 0.53 and 0.66 than

that of stover removed and fallow land, respectively. Compared with control, application of 20 kg N and 40 kg N/ha, application of 60 Kg N/ha resulted in significantly higher yield by 29.8 q/ha (20.16%), 17.2 q/ha (10.72%) and 11.3 q/ha (6.8%), respectively while application of 60 Kg N/ha being statistically at par with 80 kg N/ha level. Leaf N content (%) was higher by 0.64, 0.51, 0.32 and curd N content (%) by 0.53, 0.46 and 0.35 with 60 kg N/ha level than with control, 20 kg N/ha and 40 kg N/ha, respectively. Stover incorporation increased residual organic matter content (%) by 0.19, available N content by 16.56 kg/ha (6.7%), available P content by 2.6 kg/ha (20.63%) and available K content by 23.7 kg/ha (18.23%) than that of initial value. Maximum net returns (Rs. 63430/ha) and B:C ratio (2.59) accrued when planted at stover incorporated practices with the application of 60 kg N/ha compared to other N doses applied. The practice of stover incorporation into the soil along with 60 kg N/ha applied was found optimum for obtaining higher cauliflower curd yield and building up of NPK status in soil [Sarma, U. J. and Chakravarty, M. (Regional Agricultural Research Station, Assam Agricultural University, Assam), *Asian Journal of Soil Science*, 2011, **6**(1), 61-65].

NPARR 3(1), 2012-0107, **Cultivation of *Chlorella pyrenoidosa* in soybean processing wastewater**

Chlorella pyrenoidosa was cultivated in soybean processing wastewater (SPW) in batch and fed-batch cultures without a supply of additional nutrients. The alga was able to remove $77.8 \pm 5.7\%$, $88.8 \pm 1.0\%$, $89.1 \pm 0.6\%$ and $70.3 \pm 11.4\%$ of soluble chemical oxygen demand (SCOD_{Cr}), total nitrogen (TN), NH₄⁺-N and total phosphate (TP), respectively, after 120 h in fed-batch culture. *C. pyrenoidosa* attained an average biomass productivity of $0.64 \text{ g L}^{-1} \text{ d}^{-1}$, an average lipid content of $37.00 \pm 9.34\%$, and a high lipid productivity of $0.40 \text{ g L}^{-1} \text{ d}^{-1}$. Therefore, cultivation of *C. pyrenoidosa* in SPW could yield cleaner water and useful biomass [Su Hongyang, Zhang Yalei* Zhang Chunmin, Zhou Xuefei and Li Jinpeng (State Key Laboratory of Pollution Control and Resources Reuse, College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China), *Bioresource Technology*, 2011, **102**(21), 9884-9890].

NEW SPECIES

NPARR 3(1), 2012-0108, *Amomum nilgircum* (Zingiberaceae), a new species from Western Ghats, India

A new species of *Amomum* Roxb. from Western Ghats of Kerala is illustrated and described. *Amomum nilgircum* V.P. Thomas & M. Sabu, sp. nov. shows similarity with *A. masticatorium* Thwaites in having long drying ligule with an acuminate apex, pubescent anther and echinate capsules, but differs in clump forming habit with non-stoloniferous rhizomes, tomentose lamina beneath, long corolla tube, obovate to rhomboid labellum with clefted apex and without any colour design, emarginate anther crest and reduced staminodes. Detailed description, illustration, photographs, conservation status, and distributional details are provided [V. P. Thomas, M. Sabu, K.M. Prabhu Kumar (Department of Botany, University of Calicut, P. O. Calicut University 673 635, Kerala, India), *PhytoKeys*, 2012, **8**, 99-104].

NPARR 3(1), 2012-0109, *Miliusa gokhalaiei*, a new species of Annonaceae from India with notes on interrelationships, population structure and conservation status

Miliusa gokhalaiei (Annonaceae), a new species from the Western Ghats, India, is described and illustrated. It is distinguished by unequal rounded leaf bases, sessile or shortly pedicellate flowers, thick fleshy petals, glabrous carpel, and included connective of anther. It is closely related to *M. indica* and *M. eriocarpa*, with which it shares sub-sessile or shortly petiolate, hairy-nerved leaves, axillary solitary flowers, and flask-shaped carpel with 1-2 ovules. Notes on interrelationships, population structure, conservation status and an identification key to the taxa of *Miliusa* in peninsular India are also provided [M. K. Ratheesh Narayanan, P. Sujanal, N. Anil Kumar, M. Sivadasan*, Ahmed H. Alfarhan and Jacob Thomas (Department of Botany & Microbiology, King Saud University, P. O. Box 2455, Riyadh 11451, Kingdom of Saudi Arabia), *Phytotaxa*, 2012, **42**, 26-34].

NPARR 3(1), 2012-0110, A new scapigerous species of *impatiens* (balsaminaceae) from India

Impatiens minae Ratheesh, Anil Kumar & Sivad. a new scapigerous species of *Impatiens* from Wayanad district in Kerala, India is described and illustrated. The new species resembles *Impatiens denisonii* and *I. scapiflora* by its 3-lobed lateral united petals and lower sepal with a long spur; but differs from the latter in having a curved band of dense fleshy clavate papillae at the base of lateral united petals, and from the former in the absence of a dorsal filiform appendage or auricle at the base of the lateral united petals [M. K. Ratheesh Narayanan, N. Anilkumar, R. Meera Raj, M. Sivadasan* and A.H. Alfarhan (M. S. Swaminathan Research Foundation, Puthoorvayal 673 121, Kalpetta, Wayanad, Kerala, India), *Bangladesh Journal Plant Taxonomy*, 2011, **18**(2), 141-148].

NPARR 3(1), 2012-0111, New distributional records of two little-known orchids of Himachal Pradesh from Churdhar Wildlife Sanctuary, Sirmour district, India

Chusua nana (King & Pantling) Pradhan and *Hetaeria fusca* Lindl. are two little-known orchids collected from Churdhar Wildlife Sanctuary, Shivalik hills of Sirmour district, forms new distribution

records and second report to the state Himachal Pradesh. Very small numbers of individuals of

population observed were described along with distribution, phenology and ecological notes [S.P. Subramani* and K.S. Kapoor (Institute of Forest Genetics & Tree Breeding (IFGTB), Forest Campus, R.S. Puram, Coimbatore, Tamil Nadu, 641002, India), *International Journal of Biological Technology*, 2011, **2**(2), 8-11].

NPARR 3(1), 2012-0112, Two new species of *Euphrasia* (Orobanchaceae) from Pakistan and adjoining areas

A morphological analysis of *Euphrasia densiflora* complex and *E. jaeschkei* complex from Pakistan and adjoining areas was carried out. Principal component analysis of 46 OTU's for *E. densiflora* complex and 27 OTU's for *E. jaeschkei* were employed which resulted in the recognition of *E. densiflora* Pennell *sensu stricto*, *E. jaeschkei* Wettst. *sensu stricto* and two new species [*E. omeri*

Qaiser & T. Siddiqui and *E. Alii* Qaiser & T. Siddiqui. The relationship of the allied species has

also been discussed [M. Qaiser, Tahmeena Siddiqui and S. Shahid Shaukat (*Federal Urdu University of Arts, Science & Technology, Karachi, Pakistan*), *Pakistan Journal of Botany*, 2011, **43**(4), 1809-1818].

NPARR 3(1), 2012-0113, Evidence of a new *Musa* species - *M. swarnaphalya* in India and its confirmation through morpho-molecular characterization

A new species, *Musa swarnaphalya*, Uma, Saraswathi and Durai, has been identified from Sessa village of Balukpong district in southern Arunachal

Pradesh. It is characterised by its unique greenish-yellow colour male bud. Diploid status of this species was proven using flow cytometry and its identity as a new species was assessed through morpho-taxonomy and confirmed through RAPD and IRAP markers. *M. swarnaphalya* grouped with *M. itinerans* and *M. nagensium* in a distinct cluster confirming its stand within the section *Eumusa*. Freedom from pests and diseases in its place of distribution suggests its possible utility as a resistant gene source in future breeding programmers [Uma S.*, Saraswathi M.S. and Durai P. (National Research Centre for Banana, Thogamalai Road, Thayanur Post, Tiruchirapalli, 620 102, Tamil Nadu), *Indian Journal of Horticulture*, 2011, **68**(2), 145-151].

ANALYTICAL METHODS

NPARR 3(1), 2012-0114, Classification of olive oils according to geographical origin by using ¹H NMR fingerprinting combined with multivariate analysis

Authentic extravirgin olive oils from 7 different regions (Italy – 3 regions, Greece – 4 regions) have been investigated by ¹H Nuclear Magnetic Resonance (NMR) fingerprinting in combination with multivariate statistical analysis. In order to cover the dominating lipid signals as well as signals from compounds of low abundance in the oil, both a simple one pulse experiment and an experiment with multiple saturation of the lipid signals was applied to each sample. Thus, the dynamic range of concentrations covered by the two experiments was of the order of 100,000 allowing for a more comprehensive NMR assessment of the samples. Monte-Carlo embedded cross-validation was used to demonstrate that a combination of principal component analysis, canonical analysis, and classification via nearest class mean can be used to predict the origin of olive oil samples from ¹H NMR data. Given the rather limited number of samples tested, correct prediction probabilities of 78% were achieved with region specific correct predictions between 53% and 100% [F. Longobardi, A. Ventrella, C. Napoli, E. Humpfer, B. Schütz, H. Schäfer, M.G. Kontominas and, A. Sacco* (Dipartimento di Chimica, Università degli Studi di Bari “Aldo Moro”, Via Orabona 4, 70126 Bari, Italy), *Food Chemistry*, 2012, **130**(1), 177-183].

NPARR 3(1), 2012-0115, Microwave-assisted extraction of chlorogenic acids from green coffee beans

Microwave-assisted extraction (MAE) has been considered as a potential alternative to conventional solvent extraction for the isolation of phenolic compounds from plants. Aqueous and alcoholic extracts of green coffee bean obtained by MAE were quantitatively analysed for total yield of extracts, chlorogenic acids, caffeine and total polyphenol content. The extracts were also evaluated for radical-scavenging activity, using 1, 1-diphenyl- β -picrylhydrazyl radical. Under optimum conditions of time (5 min), temperature (50°C) and wattage (800 W), the maximum chlorogenic acids and caffeine

could be extracted with water as solvent. The extracts contained chlorogenic acids and caffeine in the ranges of 31-62% and 22-40%, respectively. The yields of MAE under optimum conditions were higher than those from the conventional solvent extraction at 5 min and 50 °C and the extracts showed radical-scavenging activity of >75%, even at the concentration of 25 ppm. The MAE process can thus be predicted and controlled for industrial application [Rohit Upadhyay, K. Ramalakshmi, L. Jagan Mohan Rao*(Plantation Products, Spices and Flavour Technology Department, Central Food Technological Research Institute (Council of Scientific and Industrial Research), Mysore 570 020, India), *Food Chemistry*, 2012, **130**(1), 184-188].

NPARR 3(1), 2012-0116, Chemometric approach to evaluate trace metal concentrations in some spices and herbs

Herbs (mint, thyme and rosemary) and spices (black pepper, chili pepper, cinnamon, cumin, sweet red pepper and turmeric) were analysed using atomic spectrometry and then subjected to chemometric evaluation in an attempt to classify them using their trace metallic analyte concentrations (As, Ba, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Sr and Zn). Trace metals in acid digests of these materials were determined using both inductively coupled plasma-atomic emission spectrometry and inductively coupled plasma-mass spectrometry. The chemometric techniques of principal component analysis (PCA), linear discriminant analysis (LDA) and cluster analysis (CA) were used for the classification studies. These herbs and spices were classified into five groups by PCA and CA. When the results of these techniques were compared with those from LDA, it was found that all group members determined by PCA and CA are in the predicted group that 100.0% of original grouped cases correctly classified by LDA [Cennet Karadaş and Derya Kara* (Department of Chemistry, Art and Science Faculty, Balıkesir University, 10100 Balıkesir, Turkey), *Food Chemistry*, 2012, **130**(1), 196-202].

NPARR 3(1), 2012-0117, Development and validation of a novel real-time PCR method for the detection of celery (*Apium graveolens*) in food

The paper presents a novel real-time PCR method allowing the detection of traces of celery (*Apium graveolens*) in complex food matrices. The method is based on the amplification of a sequence of the gene coding for the *Apium graveolens* NADPH-dependent mannose-6-phosphate reductase. It allows the detection of three commonly used celery varieties, celery roots (*Apium graveolens* var. *rapaceum*), celery stalks (*Apium graveolens* var. *dulce*) and leaf celery (*Apium graveolens* var. *secalinum*) and does not show any cross-reactivity with 64 biological species, including ten members of the *Apiaceae*

family. The limit of detection, determined by analysing serially diluted celery extracts, is 10 pg celery DNA for all three celery varieties. In spiked model sausages, the LOD is 0.005% celery. The real-time PCR method was applied to 26 commercial food products. Celery DNA was found in one out of ten samples without any information about the presence of celery [Magdalena Fuchs, Margit Cichna-Markl* and Rupert Hochegger (Department of Analytical Chemistry, University of Vienna, Währinger Straße 38, 1090 Vienna, Austria), *Food Chemistry*, 2012, **130**(1), 189-195]

POSTHARVEST TECHNOLOGIES

NPARR 3(1), 2012-0118, Effects of a phospholipase D inhibitor on postharvest enzymatic browning and oxidative stress of litchi fruit

Membrane lipid degradation catalyzed by phospholipase D (PLD) results in postharvest browning and senescence of litchi fruit. The effects of *n*-butanol, a specific PLD inhibitor, on enzymatic browning and oxidative stress during storage of litchi fruit at room temperature were evaluated. *n*-Butanol-treated fruit had a lower browning index and disease index than untreated fruit. *n*-Butanol treatment also decreased PLD activity. As a result, the decompartmentalization of litchi polyphenoloxidase and substrates was reduced. The conversion of substrates (–)-epicatechin and procyanidin A₂ into quinones was slowed down and enzymatic browning of litchi pericarp tissues was lower after 6 d storage. Additionally, *n*-butanol-treated fruit possessed significantly lower malondialdehyde contents than untreated fruit after 4 d storage. Analysis of antioxidative enzyme activities showed that *n*-butanol treatment inhibited oxidative stress mainly by maintaining high catalase activity in litchi pericarp tissues. Consequently, senescence of litchi fruit during storage was moderated [Jian Sun*, Xiangrong You, Li Li, Hongxiang Peng, Weiqiang Su, Changbao Li, Quanguang He and Fen Liao (Institute of Agro-food Science & Technology, Guangxi Academy of Agricultural Sciences, 174 East Daxue Road, 530007 Nanning, China), *Postharvest Biology and Technology*, 2011, **62**(3), 288-294].

NPARR 3(1), 2012-0119, The efficacy of ultrasonic fumigation for disinfestation of storage facilities against postharvest pathogens

Inoculum of postharvest pathogens can accumulate inside storage rooms and contaminate new batches of fruit and vegetables, but this chain can be broken by disinfecting storage facilities between storage periods. Quaternary ammonium (QA) has been known for over 50 years as an efficient disinfectant against microorganisms, with wide applications in the food industry. The aim of this study was to determine the efficacy of didecyldimethylammonium chloride (Sporekill,

designated here as QA^{sk}), against development of *Botrytis cinerea* after direct exposure or by ultrasonic fogging. Following direct exposure to a concentration of QA^{sk} below 5 mg L⁻¹, a population of 10⁴ conidia of *B. cinerea* was inactivated after 2 min; ultrasonic fogging with QA^{sk} at 500 mg L⁻¹ took 30 min to achieve consistent inactivation. Fumigation at 20°C was considerably more effective than fumigation at 5°C, and similar results were obtained for three other postharvest pathogens, *Penicillium expansum*, *Colletotrichum gloeosporioides* and *Alternaria alternata*. These results show that conidia of *B. cinerea* are highly sensitive to direct exposure to QA^{sk}, but that effective sanitation of a storage facility by ultrasonic fumigation requires a QA^{sk} concentration two orders of magnitude greater [Avinoam Daus, Batia Horev, Orit Dvir, Shahar Ish-Shalom and Amnon Lichter* (Department of Postharvest Science, ARO, The Volcani Center, POB 6, Bet Dagan 50250, Israel), *Postharvest Biology and Technology*, 2011, **62** (3), 310-313].

NPARR 3(1), 2012-0120, Factors affecting the postharvest soluble solids and sugar content of tomato (*Solanum lycopersicum* L.) fruit

Although a large component of tomato fruit taste is sugars, the choice of tomato cultivar and the postharvest practices implemented by industry are designed to reduce crop loss and lengthen shelf-life and do not prioritize sweetness. However, because there is a growing recognition that taste and flavor are key components of tomato marketability, greater emphasis is now being placed on improving traits like sugar content. In this review the factors, both pre-, post and at harvest that influence sugar content in fruits sold at market are broadly outlined. Lines of investigation that may maximise the outcome of current practices and lead, long-term, to enhanced postharvest fruit sugar contents are suggested [Diane M. Beckles* (Department of Plant Sciences, University of California, One Shields Avenue, Davis, CA 95616, United States), *Postharvest Biology and Technology*, 2012, **63**(1), 129-140].

NPARR 3(1), 2012-0121, Recent advances on the use of natural and safe alternatives to conventional methods to control postharvest gray mold of table grapes

Gray mold, caused by *Botrytis cinerea*, is the main postharvest decay of table grapes. It can develop in the vineyard and spread rapidly among berries after harvest, during long distant transport, cold storage and shelf-life. In conventional agriculture, bunches are sprayed with fungicides after flowering, at pre-bunch closure, at veraison, and later, depending on the time of harvest. Harvested bunches are usually stored in the presence of sulfur dioxide. However, the use of synthetic fungicides and of sulfur dioxide is not allowed on organic grapes and the study of alternative methods to control postharvest decay has developed over several decades, along with the demand for safer storage methods. This review summarizes the results published in the field within the last 5 years (2006-2010). We can group these approaches as follows: (i) biocontrol agents; (ii) natural antimicrobials; (iii) GRAS type decontaminating agents; and (iv) physical means. Two biocontrol agents, *Muscador albus* and *Hanseniaspora uvarum*, have shown equal or better effectiveness than conventional methods to control gray mold of table grapes in laboratory scale experiments. Currently, the bottleneck for the commercial use of biocontrol agents is that the registration process is comparable to that of fungicides, with similar costs but often with a

narrower market. This delays their transition from experimental to practical use. Natural antimicrobials, such as salts, chitosan, and plant extracts, have demonstrated good results and often have been applied in various scales. Several GRAS-classified sanitizers have been tested to extend postharvest storage of table grapes, including acetic acid, electrolyzed oxidizing water, ozone, and ethanol. Physical technologies involving variations in temperature, UV-C irradiation, and pressure or changing atmospheric composition are all postharvest practices which require significant adaptation by an industry which is accustomed to minimal intervention during harvest. Overall, the use of ozone and of calcium chloride is two promising examples of treatments that are beginning to be adopted on a commercial scale. The requirements for the optimal treatment of grapes against gray mold before harvest or during storage are summarized [Gianfranco Romanazzi*, Amnon Lichter, Franka Mlikota Gabler and Joseph L. Smilanick (Department of Agriculture, Food and Environment, Marche Polytechnic University, Via Breccia Bianche, 60131 Ancona, Italy), *Postharvest Biology and Technology*, 2012, **63**(1), 141-147].

Book Review

Quality Assessment of Selected Indian Medicinal Plants Volume 1 by Amit Agarwal & Balasubramanian Murali, National Medicinal Plants Board and M/s Natural Remedies Pvt Ltd., ISBN: 978-81-910093-0-9, YEAR, 2010, PAGES: 252+A41 | SIZE: 17.5 x 25.5 x 2.5 cm, BINDING: Hard, LANGUAGE: English; Price: \$50.00, Rs. 1000/-.

The biological activities of medicinal plants are attributed to various active principles i.e. chemical constituents present in them. The activities shown by various plants parts also vary as per the presence of amount of a particular photochemical. Edaphic, climatic, seasonal and quality of the collected raw material also contribute to high, low or medium activity. The National Medicinal Plant Board (NMPB), New Delhi, set-up by Government of India for the promotion of cultivation, trade and applications of crude and natural drugs in medicine, is working hard to standardize the quality of raw materials. M/s Natural Remedies Pvt. Ltd., Bangalore having a well established research and development center and expert team for chemical and biological testing has brought out several monographs for pharmacopoeial studies. This book is the outcome of a project funded by NMPB on development of quality assessment parameters for selected Indian medicinal plants. The project involved standardization of 16 different medicinal plants, ten out of which have been covered in the first volume of this book series.

The book is divided in 10 chapters, devoted to 10 plant species, viz. *Andrographis paniculata* Nees (Kalmegh), *Bacopa monnieri* (L.) Pennell (Brahmi), *Commiphora wightii* (Arn.) Bhandari (Guggul), *Glycyrrhiza glabra* L. (Licorice), *Ocimum tenuiflorum* L. (Tulsi), *Phyllanthus amarus* Schum. (Bhuiamla), *Phyllanthus emblica* L. (Amla), *Piper longum* L. (Pippali), *Plectranthus barbatus* Andrews (Coleus) and *Withania somnifera* (L.) Dunal (Ashwagandha). The chapters are followed by 7 Appendices (Phytochemical reference standards, About reference material, Sampling and Terminologies and Abbreviations). Annexure I-Method of analysis- Chemical; Annexure II- Method of analysis, Microbiological and Annexure III- Selection of desirable compounds are the attractions in the book. In chapters authors have given botanical name of the species, synonyms, family, parts used, along with coloured picture of the plant. Traditional uses, phytochemical information, organoleptic characters, pharmacognostical characters (with pictures), analytical specification, grading, morphological descriptors of high quality, identification by TLC, estimation of major chemical constituent by analytical specifications and regulatory status followed by references.

The book is recommended for analytical laboratories involved in objective quality assessment of Indian medicinal plants, researchers doing pharmacognostical studies and chemical analysis along with finding molecular structures. The quality of the paper and printing are good to handle this handy monograph. However, it has been observed that when for each plant almost same references are given they may be clubbed together at the end of book and spelling of titles should also be checked in forthcoming editions.

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Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. **National Conference on Biotechnology and Society - NCBS2012, 19 to 20 April 2012**, Kuvempu University Shankaraghatta, Karnataka, India; Website: <https://sites.google.com/site/biotechnologyconference/call-for-papers>
2. **National Conference on New Frontiers in Animal Science, 9 to 10 April 2012**, Shankaraghatta, Shivamogga, Karnataka, India, Website: <http://www.kuvempu.ac.in/az-nc-2012-br.pdf>
3. **World Congress on Biotechnology-2012, 4 to 6 May 2012**, Bright Technologies, Hyderabad Andhra Pradesh India, Website: <http://www.brightice.org>
4. **Biodiversity Asia 2012, 7 to 10 August 2012**, Organized by: Society for Conservation Biology –Asia, Bangalore (Bengaluru), India, Website: <http://www.scbasia2012.org>
5. **The 2012 International Conference on the Utilization of Heterosis in Crops, 19 to 22 August 2012**, Xi'an, Shaanxi, China, Website: <http://icuhc.nwsuaf.edu.cn/html/en/>
6. **The 18th Congress of the International Society for Mushroom Science, 26 to 30 August 2012**, Beijing, China, Website: <http://www.isms2012.com/>
7. **International Joint Conference on Pharmacology and Pharmaceutical Technology, 6 September 2012**, New Delhi, India, Website: <http://www.interscience.ac.in/Delhi/IJCPPT/index.html>
8. **3rd World Congress on Biotechnology, 13 to 15 September 2012**, OMICS Publishing Group, Hyderabad International Convention Center, India, Andhra Pradesh, India, Website: <http://www.omicsonline.org/biotechnology2012/>
9. **National Conference on Environment and Biodiversity of India, 3 to 4 November 2012** Organized by North East Centre for Environmental Education and Research at Jamia Millia Islamia, New Delhi, Website: <http://www.ebiconference.com/>
10. **IInd WCMANU-2012, Global Change: Impact on Biodiversity, Cultures & Technology, 3 to 5 November 2012** organized by International Council for Man & Nature & Sevadal Mahila Mahavidyalaya, Nagpur, Maharashtra, India, Website: <http://www.wcmanu.com/>
11. **International Conference on Biodiversity and Sustainable Energy Development, 19 to 21 November 2012**, Hyderabad, Andhra Pradesh, India, Organized by Omics Group Conferences, Hyderabad Andhra Pradesh India, Website: <http://omicsonline.org/biodiversity2012/>
12. **13th International Symposium on Environmental Issues and Waste Management in Energy and Mineral Industries, 28 to 30 November 2012**, New Delhi, India, Website: <http://www.mpes-cami-swemp.com/intro.html>

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