

From the Director's Desk

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

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Gangan Prathap
(Former Director)
CSIR-NISCAIR

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

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Pages -191-250

NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

C O N T E N T S

Volume 4, No. 4

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Products

Beverages	195
Cosmetics/Cosmeceuticals	197
Dyes	199
Essential oils	201
Feed/Fodder	203
Fibres	205
Food	207
Fruits	212
Fuel	215
Insecticides	217
Manure/Fertilizers	219
Oils/Fats	221
Phytochemicals	223
Pulp/Paper	226
Rubber/Gum	228
Spices/Condiments	230
Sugars	232
Therapeutics	234
Vegetables	239
Wood	241

Others

Cultivation	242
Postharvest Technology	244
Forthcoming events	246
Announcements	247

NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

NPARR 4(4), 2013-0337 Effect of extraction, pasteurization and cold storage on flavonoids and other secondary metabolites in fresh orange juice

Fresh orange juice is perceived to be more wholesome than processed juice. Fresh juice may have nutrients and phytonutrients that differ from pasteurized or processed juice. 'Hamlin' and 'Valencia' oranges were extracted using a commercial food service juicer, pasteurized or not, resulting in fresh-commercial juice (FCJ) or pasteurized FCJ (FCPJ) for comparison with pasteurized processed juice (PPJ) in 2009, and gently hand-squeezed 'Valencia' juice (HSJ) in 2010 for nutrient and phytonutrient content. Regardless of pasteurization, FCJ/FCPJ contained 25–49% lower insoluble solids than the PPJ, while in HSJ the insoluble solids content was between that of FCJ and PPJ. The major orange juice flavonoid glycosides were twofold higher in PPJ than in FCJ/FCPJ and HSJ, indicating that the extraction and finishing process led to more peel tissue in the juice than fresh juice extraction methods. The total phenolic content (TPC) in the juices followed a similar pattern to the flavonoid glycoside content. The polymethoxylated flavones (PMFs), associated with peel oil, occurred at the highest levels in the FCJ/FCPJ and lowest in HSJ. Limonoids and alkaloids occurred at higher levels in PPJ and HSJ than in FCJ/FCPJ. The high peel oil content of FCJ/FCPJ resulted in higher PMF levels compared to PPJ and HSJ, while flavonoid glycosides, limonoids and alkaloids, which occur at high concentrations in the inner peel albedo, occurred at higher concentrations in PPJ [Jinhe Bai, John A Manthey, Bryan L Ford, Gary Luzio, Randall G Cameron, Jan Narciso and Elizabeth A Baldwin* (USDA-ARS Horticultural Research Laboratory, Fort Pierce, FL 34945, USA.)

Journal of the Science of Food and Agriculture, 2013, **93** (11), 2771-2781].

NPARR 4(4), 2013-0338 A water-alcohol extract of *Citrus grandis* whole fruits has beneficial metabolic effects in the obese Zucker rats fed with high fat/high cholesterol diet

Epidemiological studies suggest that citrus fruits and compounds such as flavonoids, limonoids and pectins have health promoting effects. Our aim was to study the effects of *Citrus grandis* (L.) Osbeck var. tomentosa hort. fruit extract on the energy metabolism. A whole fruit powder from dry water and alcohol extracts of *C. grandis* containing 19% naringin flavonoid was prepared. The effects of the citrus extract were followed in the obese Zucker rats fed with the HFD. The circulatory levels of GLP-1 decreased significantly by the extract in comparison to the HFD group, whereas the decreased ghrelin levels were reversed. The levels of PYY were decreased in all HFD groups. The leptin amounts decreased but not significantly whereas insulin and amylin were unchanged. The cholesterol and glucose levels were somewhat but not systematically improved in the HFD fed rats. Further studies are needed to identify the active compounds and their mechanisms [Atso Raasmaja, Anne Lecklin, Xiang Ming Li, Jianqiang Zou, Guo-Guang Zhu, Into Laakso and Raimo Hiltunen (Pharmacology & Toxicology, Faculty of Pharmacy, University of Helsinki, P.O. Box 56 (Viikinkaari 5E), FIN-00014, Finland), *Food Chemistry*, 2013, **138** (2-3), 1392-1399].

NPARR 4(4), 2013-0339 Total amino acid profiles of heat-processed fresh *Elaeis guineensis* and *Raphia hookeri* wines

Total amino acid (AA) profiles of heat-processed fresh *Elaeis guineensis* and *Raphia hookeri* wines were studied. Heating their fresh wines to 85 °C, cooling and diluting to original

volumes distilled off ethanol, but did not change their moisture and nitrogen contents. *R. hookeri* wine contained more ($p < 0.05$) Phe, Val, Ala, Gly, Pro, Asp, Asn, His and Lys than *E. guineensis* wine which contained more ($p < 0.05$) Met, Cys, Glu, Gln, Ser and Arg. Tyrosine, Leu, Ile and Thr contents did not vary ($p > 0.05$). Glycine and Pro contents were low suggesting high globular protein concentrations. \sum basic AA/ \sum acidic AA ratios were >1 suggesting high basic protein contents. The *E. guineensis* and *R. hookeri* wines contained $58.25 \pm 0.56\%$ and $56.79 \pm 0.4\%$ essential AAs, respectively. Essential AA scores suggested Leu as their limiting AA. In conclusion, the wines can adequately meet daily nitrogen and essential AA needs when a 70 kg adult drinks 1425.45 ml [C.O. Ibegbulem, C.U. Igwe, G.N. Okwu, C.O. Ujowundu, E.N. Onyeike and E.O. Ayalogu (Department of Biochemistry, Federal University of Technology, Owerri, Nigeria), *Food Chemistry*, 2013, **138**(2-3), 1616-1620].

NPARR 4(4), 2013-0340 Changes in polyphenol content during production of grape juice concentrate

The production of grape juice concentrate on an industrial scale was evaluated and samples from the main steps of processing have been collected and analyzed. The sampling steps included the selection and washing of grapes (Nevsehir Patlak variety), pressing in order to obtain the juice separate from the seed and the skin fraction, pasteurization, clarification, filtration, evaporation, and filling-packing at 27 °C with a Brix of 45°. Samples from each of the processing steps were analyzed by a number of spectrophotometric analysis. A series of anthocyanin compounds was identified using HPLC-MS, and the fate of anthocyanins, quercetin rutinoside and procyanidins was followed using HPLC. The results indicate that

the removal of seed and fruit skin removes most of the procyanidins and anthocyanins, while subsequent clarification and filtration treatments further reduce the anthocyanin content [Esra Capanoglu, Ric C.H. de Vos, Robert D. Hall, Dilek Boyacioglu and Jules Beekwilder (Istanbul Technical University, Faculty of Chemical and Metallurgical Engineering, Food Engineering Department, Maslak, 34469 Istanbul, Turkey), *Food Chemistry*, 2013, **139** (1-4), 521-526].

NPARR 4(4), 2013-0341 Beneficial effects of noni (*Morinda citrifolia* L.) juice on livers of high-fat dietary hamsters

Polyphenols in noni juice (NJ) are mainly composed of phenolic acids, mainly gentisic, *p*-hydroxybenoic, and chlorogenic acids. To investigate the beneficial effects of NJ on the liver, hamsters were fed with two diets, normal-fat and high-fat diets. Furthermore, high-fat dietary hamsters were received distilled water, and 3, 6, and 9 mL NJ/kg BW, respectively. After a 6-week feeding period, the increased ($p < 0.05$) sizes of liver and visceral fat in high-fat dietary hamsters compared to the control hamsters were ameliorated ($p < 0.05$) by NJ supplementation. NJ also decreased ($p < 0.05$) serum/liver lipids but enhanced ($p < 0.05$) daily faecal lipid/bile acid outputs in the high-fat dietary hamsters. High-fat dietary hamsters supplemented with NJ had higher ($p < 0.05$) liver antioxidant capacities but lowered ($p < 0.05$) liver iNOS, COX-2, TNF- α , and IL-1 β expressions, gelatinolytic levels of MMP9, and serum ALT values compared to those without NJ. Hence, NJ protects liver against a high-fat dietary habit via regulations of antioxidative and anti-inflammatory responses [Yi-Ling Lin, Yuan-Yen Chang, Deng-Jye Yang Bor-Show Tzang and Yi-Chen Chen (Department of Animal Science and Technology, National Taiwan University, Taipei 106, Taiwan), *Food Chemistry*, 2013, **140** (1-2), 31-38].

COSMETICS/COSMECEUTICALS

NPARR 4(4), 2013-0342 *Medicago* spp. extracts as promising ingredients for skin care products

Agro-industrial by-products have the potential to be used with different purposes thus providing economical advantage to otherwise disposable residues. In particular, the field of skin care products and cosmetics may benefit from these remaining materials. Hydro-alcoholic extracts of seven species of *Medicago* (*M. minima*, *M. tornata*, *M. truncatula*, *M. rigidula*, *M. scutellata*, *M. segitalis* and *M. sativa*) were screened for antioxidant, cytotoxicity and antimicrobial activities aiming at their application as functional ingredient in skin formulations. Antioxidant activity was evaluated by standard methods such as DPPH· and FRAP. In both methods the antioxidant activity of *M. segitalis* displayed the highest antioxidant activity (214.49 ± 6.69 μmol Trolox equivalent per g db for DPPH; 120.84 ± 1.86 $\mu\text{mol}/\text{mg}$ db for FRAP). For DPPH *M. rigidula* showed the lowest antioxidant activity (127.18 ± 1.96 μmol Trolox equivalent per g db) and for FRAP *M. minima* showed the lowest one (58.05 ± 6.09 μmol per mg db). Also, the total phenolic and total flavonoid contents (TPC and TFC, respectively) were evaluated. The TPC of the different extracts varied from 21.96 mg to 36.41 mg GAE/g db sample, being the highest TPC obtained for *M. minima* and the lowest for the *M. scutellata*. TFC varied from 5.54 to 11.67 mg CEQ/g db sample. Linear negative correlations were established between the total phenol contents and for both the antioxidant activity methods. The extracts were also screened for cytotoxicity using MTS and LDH assays in two different skin cell lines (HaCaT and HFF-1) and showed low cytotoxicity. Preliminary assays for antimicrobial potential showed that extracts from *Medicago* display antibacterial activity, with MIC values of 31.3 $\mu\text{g}/\text{mL}$ and 125 $\mu\text{g}/\text{mL}$ for some Gram-positive and Gram-negative bacteria, respectively. Taken together, the results

suggested that *Medicago* hydro-alcoholic extracts are a potential source of natural compounds with high levels of antioxidant activity, low cytotoxicity for skin cells and the ability to potentially prevent microbial infections of the skin due to its antimicrobial effect, as well as contribute as a natural preservative in cosmetic products. All referred above justify their possible uses in skin care products [Francisca Rodrigues, Ana Palmeira-de-Oliveira, José das Neves, Bruno Sarmiento, Maria Helena Amaral and Maria Beatriz Oliveira* (REQUIMTE, Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, Rua de Jorge Viterbo Ferreira, 228, 4050-313 Porto, Portugal), *Industrial Crops and Products*, 2013, **49**, 634-644].

NPARR 4(4), 2013-0343 Evaluation of anti-oxidative activity and UV absorption potential of the extracts of *Aloe vera* L. gel from different growth periods of plants

Antioxidant assay, ATR-FTIR spectroscopy mediated predominant functional group detection and UV-absorption spectroscopy have been carried out with methanolic extracts of *Aloe vera* L. gel (gel-extract) from two, three and four-year-old plants in summer season. To explore the seasonal influence gel-extract has also been prepared from three-year-old aloe in rainy and winter season. Gel-extracts from three-year-old aloe in winter exhibited high response at IR and UV absorption spectrum. Maximum transmittance in IR spectrum has been assigned to phenolic —OH stretching followed by C—H , =CO and —COC . Total phenols, flavonoids and flavonols content range from 30.11 ± 1.89 to 35.77 ± 1.07 μg GAE/mg, 11.00 ± 0.88 to 29.75 ± 0.88 μg RE/mg and 7.47 ± 0.31 to 13.87 ± 0.08 μg RE/mg, respectively. The contents of total phenolics, flavonoids, flavonols, aloin, and different free radical scavenging, transition metal chelating and Fe^{3+} reducing are more pronounced in the gel-extracts from three-year-old aloe at winter and summer season.

Phenolics concentration and the distribution of aloin in the gel-extract are significantly ($p \leq 0.05$) influenced by the growth periods of *A. vera*. The presence of conjugated double bonds and high abundance of the integral phenolic —OH attribute to the UV absorption and antioxidant potential of the gel-extract, respectively. The present work analysis shows that growth periods

of *A. vera* plays a decisive factor in the regulation of antioxidant activity and UV absorption property of the gel-extracts [Anirban Ray, S. Dutta Gupta and Sampad Ghosh (Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, West Bengal, Kharagpur 721302, India), *Industrial Crops and Products*, 2013, **49**, 712-719].

DYES (incl. Food colorants)

NPARR 4(4), 2013-0344 Synergistic effect of hydrolyzed collagen in the dyeing of wool

The effect of hydrolyzed collagen in the dyeing of wool was investigated. The main objective of the study was to enhance the exhaustion of the reactive and acid dyes on wool by using hydrolyzed collagen as a dyebath additive. First of all, the optimum dyeing parameters were determined followed by the optimization of the proportion of hydrolyzed collagen to be added to the dyebath. Study was also carried out to determine the most adequate fraction of the hydrolyzed collagen that can ensure high dye affinity to wool and the dyeing mechanism was elucidated. The results are promising and contribute toward the “greening” of the wool dyeing process, as the hydrolyzed collagen is a natural and bio-degradable product [Marolda Brouta-Agnésa, Sandra Balsells and Roshan Paul (R&D Department, LEITAT Technological Center, C/ de la Innovació 2, 08225 Terrassa (Barcelona), Spain) *Dyes and Pigments*, 2013, **99**(1), 116-119].

NPARR 4(4), 2013-0345 A study on extraction and application of eco -friendly natural dye extracted from leaves of *Acalypha indica* Linn. on silk fabric

The present investigation was carried out to revive the old art of dyeing with natural dye from leaves of *Acalypha indica* Linn. It belongs to family Euphorbiaceae, commonly known kuppaimeni. The dye has good scope in the commercial dyeing of silk in garments industry. In the present study, degummed silkfabrics were dyed with chemical and natural mordants. Dyeing was carried out by pre mordanting, post mordanting and simultaneous mordanting. The dyed samples have shown good washing, light, rubbing fastness and perspiration fastness properties. The various colour changes

were measured by computer colour matching software. ICPMS studies have proved that, heavy metals such as antimony, arsenic, cadmium and lead were not present in the dye extract. Antibacterial and antifungal activities of the dye were also studied [P. Saravanan*, G. Chandramohan, P. Shanmuga Sundaram and P. Sumathi (Department of Chemistry, Kings College of Engineering, Punalkulam, Thanjavur, Tamilnadu, India), *International Journal of Textile and Fashion Technology*, 2013, **3** (5), 1-8].

NPARR 4(4), 2013-0346 Antimicrobial activity of cotton fabrics treated with curcumin

Curcumin, a yellow pigment known to have various biological activities, was applied onto cotton as an antimicrobial agent. Curcumin could provide both color and antimicrobial activity to cotton and can be dyed using a batch or continuous process. However, curcumin and cotton have low affinity and therefore the ability of curcumin to impart durable antimicrobial activity on cotton needs to be studied. In this research, the ability of curcumin dyed onto cotton fabrics to inhibit the growth of *Escherichia coli* and *Staphylococcus aureus* was studied. Relationships that can predict the rate of inhibition based on the curcumin concentration or shade depth (*K/S* values) were developed without the need for an antimicrobial test. Durability of antimicrobial activity to laundering and to light was also studied. Curcumin was more effective in inhibiting *S. aureus* than *E. coli*. The reduction of bacteria and durability of antimicrobial activity of curcumin to laundering was inferior on cotton fabrics compared with wool [Narendra Reddy*, Shinyoung Han, Yi Zhao and Yiqi Yang (Department of Textiles, Clothing & Design, University of Nebraska-Lincoln, Lincoln, Nebraska), *Journal of Applied Polymer Science*, 2013, **127** (4), 2698-2702].

NPARR 4(4), 2013-0347 Ecofriendly Dyeing and Antibacterial Finishing of Soyabean

Protein Fabric Using Waste Flowers from Temples

Soyabean Protein Fibre (SPF) is considered to be important regenerated protein fibre for various applications in textiles because of its unique properties. However the lack of antibacterial properties of such protein containing polymers is held as a severe limitation for its applications in hygienic textiles and the need to make it antibacterial is quite intense. A lot of marigold (which is antibacterial), used in Idol worship forms a temple waste and there is tremendous potential to use this waste as a good source of natural dye. In the current study, the tannin mordants were extracted from tamarind seed coats, amla (Indian gooseberry) and harda

(Myrobalan fruits) and their application in natural dyeing using temple waste marigold as a dye was carried out. Marigold dyeing using most commonly found alum mordant was also carried out for comparison of the purpose. The dyed SPF fabrics were then evaluated for colour values, fastness properties, antibacterial activities as well as durability of the same. The results clearly indicated the advantages of using such mordants both in case of achieving antibacterial functionality as well as eco-friendliness [M D. Teli*, Javed Sheikh and Maruti Kamble (Department of Fibres and Textile Processing Technology, Institute of Chemical Technology Matunga (E), Mumbai, India), *Textiles and Light Industrial Science and Technology*, 2013, **2**(2), 78-84].

ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 4(4), 2013-0348 Chemical composition and bioactivity of different oregano (*Origanum vulgare*) extracts and essential oil

There is a growing interest in industry to replace synthetic chemicals by natural products with bioactive properties. Aromatic plants are excellent sources of bioactive compounds that can be extracted using several processes. As far as oregano is concerned, studies are lacking addressing the effect of extraction processes in bioactivity of extracts. This study aimed to characterise the in vitro antioxidant and antibacterial properties of oregano (*Origanum vulgare*) essential oil and extracts (in hot and cold water, and ethanol), and the chemical composition of its essential oil. The major components of oregano essential oil were carvacrol, β -fenchyl alcohol, thymol, and γ -terpinene. Hot water extract had the strongest antioxidant properties and the highest phenolic content. All extracts were ineffective in inhibiting the growth of the seven tested bacteria. In contrast, the essential oil inhibited the growth of all bacteria, causing greater reductions on both *Listeria* strains (*L. monocytogenes* and *L. innocua*). *O. vulgare* extracts and essential oil from Portuguese origin are strong candidates to replace synthetic chemicals used by the industry [Bárbara Teixeira, António Marques*, Cristina Ramos, Carmo Serrano, Olívia Matos, Nuno R Neng, José M F Nogueira, Jorge Alexandre Saraiva and Maria Leonor Nunes (António Marques, Division of Aquaculture and Upgrading, Portuguese Institute for the Sea and Atmosphere, I.P. (IPMA, I.P.), Avenida de Brasília, 1449-006 Lisboa, Portugal), *Journal of the Science of Food and Agriculture*, 2013, **93** (11), 2707–2714].

NPARR 4(4), 2013-0349 Chemical composition and biological activity of *Gaultheria procumbens* L. essential oil

The aim of this study was to examine chemical composition and biological activity of *Gaultheria procumbens* L. essential oil (EO) against food spoilage and oral microorganisms. The components of EO were identified by GC–MS. Antimicrobial activity was determined against food spoilage (five bacteria and six fungal species) and oral microorganisms (eight bacteria and thirty two fungal species) by microdilution and microplate biofilm assay, antioxidant activity was tested using the persistent free radical 2,2-diphenyl-1-picryl hydrazyl (DPPH), while antiradical activity was examined by fluorescence spectroscopy and electron paramagnetic resonance spectroscopy (EPR). GC–MS analysis showed that methyl salicylate (96.90%) was the main component of the oil. Essential oil inhibited the growth of all microorganisms tested, i.e. food and oral bacteria and fungi, respectively (MIC 0.18–3.00 mg/ml and MBC 1.25–4.00 mg/ml; MIC 0.73–5.00 mg/ml and MFC 2.92–26.67 mg/ml); The oil effectively inhibited the biofilm formation of oral *Streptococcus mutans* and *Candida albicans* as well (MIC 25.00 MBC 50.00 mg/ml; MIC 12.50, MFC 50.00 mg/ml). In addition, oil exhibited a dose-dependent DPPH-radical-scavenging activity with IC₅₀ value of 30.61 mg/ml. The specific fluorescence probe 2-[6-(4'-amino)phenoxy-3H-xanten-3-on-9-yl] benzoic acid (APF) and the spin trap 5-(Diethoxyphosphoryl)-5-methyl-1-pyrroline-N-oxide (DEPMPO), capable for simultaneous detection of different free radical specie were used in antiradical activity of the oil measurements. Oil showed a moderate antiradical activity, reducing quantity of produced hydroxyl radicals to about 20% of initial value. This study succeeds in creating directly comparable and quantitative data for the oil insufficiently examined so far [Miloš Nikolić*, Tatjana Marković, Miloš Mojović, Boris Pejin,

Aleksandar Savić, Tamara Perić, Dejan Marković, Tatjana Stević and Marina Soković (Institute for Biological Research “Siniša Stanković, University of Belgrade, Bulevar Despota Stefana 142, 11060 Belgrade, Serbia), *Industrial Crops and Products*, 2013, **49**, 561-567].

FEED/FODDER

NPARR 4(4), 2013-0350 **Short-term oxidative lime pretreatment of palm pruning waste for use as animal feedstuff**

Oxidative lime pretreatment (OLP) is an effective pretreatment for highly recalcitrant lignocellulosic materials. This experiment was conducted to investigate the effect of short-term OLP on fermentative gas production kinetics of date palm prunings. Rachis and petiole were pretreated with excess lime (0.5 g Ca(OH)₂ g⁻¹ dry matter) in a reactor charged with 10 bar pure oxygen pressure at different times and temperatures. Lignin removal was greatly affected by OLP, whereas cellulose was well preserved even after severe pretreatment. After 72 h fermentation, the cumulative gas production was 321.2 mL gas g⁻¹ organic matter (OM) for the most severe pretreatment, compared to 73.6 mL g⁻¹ OM for the untreated rachis. For the petiole pretreated at 120 °C for 280 min, 268 mL gas was produced compared to 59 mL gas g⁻¹ OM for the untreated petiole. Scanning electron microscope images showed the formation of pores (average diameter of 10–12 µm) and carbonate calcium deposits on the surface of treated biomass. An increase in biomass crystallinity was observed in pretreated samples resulting from cellulose enrichment. The results suggest that OLP improves the ruminal digestibility of date palm prunings, which may have potential for inclusion in the ruminant diet at low cost [Farhad Ahmadi*, Abbas Rajaei Rad, Mark T Holtzapfel and Mohammad Javad Zamiri (Department of Animal Science, College of Agriculture, Shiraz University, Shiraz, Iran.), *Journal of the Science of Food and Agriculture*, 2013, **93**(8), 2061-2070].

NPARR 4(4), 2013-0351 **Effect of replacement of concentrate with chaya (*Cnidioscolus aconitifolius*) fodder meal on nutrient utilization and growth performance of bundelkhandi goats**

Twenty-four growing Bundelkhandi goats (weighing 9.21±0.50 kg) were randomly divided according to body weight into three groups of eight animals in each, and offered a composite ration of dry grass and concentrate mixture to investigate the effect of replacing concentrate with chaya fodder meal on feed intake, nutrient utilization and growth performance in goats. In the concentrate mixture of groups T₁, T₂ and T₃, 0, 50 and 80% crude protein (CP) was replaced with chaya fodder meal. All the animals were remained under this feeding regime for a period of 90 days and at the end of experimental feeding, a metabolism trial was conducted for 7 days duration. For conducting the digestibility cum metabolism trial five kids were selected from each group. Voluntary feed intake (g/kgW^{0.75}) was similar in T₁ (60.90), T₂ (62.01) and T₃ (61.16). Digestibility coefficients (%) of DM, OM, CP, EE and NFE were higher (p<0.05) in T₁ and T₂ than T₃, except for CP and ADF, which were similar among treatment groups. Total VFA and TCA-precipitable-N was higher (p<0.05) in T₁ and T₂, while reverse was true for pH and ammonia-N. DCP intake in T₁ and T₂ was sufficient for daily gain of 60g while it was sufficient for 50g only in T₃. N balance (g/d) was significantly higher in T₁ (3.77) or T₂ (3.40) than T₃ (1.88). Similarly, average daily gain (g) was also higher (p<0.05) in T₁ (54.17) and T₂ (55.70) as compared to T₃ (40.63). The results indicated that 50% crude protein replacement of concentrate mixture did not affect the nutrient utilization and growth performance, however, replacement of 80% CP of concentrate mixture with chaya fodder meal adversely affected the N retention. It was concluded that 50% CP from concentrate mixture could be replaced by Chaya fodder meal without affecting nutrient utilization and growth performance in *Bundelkhandi* kids [Singh K.K.*, Das M.M., Sharma P., Maity S.B., and Misra A.K (Plant Animal relationship Division, Indian Grassland and Fodder Research Institute, Jhansi-284003, Uttar Pradesh, India), *Indian Journal of Animal Nutrition*, 2013, **30**(3), 237-241].

NPARR 4(4), 2013-0352 Correlation and path coefficient analysis for fodder and grain yield related traits in oats (*Avena sativa* L.).

Seventy-five germplasm lines of oat were evaluated for 10 morphological traits to determine the interrelationships and effects among fodder and grain yield traits of oats. The PCV and GCV showed low level of difference for days to 50% flowering, plant height, leaf/stem ratio, green fodder yield and grain yield indicating the low effect of environment on these traits. Days to 50% flowering, plant height, number of spikelets/panicle, leaf width and green fodder yield showed high heritability and genetic advance. Grain yield was found to be positively correlated with days to 50% flowering, plant height, number of leaves/plant, leaf length, leaf width, leaf/stem ratio and green fodder yield. For fodder yield, leaf length had maximum positive direct effect followed by number of leaves/plant and plant height. The high positive correlation between fodder yield and days to 50% flowering, plant height, number of spikelets/panicle, leaf/stem ratio was obtained mainly through indirect effect via number of leaves/plant, leaf length and leaf width. The path coefficient analysis for grain yield revealed that green fodder yield had maximum positive direct effect on grain yield followed by number of leaves/plant and leaf width indicating true and perfect relationship. The high positive correlation between grain yield and leaf length, leaf/stem ratio, plant height was obtained mainly through indirect effect via green fodder yield [Ahmed, S.,

Roy, A. K., Majumdar, A. B., *Annals of Biology*, 2013, **29**(1), 75-78].

NPARR 4(4), 2013-0353 Value addition of feed and fodder by alleviating the antinutritional effects of tannins

Tannins are one of the important plant secondary metabolites having wide prevalence in the plant kingdom. They are a prominent constituent of various types of feed, fodder and agro-industrial wastes. The intake of tannins at a low level has recently been found to have some positive effects in ruminants. However, the use of tannin-rich biomass as animal feed, having high content of tannins, is limited by the antinutritional effects of tannins at this level in an animal system. A number of physical, chemical, biological and miscellaneous approaches have been developed for inactivation or removal of tannins for enhancement of the feeding value of tannin-rich biomass. However, none of the individual method is successful in total inactivation or removal of tannins without loss of nutritive value, and this limits the utilization of a vast amount of plant resource. A cohesive and an integrated detanninification strategy is required for alleviating the antinutritional effects of tannins in animals and upgrading the feeding value of tanniniferous biomass [T. K. Bhat*, A. Kannan, Birbal Singh and O. P. Sharma (Regional Station, Indian Veterinary Research Institute, Palampur 176061, Himachal Pradesh, India), *Agric Res*, 2013, **2**(3), 189-206].

FIBRES (incl. Textile and other utility fibres)

NPARR 4(4), 2013-0354 Influence of the degree of retting of flax fibers on the tensile properties of single fibers and short fiber/polypropylene composites

The flax quality required for composite applications is not yet well established. Retting is one of the steps that are not well defined for these applications, and is a critical parameter during flax production. In this study, the influence of the degree of retting of flax on the properties of short flax fiber/polypropylene composites has been assessed. First, the degree of retting of gradually retted flax was measured by both qualitative and quantitative experimental techniques. In addition, water sorption studies were performed. Furthermore, tensile tests were carried out on both single fiber and injected composite materials. The microstructure of the composites was analyzed by scanning electron microscopy and X-ray micro-tomography. Single fiber and composite tensile properties, as well as water sorption behavior of flax fibers, were found to depend upon the degree of retting [Nicolas Martin*, Nicolas Mouret, Peter Davies and Christophe Baley (Laboratoire d'Ingénierie des Matériaux de Bretagne (LIMATB), Université de Bretagne-Sud Rue de Saint-Maudé, BP 92116, 56321 Lorient Cedex, France), *Industrial Crops and Products*, 2013, **49**, 755-767].

NPARR 4(4), 2013-0355 Studies on camel hair - merino wool blended knitted fabrics

Effect of blending camel kid hair with merino wool on performance of resultant yarn and fabric has been studied. Camel hair (CH) has been blended with merino wool (M) in three different ratios, viz. 25:75, 75:25 and 50:50 on khadi hand spinning system. Knitted fabric samples are then prepared on circular hand

knitting machine. Properties of yarn and knitted fabric are also evaluated. It is found that the blending of merino wool with camel hair improves fineness and strength of yarn. Performance of CH75:M25 knitted fabric is found better in terms of strength and warmth, whereas CH25:M75 fabric shows higher abrasion resistance and better knitting performance and hand [Anjali Sharma* and Suman Pant (Clothing and Textiles, Faculty of Home Science, Banasthali University, Banasthali 304 022, India), *Indian Journal of Fibre & Textile Research*, 2013, **38**, 317-319].

NPARR 4(4), 2013-0356 Optimisation of process conditions of cotton fabric treatment with *Terminalia chebula* extract for antibacterial application

The methanol extracts of *Terminalia chebula* fruits as antibacterial agent and citric acid as a crosslinking agent have been applied on cotton plain woven fabric and the treated fabrics are then tested for antibacterial activity against bacterial strains like *Staphylococcus aureus* and *Escherichia coli*, under agar diffusion test and quantitative assessment. The results indicate that the treated cotton fabric shows a clear antibacterial activity with 27-38 mm zone of inhibition in the agar diffusion test against the above-mentioned strains. The treated samples show 93.33% of reduction against *Staphylococcus aureus* and 82.14 % reduction against *Escherichia coli* as per quantitative assessment. The antibacterial finished textile samples have also been evaluated for the physical properties like tensile strength, tearing strength, water absorbency and air permeability. Process parameters are optimized for better performance of antibacterial treated material by the response surface methodology adopted using Box – behnken design and the regression equations have been obtained for fabric properties. The optimized process parameters for higher antibacterial ability of the treated textile material

with optimum physical properties are extract concentration of 25%, crosslinking agent of 7.5% and the curing temperature of 94.16°C [R Rathinamoorthy* and G Thilagavathi (Department of Fashion Technology, PSG College of Technology, Coimbatore- 641 004, India), *Indian Journal of Fibre & Textile Research*, 2013, **38**, 293-303].

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

NPARR 4(4), 2013-0357 **Physico-chemical characteristics and sensory evaluation of wheat bread partially substituted with banana (*Musa acuminata* X *balbisiana* cv. Awak) pseudo-stem flour**

The physico-chemical and sensorial properties of the control (BCtr), commercial wheat flour (CWF) bread substituted with 10% BPF (banana pseudo-stem flour) (B10BPF) and B10BPF with added 0.8% w/w (flour weight basis) xanthan gum (XG) or sodium carboxymethylcellulose (CMC) (B10BPF_{XG} and B10BPF_{CMC}, respectively) were examined. The proximate analyses revealed that the composite bread had significantly higher moisture, ash, crude fibre, soluble, insoluble and total dietary fibre contents but lower protein, fat and carbohydrate contents than the BCtr. Bread incorporated with BPF resulted in a lower volume, darker crumb and lighter crust colour than the BCtr. The addition of CMC improved the bread volume. All breads containing BPF had greater total phenolics, and antioxidant properties than the control bread. Sensory evaluation indicated that the B10BPF_{CMC} bread had the highest acceptability [Lee-Hoon Ho*, Noor Aziah Abdul Aziz and Baharin Azahari (Food Technology Division, School of Industrial Technology, Universiti Sains Malaysia, 11800 Penang, Malaysia), *Food Chemistry*, 2013, **139**(1-4), 532-539].

NPARR 4(4), 2013-0358 **Biofortification of mungbean (*Vigna radiata*) as a whole food to enhance human health**

Mungbean [*Vigna radiata* (L.) R. Wilczek var. *radiata*] is one of the most important pulse crops grown in South, East and Southeast Asia. It provides significant amounts of protein (240 g kg⁻¹) and carbohydrate (630 g kg⁻¹) and a

range of micronutrients in diets. Mungbean protein and carbohydrate are easily digestible and create less flatulence than proteins derived from other legumes. In addition, mungbean is lower in phytic acid (72% of total phosphorus content) than pigeonpea (*Cajanus cajan* L. Millsp.), soybean (*Glycine max* L.) and cereals; phytic acid is commonly found in cereal and legume crops and has a negative impact on iron and zinc bioavailability in plant-based diets. Owing to its palatable taste and nutritional quality, mungbean has been used as an iron-rich whole food source for baby food. The wide genetic variability of mineral concentrations (e.g. 0.03–0.06 Fe kg⁻¹, 0.02–0.04 g Zn kg⁻¹) in mungbean indicates possibilities to improve its micronutrient content through biofortification. Therefore biofortification of existing mungbean varieties has great potential for enhancing the nutritional quality of diets in South and Southeast Asia, where protein and micronutrient malnutrition are among the highest in the world. This review paper discusses the importance of mungbean in agricultural production and traditional diets and the potential of enhancing the nutritional quality of mungbean through breeding and other means, including agronomic practices [Ramakrishnan M Nair*, Ray-Yu Yang², Warwick J Easdown, Dil Thavarajah, Pushparajah Thavarajah, Jacqueline d'A Hughes, JDH (Dyno) Keatinge (AVRDC South Asia, ICRISAT Campus, Hyderabad, AP, India) *Journal of the Science of Food and Agriculture*, 2013, **93**(8), 1805-1813].

NPARR 4(4), 2013-0359 **Preparation of dietary fibre-enriched materials from preharvest dropped apples and their utilisation as a high-fibre flour substitute**

Preharvest dropped apples from a weather disaster are generally discarded or used in animal feed due to reduced market value. In this study, they were utilised to produce dietary fibre-enriched materials (DFEMs) and their baking performance in a food system was then evaluated as a high-fibre and low-calorie flour substitute.

Hydrothermal treatment and fractionation of preharvest dropped apple powder produced fibre-rich fractions (856.2 g kg^{-1}). The use of DFEMs increased the pasting properties of wheat flour and improved dough mixing stability. When DFEMs were incorporated in the cookie formulation (2, 4 and 6 g dietary fibre per serving), the cookie dough exhibited increased elongational viscosity and solid-like behaviour which became more pronounced with increasing levels of DFEMs. After baking, reduced spread was observed in DFEM cookies which could be readily attributed to their rheological characteristics. However, greater moisture retention by DFEMs produced cookie samples with softer texture. DFEMs prepared from preharvest dropped apples could be successfully evaluated in a cookie model system as a high-fibre and low-calorie substitute for wheat flour. This study suggests a new value-added application of preharvest dropped fruits, positively extending their use for better healthful diets [Yujeong Kim, Yongwook Kim, In Young Bae, Hyeon Gyu Lee, and Suyong Lee* (Department of Food Science & Technology and Carbohydrate Bioproduct Research Center, Sejong University, 98 Gunja-dong, Gwangjin-gu, Seoul, 143-747, Korea), *Journal of the Science of Food and Agriculture*, 2013, **93**, (8)1974-1978].

NPARR 4(4), 2013-0360 Studies on the Effect of butter milk solids and vegetable oil on preparation of “filled Chhana”

The production of *Chhana* is confined to the eastern region of the country. It contains less than 70 percent moisture and approximate 50 percent fat on dry matter basis. *Chhana* is an acid coagulated indigenous milk product which is very widely used in India as a base material for the preparation of various sweetmeats like *sandesh*, *rasogolla*, *cham-cham*, *rasmalai*, *balsahi*, *Khurma*, *pantooa* etc. Butter milk containing about 10% milk solids, after modifying the composition with vegetable oil and skim milk powder (3.0% fat and 8.5% SNF), can be

converted into *chhana* like product to be utilized in making various sweetmeats, viz *Rasogolla*, *Sandesh*, *Cham-cham*, *Rasmalai*, *Pantua*, and *Rajbhog* etc. Vegetable oil, being cheaper than milk fat, can be mixed with butter milk to obtain a filled *chhana* which would definitely be cheaper than the normal *chhana*. It will be helpful for people suffering from protein energy malnutrition because this product is rich in protein and energy and it will be also helpful for people suffering from lactose intolerance where diet should contain restricted amounts or no lactose because in the absence of enzyme lactase, lactose is not hydrolyzed to glucose and galactose. Almost 90 per cent of lactose content of initial milk is lost in whey during *chhana* preparation. On other hand it will be helpful from economic point of view for those people who come under economically weaker section because by replacing milk fat with edible vegetable oil the cost of the product can considerably be reduced [Singh Upendra, Kant Rajni*, Prakash Saurabh, Kumari Sonia (Department of Food Science & Technology, Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Science, Allahabad-211007), *Trends in Biosciences*, 2013, **6**(6), 854-857].

NPARR 4(4), 2013-0361 Odour quality of spray-dried hens' egg powders: The influence of composition, processing and storage conditions

This study aimed to determine whether compositional or processing parameters have an influence on the odour quality of egg powders. The parameters tested were: whole egg vs. egg yolk, polyunsaturated fatty acid (PUFA) enrichment, spray-drying temperature (160 °C vs. 180 °C), production scale (industrial vs. pilot plant), storage temperature (15 °C vs. 30 °C) and time (1, 2, 4 and 8 months). The quality of egg powders was evaluated by sensory analysis using free sorting, and by gas chromatography coupled to mass spectrometry and olfactometry. PUFA

enrichment and spray-drying temperature do not affect the odour of egg yolk powders. There are significant differences between the odour of whole-egg and egg-yolk powders as well as between powders produced on an industrial scale or in a pilot plant. An increase in the odour intensity of egg powders was observed during storage, while unpleasant odours were perceived when the egg powders were stored at 30°C [Cécile Rannou*, Florence Texier, Michelle Moreau, Philippe Courcoux, Anne Meynier and Carole Prost (ONIRIS, UMR CNRS 6144 GEPEA, Rue de la Géraudière, BP 82225, 44322 Nantes Cedex 3, France.), *Food Chemistry*, 2013, **138**, (2-3), 905-914].

NPARR 4(4), 2013-0362 Storage stability of hen egg white powders in three protein/water dough model systems

In recent years, due to the specific health benefits associated with bioactive peptides and the reduction of protein allergenicity by enzymatic hydrolysis, the utilisation of protein hydrolysates in the intermediate-moisture food (IMF) market, such as high protein nutrition bars (HPNB), has significantly increased. Currently, no reported study is related to the storage stability of dried hen egg white (DEW) and its hydrolysates (HEW) in an IMF matrix. Therefore, three DEW/HEW dough model systems (100%HEW + 0% DEW, 75% HEW + 25% DEW and 50% HEW + 50% DEW) were established using two commercial spray-dried egg white powders to study the effect of temperature and fraction of HEW on these IMF models (water activity (a_w): ~0.8). During storage at three different temperatures (23, 35 and 45 °C) for 70 days, the selected physicochemical properties of the dough systems were compared. Overall, kinetic analysis showed an apparent zero-order model fit for the change in the colour (L^*), fluorescence intensity (FI) and hardness, as a function of time, for different dough model systems. As expected, the L^* , FI and hardness

increased as a function of time mainly due to the Maillard reaction. The amount of free amino groups decreased, with an increase in rate of loss, as temperature increased in the 100%HEW + 0%DEW model. When DEW was substituted for some HEW, the regeneration of the free amino groups after loss was observed as a function of time. Furthermore, when the percentage of HEW was decreased, the incidence of mouldy samples occurred sooner, which indicates that HEW has some antimicrobial ability, especially in the 100%HEW + 0%DEW system where mould growth did not occur [Qinchun Rao*, Jeancarlo R. Rocca-Smith and Theodore P. Labuza (Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Ave., St. Paul, MN 55108, United States), *Food Chemistry*, 2013, **138**, (2-3), 1087-1094].

NPARR 4(4), 2013-0363 Antioxidant activity and nutritional quality of traditional red-grained rice varieties containing proanthocyanidins

Proanthocyanidin-containing rice varieties have been rarely reported. Antioxidant capacity, major antioxidant components, and nutritional parameters of eight traditional red-grained rice varieties containing proanthocyanidins grown in Sri Lanka were investigated. The tested traditional red varieties, on the average, had over sevenfold higher both total antioxidant capacity and phenolic content than three light brown-grained new-improved rice varieties. Major antioxidant phenolic compounds identified in this study included proanthocyanidins, phenolic acids and γ -oryzanols (ferulic acid derivatives). Proanthocyanidins were detected only in the traditional red varieties, but not found in new-improved ones. Most traditional red varieties also contained significantly higher levels of protein with well balanced amino acids and higher contents of fat, fibre and vitamin E (tocopherols and tocotrienols) than the new-improved ones.

Great variations in antioxidant capacity, major phenolics, and nutritional parameters were observed among different rice varieties. These Sri Lankan traditional red-grained rice varieties containing proanthocyanidins may be used as important genetic sources for rice breeding [Anil Gunaratne*, Kao Wu, Dongqin Li, Amitha Bentota, Harold Corke and Yi-Zhong Cai (School of Biological Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong, China.), *Food Chemistry*, 2013, **138** (2-3), 1153-1161].

NPARR 4(4), 2013-0364 Effect of peeling and three cooking methods on the content of selected phytochemicals in potato tubers with various colour of flesh

The impact of peeling and three cooking treatments (boiling, baking and microwaving) on the content of selected phytochemicals in white-, yellow-, red- and purple-fleshed potatoes was investigated. Ascorbic acid and chlorogenic acid contents were determined by HPLC-DAD, total anthocyanin content by pH-differential spectrophotometry, glycoalkaloid, α -chaconine and α -solanine contents by HPLC-ESI/MS/MS. All cooking treatments reduced ascorbic and chlorogenic acid contents, total glycoalkaloids, α -chaconine and α -solanine with the exception of total anthocyanins. The losses of ascorbic and chlorogenic acids were minimised with boiling and total anthocyanin levels retained the highest. Boiling of peeled tubers decreased contents of total glycoalkaloids (α -chaconine and α -solanine) and appeared as the most favourable among the three tested methods. Moreover, due to higher initial levels, red- and purple-fleshed cultivars retained higher amounts of antioxidants (ascorbic acid, chlorogenic acid and total anthocyanin) after boiling and may be healthier as compared with white or yellow cultivars [Jaromír Lachman*, Karel Hamouz, Janette Musilová, Kateřina Hejtmánková, Zora Kotúková, Kateřina Pazderů, Jaroslava Domkářová, Vladimír Pivec and Jiří Cimr (Department of Chemistry, Faculty

of Agrobiology, Food and Natural Resources, Czech University of Life Sciences Prague, Kamýcká 129, 165 21 Prague 6 – Suchbát, Czech Republic), *Food Chemistry*, 2013, **138** (2-3), 1189-1197].

NPARR 4(4), 2013-0365 Effect of incorporating hydrothermal, kilned and defatted oats on antioxidant and chapatti making properties of wheat flour

Oats were subjected to treatments like defatting, hydrothermal cooking and kilning, milled into flour and then the control and treated flours were incorporated into wheat flour at 25% and 50% levels and chapatti making behaviour and antioxidant properties were studied. The treatments significantly affected the antioxidant properties of oats. Incorporating oat flours to wheat increased total phenolic content but lowered the antioxidant activity however both were decreased significantly upon baking. The reducing power of the oat blended flour was higher than the wheat flours and ranged from 8.0 to 15.5 $\mu\text{mol AAE/g}$ and was further increased upon baking. The metal chelating activity of flour blends varied from 62.0% to 73.8% and further increased upon baking. After baking the total flavonoid content was lowered and ranged from 308 to 389 $\mu\text{g CE/g}$. The non-enzymatic browning index significantly increased up to 27.6% upon baking [Hardeep Singh Gujral, Paras Sharma, Balmeet Singh Gill and Sumandeep Kaur (Department of Food Science and Technology, Guru Nanak Dev University, Amritsar, India), *Food Chemistry*, 2013, **138** (2-3), 1400-1406].

NPARR 4(4), 2013-0366 Quality and antioxidant properties of breads enriched with dry onion (*Allium cepa* L.) skin

The aim of the study was to investigate the effect on the antioxidant properties and

sensory value of bread of adding ground onion skin (OS). For a determination of bioaccessibility and bioavailability *in vitro* the human gastrointestinal tract model was used. OS contained mastication-extractable quercetin (4.6 mg/g). Quercetin from OS was highly bioaccessible during *in vitro* conditions, but only approximately 4% of quercetin released during simulated digestion was bioavailable *in vitro*. The antioxidant potential of bread with OS was significantly higher than the activity noted in the control. In particular, OS addition significantly fortified bread with bioaccessible lipid oxidation preventers and compounds with reducing and chelating abilities. The 2–3% OS addition caused significant improvement of antioxidant abilities (further increases in the OS supplement did not increase the activity of bread). Sensory evaluation showed that replacement of wheat flour in bread with up to 3% OS powder gave satisfactory consumer acceptability [Urszula Gawlik-Dziki*, Michał Świeca, Dariusz Dziki, Barbara Baraniak, Justyna Tomiło and Jarosław Czyż (Department of Biochemistry and Food Chemistry, Faculty of Food Science and Biotechnology, University of Life Sciences, Skromna Str. 8, 20-704 Lublin, Poland), *Food Chemistry*, 2013, **138** (2-3), 1621-1628].

NPARR 4(4), 2013-0367 **Temperature stimulated changes in potato and bean sprouts**

The potato and bean sprouts were tested using dynamic mechanical analysis (DMA), in air with 90% humidity between 30 and 90 °C. Temperature plots of storage (*SM* i.e. elastic) and loss (*LM* i.e. inelastic) moduli were obtained. The *SM* and *LM* values were the basis for the calculation of the loss tangent (*LT*), the parameter expressing the ratio of inelastic to elastic parenchyma toughness. As expected, the tissue toughness decreased with increasing temperature. For both moduli, the characteristic temperature area with temperature slope minimum was observed – it was termed the negative peak on the temperature slope plots or separation point. It was shown that the negative peak was related to an increase in the inelastic part of the tissue toughness. These changes were interpreted as a consequence of pore protein denaturation followed by changes of the internal stresses inside the parenchyma cells [Jiří Blahovec, Magdaléna Lahodová and Martin Kindl* (Department of Physics, Czech University of Life Sciences, 16521 Prague 6-Suchbát, Czech Republic), *Journal of Food Engineering*, 2013, **117**(93), 299-303].

FRUITS

NPARR 4(4), 2013-0368 Comparative evaluation of the phenolic content and antioxidant capacity of sun-dried raisins

Raisins are one of the favorite dried fruit because of their high healthful and nutrimental values. Three white (Besni beyazi-BBR, Hatun parmagi-HPR and Sultaniye-SR) and two red (Antep karasi-AKR and Besni karasi-BKR) grape varieties were used in the present study. The aim of this study was to determine and compare the phenolic composition and antioxidant properties of Turkish raisins. Four flavan-3-ols, six phenolic acids, four flavonols and 13 anthocyanins were identified and quantified in raisins. (+)-Catechin (range, 56.3–419 mg kg⁻¹) was the most abundant flavanol, *trans*-caftaric acid (range, 20.48–114 mg kg⁻¹) was the abundant dominant phenol acid, quercetin-3-*O*-glucoside (range, 2.79–12.83 mg kg⁻¹) was the dominant flavonol and malvidin-3-*O*-(6-*O*-*p*-coumaroyl)-glucoside (range, 16.75–22.59 mg kg⁻¹) was the major anthocyanin in all raisins. Antioxidant capacity were 22.69–63.66, 5.07–40.47, 7.00–17.69 and 40.4–40.74–77.41 mmol Trolox kg⁻¹ as determined by the ABTS, DPPH, FRAP and ORAC assays, respectively. 27 phenolic compounds from four phenolic families (i.e. flavan-3-ols, phenolic acids, flavonols and anthocyanins) have been characterised in the raisins of three white and two red grapes. The total phenolic and anthocyanins content vary widely among different raisins. Strong correlations between antioxidative capacity and phenolic content and between antioxidative capacity and flavonol content were noticed. [Hasim Kelebek*, Michael Jourdes, Serkan Selli and Pierre-Louis Teissedre (Adana Science and Technology University, Faculty of Engineering and Natural Sciences, Department of Food Engineering, 01180 Adana, Turkey), *Journal of the Science of Food and Agriculture*, 2013, **93**, (12) 2963-2972].

NPARR 4(4), 2013-0369 Influence of the freezing method on the changes that occur in grape samples after frozen storage

Sample freezing is frequently used in oenological laboratories as a compromise solution to increase the number of samples that can be analysed, despite the fact that some grape characteristics are known to change after frozen storage. However, freezing is usually performed using standard freezers, which provide a slow freezing. The aim of this work was to evaluate whether blast freezing would decrease the impact of standard freezing on grape composition. Grape quality parameters were assessed in fresh and in frozen stored samples that had been frozen using three different procedures: standard freezing and blast freezing using either a blast freezer or an ultra-freezer. The implications of frozen storage in grape samples reported in earlier research were observed for the three freezing methods evaluated. Although blast freezing improved repeatability for the most problematic parameters (tartaric acidity, TarA; total phenolics, TP), the improvement was not important from a practical point of view. However, TarA and TP were relatively repeatable among the three freezing procedures, which suggests that freezing had an effect on these parameters independently of the method used. According to our results, the salification potential of the must is probably implied in the changes observed for TarA, whereas for TP the precipitation of protoanthocyanins after association with cell wall material is hypothesized to cause the lack of repeatability between fresh and frozen grapes. Blast freezing would not imply a great improvement if implemented in oenological laboratories, at least for the parameters included in this study [Luis G Santesteban*, Carlos Miranda, and José B Royo Departamento de Producción Agraria, Universidad Pública de Navarra, 31006, Pamplona, Navarra, Spain), *Journal of the Science of Food and Agriculture*, 2013, **93** (12), 3010-3015].

NPARR 4(4), 2013-0370 Compressibility and dissolution characteristics of mixed fruit tablets made from guava and pitaya fruit powders

This study reports the tableting of whole fruit powder from pitaya and guava and their dissolution in relation to use as drink's tablets. Pulp of both fruits with peels and seeds were freeze-dried into powders with addition of 10% maltodextrin. The fruit powders, individually as well as in a binary mixture (1:1), were analyzed for material properties and were found to be poor in flow. Among the three powders, guava powder attained the lowest density during compaction and exhibited as a poor compressible powder. Mixed fruit tablets containing 1% effervescent agent eroded quite fast in all three types of solvents studied. However, the acidic solvent (0.1 N HCl) was found to be not suitable for erosion of tablets containing polyvinylpyrrolidone (Kollidon CL). In terms of active ingredient release (antioxidant), Kollidon CL was found to be the best. In the case of color release (a^*), the faster the erosion, the better was the color intensity irrespective of dissolution media. As drink tablets, the mixture containing 10% sugar was highly preferred by majority of panelists (80%). A month long storage study with the mixed fruit tablet formulation at room temperature showed good microbial stability [Lai Pei Zea*, Yus Aniza Yusof, Mohammad Gulzarul Aziz, Chin Nyuk Ling and Nor Amaiza Mohd Amin (Department of Process and Food Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia), *Powder Technology*, 2013, **247**, 112-119].

NPARR 4(4), 2013-0371 Compositional characteristics of sour cherry kernel and its oil as influenced by different extraction and roasting conditions

Sour cherry seeds arise as a waste material during processing of the fruits into

processed products such as canned or frozen sour cherry, and sour cherry juice. This study aimed to investigate the chemical composition of the kernels in depth for potential utilization as a source of oil, protein and dietary fibers. The kernel was found to contain 17.0% of oil, 29.3% of proteins and 30.3% of dietary fibers. Conventional hexane and supercritical carbon dioxide (SC-CO₂) were used to extract oil from the kernels. The kernel oil was found to contain palmitic acid (6.4%), stearic acid (1.2%), oleic acid (46.3%), linoleic acid (41.5%), and linolenic acid (4.6%). Extraction technique had no significant effect on fatty acid composition of kernel oil. The oil extracted by hexane contained significantly higher levels of tocopherols and β -carotene than the oil extracted by SC-CO₂. The effect of ethanol used as a co-solvent in both extraction techniques on the composition of oil was determined. Using ethanol with both hexane and SC-CO₂ increased total phenolic content, antioxidant capacity and β -carotene content of oil. Roasting kernels at 160 °C for 30 min decreased total tocopherols (9.8%), but increased total phenolic content (4.5 times) and hydroxymethylfurfural (1.4 mg/L) in resulting oil [Cemile Yılmaz and Vural Gökmen (Compositional characteristics of sour cherry kernel and its oil as influenced by different extraction and roasting conditions), *Industrial Crops and Products*, 2013, **49**,130-135].

NPARR 4(4), 2013-0372 Physiological responses of Indian jujube (*Ziziphus mauritiana* Lamk.) fruit to storage temperature under modified atmosphere packaging

The effect of storage temperature on physiological responses in Indian jujube (*Ziziphus mauritiana* Lamk. cv. Gola) fruit was investigated. Freshly harvested fruits at physiological maturity characterised by colour-turning stage were stored at ambient temperature, 12 and 6 °C for 21, 35 and 35 days respectively.

Headspace O₂, CO₂ and C₂H₄, moisture content, respiration, ethylene production, firmness, tristimulus colour, chroma, hue angle and chilling injury index were monitored during fruit storage. Rates of respiration and ethylene production increased after 1 week of storage at ambient temperature, while peaks were observed after 2 weeks at 12 and 6 °C. Headspace O₂ decreased continuously during storage, while CO₂ and C₂H₄ increased at all storage temperatures. Moisture content and firmness also decreased during storage. Hunter *L** values increased during storage, which correlated with the darkening of fruit colour. Fruit stored at ambient temperature did not show any chilling injury symptoms, while chilling injury appeared

on day 28 under 12 °C storage and on day 21 under 6 °C storage. Indian jujube fruit showed high rates of respiration and ethylene production that were significantly affected by different storage temperatures. Lower temperatures increased the shelf life of the fruit, but chilling injury was a problem under 6 °C storage. Indian jujube fruit could be stored at 6 °C for up to 35 days if chilling injury could be alleviated [Laxman Jat, Sunil Pareek* and Kunj B Shukla (Postharvest Technology Laboratory, Department of Horticulture, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, 313 001, India), *Journal of the Science of Food and Agriculture*, 2013, **93**(8), 1940-1944].

FUEL (incl. Biogas, Biodiesel, Biomass energy, Ethanol etc.)**NPARR 4(4), 2013-0373 An experimental investigation of a direct burning of crude Jatropha oil (CJO) and pitch in a commercial boiler system**

We conducted a test of a direct burning of crude Jatropha oil (CJO) and pitch in a commercial boiler system. The fuel, crude Jatropha oil is not biodiesel which comes from transesterification process of bio oil, but it is pure plant oil like cooking oil. The higher heating value (HHV) of the CJO is 39.3 MJ/kg (9380 kcal/kg) and is lower than that of commercial heating oil, 44.0 MJ/kg. The kinematic viscosity of CJO is 36.2 mm²/s at 40 °C and 8.0 mm²/s at 100 °C. The burner used in the test is a commercial burner for a commercial heating oil and its capacity is 140 kW (120,000 kcal/h). We did a preliminary test whether the combustion is stable or not. The preliminary test was a kind of open air combustion test using the commercial burner with crude Jatropha oil. We found that the combustion can be stable if the crude Jatropha oil temperature is higher than 90 °C. We measured the flue gas concentration by using a gas analyzer. The NO_x concentration of crude Jatropha oil is 80 ~ 100 ppm and CO concentration is nearly 0 ppm at flue gas O₂ concentration of 2.5 and 4.5%. We also tested a pitch combustion and the result shows that the NO_x concentration of pitch is about 90 ~ 110 ppm and CO concentration is below 30 ppm at flue gas O₂ concentration of 2.5 and 4.5%. As a reference data, combustion of heating oil was conducted. The NO_x concentration of heating oil is about 80 ppm which is the lowest value of tested fuels [Sae Byul Kang*, Jong Jin Kim and Yong Hoon Im (Building Energy Center, Korea Institute of Energy Research, Daejeon 305-343, Republic of Korea), *Renewable Energy*, 2013, **54**, 8-12].

NPARR 4(4), 2013-0374 Reutilization of carbon sources through sugar recovery from waste rice straw

Rice straw was utilized for the cultivation of *Phanerochaete chrysosporium* to produce cellobiose dehydrogenase. The composition of the rice straw after fermentation was found to be 28.77% glucan, 19.05% xylan and 54.81% other lignin containing sugars. The glucan and xylan content decreased due to the consumption of glucan and xylan by *P. chrysosporium*. After fermentation, the rice straw waste was subjected to chemical pretreatment to remove lignin. The effect of dilute acid pretreatment was not notable because of the glucose loss. However, when the rice straw after fermentation was treated with aqueous ammonia, the composition changed to 44.73% glucan, 25.43% xylan and 29.52% other lignin containing sugars. The aqueous ammonia pretreatment was optimized and an ammonia concentration, reaction time and temperature of 20%, 6 h and 60 °C, respectively, were determined to be the optimal pretreatment conditions. After removal of lignin, the initial reaction rate was increased to 0.009583 g/L s, which was about 3 fold higher than the rice straw after fermentation. X-ray diffractometry was performed to investigate the crystallinity index, and the XRD results showed that biological treatment and the combination of both biological treatment and chemical pretreatment decreased the crystallinity index [Sung Bong Kim*, Eunji Kim, Hah Young Yoo, Minsu Kang, Seong Woo Kang, Chulhwan Park, Jun Seok Kim and Seung Wook Kim (Department of Chemical and Biological Engineering, Korea University, Seoul 136-701, Republic of Korea) *Renewable Energy*, 2013, **53**, 43-48].

NPARR 4(4), 2013-0375 Optimization and oxidative stability of biodiesel production from rice bran oil

Biorefinery approach is introduced for the biodiesel production by utilizing low cost raw material, such as rice bran oil (RBO). The valorization of RBO was carried out by homogeneous transesterification process using response surface methodology (RSM) based on a two-variable central composition design (CCD). The process variables, temperature and catalyst concentration were found to have significant influence on biodiesel yield. The optimum combination derived via RSM for high ester yield (99.4%) was found to be 0.75% wt catalyst concentration at a reaction temperature of 45 °C. As biodiesel chemically is a long-chain alkyl methyl esters, its long-term fuel properties have become of great concern to the fuel industry. In order to determine the effects of long storage on

oxidation stability, RBO biodiesel sample was stored for 24 months and the different physical-chemical properties were checked with respect to time. The results show that the acid value (AV), peroxide value (PV), and viscosity (ν) increased while the iodine value (IV) decreased. Based on results, correlations were obtained in terms of AV, IV, PV and ν as a function of time. Those correlations can be used to predict how long time biodiesel can safely be stored. AV, IV and PV of the biodiesel sample which was stored were within the limits in European biodiesel specifications (EN 14214) [N El Boulifi*, A. Bouaid, M. Martinez and J. Aracil (Department of Chemical Engineering, Faculty of Chemistry, Complutense University, 28040 Madrid, Spain), *Renewable Energy*, 2013, **53**, 141-147].

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

NPARR 4(4), 2013-0376 Use of *Chaetomium globosum* for biocontrol of potato late blight disease

The efficacy of *Chaetomium globosum* as a biocontrol agent against the late blight pathogen *Phytophthora infestans* was evaluated in potato plants. Among eight *Chaetomium* isolates evaluated *C. globosum* isolate Cg-6 showed greater inhibition to mycelial growth of *P. infestans* *in vitro*. TLC studies showed that isolate Cg-6 produced an antibiotic called 'Chaetomin'. Isolate Cg-6 showed greater exo- and endo-glucanase enzyme activity when compared to other isolates. PCR amplification of the ITS region and sequencing of the PCR product confirmed that isolate Cg-6 belongs to the *C. globosum* group. *C. globosum* Cg-6 was formulated as a liquid and applied as a tuber, soil and foliar treatment either individually or in combination against *Phytophthora* infection in potato plants. Among different treatments, combined application of *C. globosum* as a tuber treatment @ 1 ml/kg of tubers, as a soil application @ 1 ml/kg of Farm Yard Manure (FYM) and foliar spray @ 0.7% resulted in significantly less late blight infection (72%) compared to untreated control (100%) under field conditions. The application of *C. globosum* resulted in greater tuber yield by reducing late blight infection in two field trials when compared to untreated controls. The study clearly demonstrated the potential use of *C. globosum* as a biocontrol agent in the management of late blight disease in potato plants [V. Shanthiyaa*, D. Saravanakumar, L. Rajendran, G. Karthikeyan, K. Prabakar and T. Raguchander (Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore 641 003, India), *Crop Protection*, 2013, **52**, 33-38].

NPARR 4(4), 2013-0377 Saffron corm as a natural source of fungicides: The role of saponins in the underground

Fungi cause important deteriorations of corms from *Crocus sativus* L. In order to screen the antifungal properties of this organ to fight such infections, two independent experiments based on the lyophilized and sterilized external (peel) and internal parts of the corm were conducted against five fungi isolated from infected corms during August. The minimum inhibitory concentrations (MIC) after 30 days of the peel treatments were 5.4% against *Aspergillus niger*, 3.9% against *Bipolaris spicifera*, *Fusarium oxysporum*, *Penicillium raistricki* and 2.3% against *Rhizopus nigricans* while the MIC of the internal part were not detected for *A. niger* and *B. spicifera*, 7.0% against *F. oxysporum* and *P. raistricki* and 3.9% against *R. nigricans*. The higher toxicity of the peel against fungi led us to investigate the influence of the saponins exclusively detected on the external part of the corm, as partially responsible for the extra observed effect. The main influence of these compounds on the toxicity was against *F. oxysporum*, the most devastating pathogen in saffron corms, followed by *B. spicifera* and *A. niger*. The growth inhibition of *P. raistricki* and *R. nigricans* was almost negligible. However, other compounds such as phenolics compounds could also be responsible for the fungicidal activity detected. These results illustrate that saffron corms could be further exploited in order to discover new phytochemical products with antifungal properties [Ángela Rubio-Moraga*, Lourdes Gómez-Gómez, Almudena Trapero, Natali Castro-Díaz and Oussama Ahrazem (Instituto Botánico, Departamento de Ciencia y Tecnología Agroforestal y Genética, Facultad de Farmacia, Universidad de Castilla-La Mancha, Campus Universitario s/n, 02071 Albacete, Spain.), *Industrial Crops and Products*, 2013, **49**, 915-921].

NPARR 4(4), 2013-0378 Evaluation of mosquito larvicidal activities of seed coat extract of *Cassia sophera* L.

In the present study an attempt was made to analyze the larvicidal activity of crude and ethyl acetate extracts of matured seed coat of *Cassia sophera* against *Culex quinquefasciatus*. Crude and ethyl acetate extracts of matured seed coat of *Cassia sophera* was tested against *Culex quinquefasciatus*. The lethal concentration was determined and the appropriate lethal concentrations at 24 h for ethyl acetate extract was also studied on non target organisms such as *Daphnia* sp., *Diplonychus annulatum* (predatory water-bug) and *Chironomus circumdatus* larvae (insect). Phytochemical analysis of the crude extract of matured seed coat of *Cassia sophera* was also done. All the graded concentration (0.6%, 0.7%, 0.8%, 0.9%, 1%) showed significant ($p < 0.05$) larval mortality and result of regression equation revealed that mortality rates were positively correlated with concentrations of extracts. LC_{50} and LC_{90} values were calculated at different time intervals, and the lowest values were obtained at 72 h for first instar larvae. In ethyl acetate solvent extract the mortality rate was higher at 520 ppm against *Culex quinquefasciatus* than the other doses. There was no mortality of non-target organism within 72 h of post exposure to LC_{50} concentration at 24 h of both crude and solvent extracts under the laboratory condition. The result of preliminary qualitative phytochemical analysis of the seed coat revealed the presence of some secondary metabolite such as saponin, alkaloid and cardiac glycosides. The results support that the tested plant extract can be used for control of larval form of *Culex quinquefasciatus* [Mousumi Kundu*, Anjali Rawani and Goutam Chandra (Mosquito and Microbiology Research Units, Department of Zoology, The

University of Burdwan, West Bengal, India), *Journal of Mosquito Research*, 2013, **3** (11), 76-81].

NPARR 4(4), 2013-0379 Isolation and characterization of biofumigant from leaves of *Lantana camara* for control of stored grain insect pests

Due to environmental concerns, health hazards to man and the evolution of resistance in insect pests, there have been constant efforts to discover newer insecticides both from natural sources and by chemical synthesis. Natural sources for novel molecules hold promise in view of their eco-friendly nature, selectivity and mammalian safety. We have isolated one natural bioactive molecule from the leaves of *Lantana camara* named Coumaran, based on various physical-chemical and spectroscopic techniques (IR, 1H NMR, ^{13}C NMR and MS). Coumaran is highly toxic and very low concentration is needed for control of stored product insects. This molecule has potent grain protectant potential and caused significant reduction in F1 progeny of all the three species in the treated grain and the progeny was completely suppressed at 30 $\mu g/l$. The differences in germination between the control and treated grains were not significant. The lack of any adverse effect of Coumaran on the seed germination is highly desirable for a grain protectant, becoming a potential source of biofumigant for economical and environmentally friendly pest control strategies against stored grain pests during storage of grains or pulses [Yallappa Rajashekar*, Honnaiah Vijay Kumar, Kothapalli V. Ravindra and Nandagopal Bakthavatsalam (Animal Bioresources Programme, Institute of Bioresources and Sustainable Development, Department of Biotechnology, Govt. of India, Takyelpat, Imphal 795001, Manipur, India), *Industrial Crops and Products*, 2013, **51**, 224-228].

MANURE/FERTILIZERS

NPARR 4(4), 2013-0380 Nitrogen and phosphorus recovery from anaerobic co-digestion residues of poultry manure and maize silage via struvite precipitation

Anaerobic digestion is commonly used for the stabilization of agricultural and animal wastes. However, owing to the stringent environmental criteria, anaerobic digester effluents need to be further treated to reduce nutrient loads to the receiving water bodies. Struvite precipitation is one of the promising techniques applied for this purpose. Yet, in the majority of cases, struvite precipitation is only applied to the liquid phase of anaerobic digester effluents. This study investigated the recovery of nutrients from both the liquid and the solid phases of the phase-separated effluent of a full-scale biogas plant co-digesting poultry manure and maize silage. Struvite precipitation in the liquid phase led to 72.1% and 95.1% average removal efficiencies of ammonium-nitrogen ($\text{NH}_4\text{-N}$) and orthophosphate respectively. Changing the external phosphorus source did not make any statistically significant difference in nutrient removal. An acidic phosphorus-dissolution process was applied to the solid phase sample to obtain a phosphorus-enriched solution. More than 90.0% of both $\text{NH}_4\text{-N}$ and $\text{PO}_4\text{-P}$ were recovered from the phosphorus-enriched solution with the amendments of magnesium and phosphorus. In the experiments performed without any addition of external magnesium- and phosphorus-containing chemicals, almost complete (99.6%) $\text{PO}_4\text{-P}$ recovery and partial (14.6%) $\text{NH}_4\text{-N}$ recovery was obtained. The results of this study could contribute to the understanding of nutrient recovery from anaerobic digestion residues of manure and agricultural wastes by struvite precipitation [Y Dilsad Yilmazel* and Goksel N Demirer (Civil and Environmental Engineering Department, Villanova University, Villanova, PA, USA), *Waste Manag Res*, 2013, **31** (8), 792-804].

NPARR 4(4), 2013-0381 Co-digestion of solid poultry manure with municipal sewage sludge

The anaerobic digestion was investigated using mixed sewage sludge and poultry manure. The experiments showed that a 30% addition of poultry manure to the sewage sludge did not increase specific gas yield ($376 \text{ dm}^3/\text{kg VS}$ versus $384 \text{ dm}^3/\text{kg VS}$), however gas production rate as calculated per unit volume was 1.5 higher for sludge and manure mixture. The anaerobic digestion turned out to be inefficient in terms of pathogen treatment, since the reduction of *Enterobacteriaceae* reached only two logarithmic units. In the course of the digestion processes, nutrients were released to the supernatant, and longer SRT favored that phenomenon. The liquor after the digestion of sludge alone was rich in phosphates ($348\text{--}358 \text{ gP/m}^3$) and contained a lot of organic carbon (COD of $2705\text{--}6034 \text{ gO}_2/\text{m}^3$). Conversely, more ammonium nitrogen was found in the supernatant after co-digestion of sludge with manure ($2094\text{--}2221 \text{ gN/m}^3$). However, there was no evidence of ammonia inhibition [Sebastian Borowski* and Laurence Weatherley (Technical University of Łódź, Institute of Fermentation Technology and Microbiology, Poland), *Bioresource Technology*, 2013, **142**, 345-352].

NPARR 4(4), 2013-0382 Studies on the preparation and analysis of low cost eco-friendly organic fertilizer

Fertilizer is any organic or inorganic material of natural or synthetic origin (other than liming materials) that is added to the soil in order to supply one or more plant nutrients that is essential for the growth of plants. Two different types of fertilizer are used to increase plant growth i.e., inorganic and organic. The overuse of inorganic nitrogen fertilizers is hazardous to the environment; they seriously pollute aquatic environments, including subterranean water. Bio-fertilizers being cheap provide highly cost effective supplement of chemical fertilizers,

increase farm productivity. The present study was carried out to characterise the physicochemical properties of Panchagavya, Cow horn Manure, Vermicompost, Vermiwash, Vermicast individually. Physico chemical analysis of Cow horn manure was indicating that carbon (71.2%), Nitrogen(3.84%), phosphorus(0.06%) and C/N ratio(18.5%) of the cow horn manure was highest

than ordinary [V Karthikeyan, P. A. Mohsin, J. Gowtham Kumar, Sumaiya Faiz & R Vijayakumar (Department of Biotechnology, Karpaga Vinayaga College of Engineering and Technology, Chinnako lambakkam, Kancheepuram, Tamilnadu, India), *International Journal of Agricultural Science and Research*, 2013, **3**(2), 213-218].

OILS/FATS (incl. Edible oils, Butter)

NPARR 4(4), 2013-0383 Antioxidant ability of fractionated apple peel phenolics to inhibit fish oil oxidation

Polyphenols isolated from frozen and dried apple peels were studied as potential natural antioxidants to stabilize omega-3 polyunsaturated fatty acid (ω 3 PUFA) enriched fish oil. The ethanolic extracts of apple peels were fractionated by reversed phase chromatography using gradient elution of 20–100% aqueous ethanol. The collected fractions were analyzed by ultra pressure liquid chromatography coupled with tandem mass spectrometry (UPLC–MS/MS). The total phenolic content and antioxidant capacity of each fraction were evaluated by Folin–Ciocalteu (FC), ferric reducing antioxidant power (FRAP) and 1, 1-diphenyl-2-picrylhydrazyl radical (DPPH^{*}) scavenging assays. Inhibition of fish oil oxidation was studied using the thiobarbituric acid reactive substances (TBARS) assay. Polyphenols fractionated using frozen apple peel extract had significantly higher FC, FRAP and DPPH^{*} scavenging values than those of dried apple peel ($p < 0.05$). The flavonol-rich fractions inhibited fish oil oxidation by 40–62% at a total phenolic concentration of 200 μ g/ml. The fractionated polyphenols from both dried and frozen apple peel showed higher inhibition of lipid oxidation compared to α -tocopherol, butylated hydroxytoluene and crude apple peel extracts [Satvir Sekhon-Loodu*, Sumudu N. Warnakulasuriya, H.P. Vasantha Rupasinghe and Fereidoon Shahidi (Department of Environmental Sciences, Faculty of Agriculture, Dalhousie University, P.O. Box 550, Truro, NS, Canada B2N 5E3), *Food Chemistry*, 2013, **140** (1-2), 189-196].

NPARR 4(4), 2013-0384 Oil composition and characterisation of phenolic compounds of *Opuntia ficus-indica* seeds

The seed composition of four varieties of *Opuntia ficus-indica* growing in Algeria was investigated. Seeds ground into a fine powder were first, subjected to oil extraction and fatty acids analysis. The phenolic compounds were then extracted from the defatted powder of seeds in order to be quantified and characterised by liquid chromatography coupled to mass spectrometry (LC–MSⁿ) and to nuclear magnetic resonance (LC–NMR) approaches. In addition, an evaluation of the antioxidant activity of the phenolic extracts was investigated. Gas chromatography analysis of the seed oil showed high percentages of linoleic acid in the four varieties ranging from 58% to 63%. The phenolic profile of the *Opuntia ficus-indica* seeds displayed a high complexity, with more than 20 compounds detected at 330 nm after the LC separation. Among them, three isomers of feruloyl-sucrose were firmly identified and another was strongly supposed to be a sinapoyl-diglycoside. High correlations were found between phenolic content in the defatted seed extracts and their antioxidant activity. The data indicate that the defatted cactus seed wastes still contain various components that constitute a source for natural foods. [Nadia Chougui*, Abderezak Tamendjari, Wahiba Hamidj, Salima Hallal, Alexandre Barras, Tristan Richard, Romain Larbat(de Lorraine UMR 1121 “Agronomie & Environnement” Nancy-Colmar, TSA 40602, 54518 Vandoeuvre Cedex, France), *Food Chemistry*, 2013, **139** (1-4), 796-803].

NPARR 4(4), 2013-0385 Influence of linseed variety on fatty acid profile in cow's milk

The aim of this study was to examine the influence of linseed variety on the concentration of cow's milk constituents, particularly fatty acids. The experiment was conducted on 30 Polish Holstein Friesian cows whose diet was supplemented with two varieties of crude linseed, Opal and Szafor. After 21 days of linseed supplementation, the Szafor variety proved to be a better supplement than the Opal variety, particularly in relation to the

concentration of saturated fatty acids, C20:5 (69.2% higher) and C22:6 (147.1% higher) and also because of improved chemical composition of the milk (19.7% higher fat, 2.9% higher protein and 39.9% higher casein content). Linseed variety significantly influenced the lipid fraction level and the basic chemical composition of cow's milk. Linseed variety should therefore be taken into consideration in subsequent experiments in addition to the quantity and physical form of linseed. The results showed that the use of a diet supplemented with linseed, especially the Szafir variety, was effective in reducing saturation, atherogenic and thrombogenic indices, yielding benefits for consumers by improving the nutritional quality of cow's milk [Kamila Puppel*, Beata Kuczyńska, Teresa Nałęcz-Tarwacka and Henryk Grodzki (Department of Animal Breeding, Warsaw University of Life Sciences, Warsaw, Poland), *Journal of the Science of Food and Agriculture*, 2013, **93**(9), 2276-2280].

NPARR 4(4), 2013-0386 Bitter and sweet lupin (*Lupinus albus* L.) seeds and seed oils: A comparison study of their compositions and physicochemical properties

In this study, bitter and sweet lupin (*Lupinus albus* L.) seed oils (BLO and SLO) were extracted using the soxhlet extraction method. The physicochemical properties, fatty acid compositions, thermal properties, ¹H NMR, FTIR and UV visible spectra of BLO and SLO were evaluated. In addition, the antioxidant properties of bitter and sweet lupin seeds and their oils were also studied. The results showed that the bitter and sweet lupin seeds consist of 8% and 12% of oil, respectively. BLO and SLO contained high concentration of oleic acid (46.28 and 48.72%), followed by linoleic acid (21.55 and 20.90%), linolenic acid (7.69 and 8.95%), and palmitic acid (7.39 and 7.5%). The total tocopherol content of BLO and SLO were 184.70 and 317.01 mg/100 g oil, respectively. TG/DTG curves showed that the process thermal decomposition of the oils occurs in four phases for SLO and three phases for BLO [Hassen Mohamed Sbihi, Imeddine Arbi Nehdi, Chin Ping Tan and Saud Ibrahim (Al-Resayes King Saud University, College of Science, Chemistry Department, Riyadh 1145, Saudi Arabia), *Industrial Crops and Products*, 2013, **49**, 573-579].

PHYTOCHEMICALS

NPARR 4(4), 2013-0387 **Studies on antimicrobial compounds of extract of bark of *Sonneratia alba***

This study was aimed at evaluating antibacterial potential of the *Sonneratia alba* in attempt to identify potential natural sources for synthesis of new drug to avoid the growing antibacterial resistance. The peels of bark were extracted by cold and hot methanolic extract by Alade and Irobi's and Soxhlet extraction method. Antibacterial activity of crude extract showed promising activity against tested organisms. The MIC of crude hot methanolic extracts was >2.5 mg/ml and cold methanolic extract were 1.25 mg/ml. The methanolic crude extract was subjected for HPTLC analysis shows 11 peaks indicates approx. 11 different phyto-compounds such as glycosides, tannins, saponins and alkaloids. The hot methanolic crude extract was further subjected to activity guided fractionation with different polarity solvents, showed varying levels of bactericidal activity. Fraction E[acetone] and fraction F[methanol] shows maximum activity than other fractions. HPTLC and bioautography was performed for both fractions and phytochemical analysis shows mainly presence of flavonoids and saponin. Preparative HPTLC was performed to obtained semi purified bioactive compound and separated band were subjected to AST, UV spectroscopy, GCMS, FTIR, CHNS(O) analysis and NMR spectroscopy. By comparing with GCMS library matches most of these probabilities and may be the compound of interest *viz*; N- α -Chloropropinoyltryptamine in fraction E and Myo-Inositol, 4C methyl in fraction F. Both of the compounds were confirmed by performing NMR spectroscopy and matching its dell values [Raut Savanta V* and Anthappan P.D. (Department of Microbiology, Bhavan's College, Munshi nagar, Andheri [W], Mumbai-400 058), *Trends in Biosciences*, 2013, **6**(6), 831-837].

NPARR 4(4), 2013-0388 **Antihypertensive effect of passion fruit peel extract and its major bioactive components following acute supplementation in spontaneously hypertensive rats**

Extracts from leaves, peels or flowers of *Passiflora* are noted for their medicinal effects. *Passiflora edulis* peel extract (PFPE) has been proposed to lower blood pressure (BP); however, only indirect measurement techniques have been employed. To more accurately measure the effect of PFPE on hemodynamic parameters and determine the minimal effective dose, hemodynamic parameters were directly measured in spontaneously hypertensive rats (SHR) implanted with radiotelemeters. PFPE was given orally at 0, 2.5, 50 or 200 mg/kg body weight (BW) to determine the minimal effective dose. Once this dose was determined, the potential active components, edulilic acid (EA), anthocyanin fraction (AF) or γ -aminobutyric acid (GABA), were tested to determine which may contribute to the reductions in BP. The 50 mg PFPE/kg BW dose was the lowest dose that significantly reduced all hemodynamic parameters from baseline when compared to control. When the potential actives were provided at equivalent doses to those found in 50 mg PFPE/kg BW, the EA and AF significantly reduced all measured hemodynamic parameters from baseline when compared to control. GABA did not significantly affect any hemodynamic parameters compared to control and significantly increased heart rate. These direct measurements indicate that PFPE can decrease hemodynamic parameters in SHR and indicate that EA and AF are active compounds that contribute to the antihypertensive effects of PFPE supplementation. While these results are encouraging, detailed mechanistic studies are needed to determine the putative value of PFPE for blood pressure control in humans [Brandon J. Lewis*, Kelli A. Herrlinger, Teresa A. Craig, Cynthia E. Mehrling-Franklin, Zoraida DeFreitas

and Carmen Hinojosa-Laborde (Kemin Foods, L.C. Research and Development, Des Moines, IA 50309), *The Journal of Nutritional Biochemistry*, 2013, **24** (7), 1359-1366].

NPARR 4(4), 2013-0389 Enzyme-assisted extraction of bioactive compounds from ginger (*Zingiber officinale* Roscoe)

Ginger (*Zingiber officinale*) is a popular spice used in various foods and beverages. 6-Gingerol is the major bioactive constituent responsible for the antiinflammatory, antitumour and antioxidant activities of ginger. The effect of application of α -amylase, viscozyme, cellulase, protease and pectinase enzymes to ginger on the oleoresin yield and 6-gingerol content has been investigated. Pre-treatment of ginger with α -amylase or viscozyme followed by extraction with acetone afforded higher yield of oleoresin ($20\% \pm 0.5$) and gingerol ($12.2\% \pm 0.4$) compared to control ($15\% \pm 0.6$ oleoresin, $6.4\% \pm 0.4$ gingerol). Extraction of ginger pre-treated with enzymes followed by extraction with ethanol provided higher yield of gingerol (6.2–6.3%) than the control (5.5%) with comparable yields of the oleoresin (31–32%). Also, ethanol extract of cellulase pre-treated ginger had the maximum polyphenol content (37.5 mg/g). Apart from 6-gingerol, 6-paradol along with 6- and 8-methyl shogaols were the other important bioactive constituents in the oleoresin from cellulase-treated ginger [K.L. Nagendra Chari*, D. Manasa, P. Srinivas, H.B. Sowbhagya (Department of Plantation Products, Spices and Flavour Technology, CSIR-Central Food Technological Research Institute, Cheluvamba Mansion, Mysore 570 020, Karnataka, India), *Food Chemistry*, 2013, **139**(1-4), 509-514].

NPARR 4(4), 2013-0390 Carotenoids and tocopherols in yellow and red raspberries

The composition of carotenoids, chlorophyll derivatives and tocopherols in raspberries of different varieties, including

yellow and red varieties, over different ripening stages has been studied. The profile of pigments in ripening raspberries changes drastically, with a dramatic decrease of β -carotene and chlorophyll derivatives, the xanthophyll lutein has also decreased but not to the same extent. In contrast esterified lutein increased and is present in ripe raspberries esterified with saturated fatty acids with C8–C16 chains. Ripe raspberries contain considerable amounts of free lutein, esterified lutein, and tocopherols (up to 20, 49 and 366 mg/kg dry weight, respectively). The different samples analysed show different contents of carotenoids and tocopherols. Whether the differences arise from the variety or other factors such as the environmental conditions needs to be ascertained but isoprenoids should not be neglected when considering raspberry antioxidant and nutraceutical composition [Elisabete Carvalho*, Paul D. Fraser and Stefan Martens (Department of Food Quality and Nutrition, Research and Innovation Centre, Fondazione Edmund Mach (FEM) Via E. Mach 1, 38010 San Michele all'Adige, Italy), *Food Chemistry*, 2013, **139** (1-4), 744-752].

NPARR 4(4), 2013-0391 Bioactive contents and free radical scavenging activity of *Moringa oleifera* leaf extract under different storage conditions

Moringa oleifera Lam. (Moringaceae) possesses therapeutic potential for pharmaceutical product development. However, reports on chemical and biological stabilities of the bioactive components in the leaf extracts of *M. oleifera* are limited. This investigation aimed to evaluate the stability of bioactive compounds and free radical scavenging abilities of the leaf extracts stored under different conditions as established in the ASEAN guideline on drug stability study. The quantitative analysis of three major anti-oxidative constituents, cryptochlorogenic acid, isoquercetin and astragalgin, were performed using high-performance liquid

chromatography. Total phenolics and total flavonoids contents, and DPPH free radical scavenging activity of the stored extracts were also investigated. After six months of storage, the bioactive contents and free radical scavenging activity of the extract kept at 25 ± 2 °C with $60 \pm 5\%$ relative humidity (RH) slightly decreased. About 50% decrease on the contents of active compounds and scavenging activity were found in the extract kept under accelerated condition at 40 ± 2 °C with $75 \pm 5\%$ RH. High temperature and humidity negatively impacted

the contents of bioactive constituents and free radical scavenging activity of the extracts. Thus, the extracts and product from *M. oleifera* leaves should be kept in a cold place to prevent significant changes in chemical, physical and biological properties [Boonyadist Vongsak, Pongtip Sithisarn and Wandee Gritsanapan (Department of Pharmacognosy, Faculty of Pharmacy, Mahidol University, 447 Sri-Ayudthaya Road, Ratchathewi, Bangkok 10400, Thailand), *Industrial Crops and Products*, 2013, **49**, 419–421].

PULP/PAPER

NPARR 4(4), 2013-0392 Comparison of Kraft lignin and lignosulfonates addition to wheat gluten-based materials: Mechanical and thermal properties

Two types of industrial lignin, namely Kraft lignin and ammonium lignosulfonates, have been introduced into wheat gluten-based bioplastics. Mechanical, thermomechanical and water vapor sorption properties of the materials have been investigated in detail. The behaviors are clearly distinct depending on the lignin type. The addition of Kraft lignin produces stiffer materials, with increased Young's modulus but almost constant elongation at break. Glass transition temperature is higher and water vapor sensitivity reduced when Kraft lignin is added. Conversely, the incorporation of lignosulfonates leads to materials with higher elongation at break, but almost unchanged water sensitivity and glass transition temperature. Both lignins thus appear as of great interest to tailor the properties of wheat gluten-based materials. Structural differences between Kraft lignin and lignosulfonates are believed to be responsible for the distinct behaviors observed in this study. [Antoine Duval*, Sonia Molina-Boisseau and Christine Chirat (Institut de Chimie Moléculaire de Grenoble (ICMG), Joseph Fourier University and Carnot Polynat Institute.), *Industrial Crops and Products*, 2013, **49**, 66-74].

NPARR 4(4), 2013-0393 *Leucaena leucocephala*: an underutilized plant for pulp and paper production

Leucaena leucocephala (Lam.) de Wit. is native to Central America and Mexico, but now grows naturally in most tropical areas globally. It is a neglected and underutilized; medium to small sized tree of multiple values. It is commonly known as wild tamarind in English and subabul in Hindi. In recent years, *Leucaena* has gained a

great attention for its utilization as raw material on large scale for pulp and paper industries and manufacturing of packaging material. Present paper deals with distribution, morphological description, current utilization, future prospective and propagation of this species. During the present study we have standardized macro-propagation technique for *L. leucocephala*. We used fly ash amended sand to develop rooting media for vegetative propagation of *L. leucocephala* and assess its potential as a rooting media. Root formation was significantly high ($p < 0.05$) in 10 % FA amended sand in comparison to other used media. Rooted plants showed nutrient deficiency symptoms after 40–50 days in sand while in 10 % FA amended sand they were healthy, greener and do not showed nutrient deficiency symptoms. On the basis of present study, it is concluded that 10 % fly ash amended sand is a suitable rooting media for vegetative propagation of *L. leucocephala* [Vimal Chandra Pandey* and Akhilesh Kumar (Department of Environment Science, Babasaheb Bhimrao Ambedkar University, Raibareilly Road, Lucknow), *Genetic Resources and Crop Evolution*, 2013, **60**(3), 165-1171].

NPARR 4(4), 2013-0394 Pine Needle -An evaluation of pulp and paper making potential

In the present studies Pine needles are evaluated for pulp and paper making properties. Different studies reported different composition of Pine needles. The pine needles collected from hilly zones of India has, 43% lignin, 52% holocellulose and 5.8% extractives content. In order to understand the paper making potential, study on pulping, bleaching and paper making properties of pine needle has been carried out. Kraft cooking of pine needle using 24% active alkali resulted into unbleached pulp of kappa number 28 and unbleached pulp yield of 24%. Due to high lignin content the unbleached pulp kappa number is also high. Pulp after DEpD

bleaching could be bleached to 75% ISO. Fiber morphological properties of pine needle fiber were also carried out [Priti S. Lal*, Arvind

Sharma and Vimlesh Bist (Central Pulp & Paper Research Institute, Saharanpur), *Journal of Forest Products & Industries*, 2013, 2(3), 42-47].

RUBBER/GUM

NPARR 4(4), 2013-0395 Environment friendly water-based drilling fluid using natural vegetable gum

This paper reported the formulation and the laboratory analysis of TLJ-1 vegetable gum drilling fluid with the temperature resistance capability up to 140 °C. Based on the single-factor method, TLJ-1 is chosen as the main treatment agents for the fluid, LV-CMC and PEG taken as the filtrate reducer, QS-2 taken as the rigid filling particles, the three formulations, i.e., the low-solids drilling fluid, the solidsfree drilling fluid and the weighting natural vegetable gum drilling fluid have been presented. The laboratory analysis has demonstrated the good temperature resistance capability of the presented TLJ-1 vegetable gum drilling fluids for environmental safety [Li, F*, Wang, Z., Tian, Y. and Zhang, J. (Chong Qing University of Science and Technology, Chongqing 401331, China), *Asian Journal of Chemistry*, 2013, **25** (7), 3651-3654].

NPARR 4(4), 2013-0396 Environment friendly water-based drilling fluid using natural vegetable gum

This paper reported the formulation and the laboratory analysis of TLJ-1 vegetable gum drilling fluid with the temperature resistance capability up to 140 °C. Based on the single-factor method, TLJ-1 is chosen as the main treatment agents for the fluid, LV-CMC and PEG taken as the filtrate reducer, QS-2 taken as the rigid filling particles, the three formulations, i.e., the low-solids drilling fluid, the solidsfree drilling fluid and the weighting natural vegetable gum drilling fluid have been presented. The laboratory analysis has demonstrated the good temperature resistance capability of the presented TLJ-1 vegetable gum drilling fluids for environmental safety [Li, F.*, Wang, Z., Tian,

Y., and Zhang, J. (Chong Qing University of Science and Technology, Chongqing 401331, China), *Asian Journal of Chemistry*, 2013, **25** (7), 3651-3654].

NPARR 4(4), 2013-0397 Locust bean gum: A versatile biopolymer (Review)

Biopolymers or natural polymers are an attractive class of biodegradable polymers since they are derived from natural sources, easily available, relatively cheap and can be modified by suitable reagent. Locust bean gum is one of them that have a wide potentiality in drug formulations due to its extensive application as food additive and its recognized lack of toxicity. It can be tailored to suit its demands of applicants in both the pharmaceutical and biomedical areas. Locust bean gum has a wide application either in the field of novel drug delivery system as rate controlling excipients or in tissue engineering as scaffold formation. Through keen references of reported literature on locust bean gum, in this review, we have described critical aspects of locust bean gum, its manufacturing process, physicochemical properties and applications in various drug delivery systems [Prajapati, V.D.*, Jani, G.K., Moradiya, N.G, Randeria, N.P., and Nagar, B.J (Department of Pharmaceutics and Pharmaceutical Technology, S.S.R. College of Pharmacy, Saily-Silvassa Road, Saily, Silvassa, U.T. of Dadra and Nagar Haveli 396 230, India), *Carbohydrate Polymers*, 2013, **94** (2), 814-821].

NPARR 4(4), 2013-0398 Effect of different drying methods on chemical and molecular structure of heteropolysaccharide-protein gum from durian seed

The functional properties and biological aspects of a natural biodegradable biopolymer depend on its chemical and molecular structure. In this study, the effect of different drying processes on the chemical and molecular structure of the natural biodegradable biopolymer

from durian seed was investigated. The chemical structure was analyzed by assessing the carbohydrate profile, protein, amino acid composition, moisture, and ash. Molecular weight (M_w), number average molecular weight (M_n), M_w/M_n ratio and mass recovery were assessed by using a size-exclusion chromatography coupled to multi angle laser light-scattering (SEC-MALS). The present study revealed that main monosaccharides in the chemical structure of differently dried durian seed gums were galactose (50.1-64.9%), glucose (29.4-45.7%), arabinose (0.11-0.89%), and xylose (0.019-0.86%). The protein analysis indicated the presence of a low amount of the protein fraction (3.2-3.9%) in the chemical

structure of the biopolymer from durian seed. The most abundant amino acids in the chemical structure of durian seed gum were leucine (31.78-43.02%), lysine (6.23-7.78%), aspartic acid (6.45-8.58%), glycine (6.17-7.27%), glutamic acid (5.43-6.55%), alanine (4.60-6.23%), and valine (4.49-5.52). The current study exhibited that the biodegradable biopolymer from durian seed was a heteropolysaccharideprotein complex with medium M_w ranging from 1.06×10^5 to 1.15×10^5 (g/mol) [Mirhosseini, H*, Amid, B.T. and Cheong, KW (Department of Food Technology, Faculty of Food Science and Technology, University Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia), *Food Hydrocolloids*, 2013, **31** (2), 210-219].

SPICES/CONDIMENTS

NPARR 4(4), 2013-0399 Impact of blanching on polyphenol stability and antioxidant capacity of innovative coriander (*Coriandrum sativum* L.) pastes

Fresh coriander leaves were steam- and water-blanching at 100 °C and at 90 and 100 °C, respectively, for 1–10 min, and subsequently comminuted to form a paste. Pasty products obtained from coriander fruits were processed after water-blanching applying the same time-temperature regimes. Among the 11 phenolics characterised in leaves by high-performance liquid chromatography coupled to mass spectrometric detection, several caffeic acid derivatives, 5-feruloylquinic and 5-*p*-coumaroylquinic acids were tentatively identified for the first time. In fruits, 10 phenolics were detected, whereas rutin, a dicaffeic acid derivative and two feruloylquinic and caffeoylquinic acid isomers were newly detected. Upon steam-blanching for 1 min, phenolic contents and antioxidant capacities remained virtually unchanged. In contrast, water-blanching and extended steam-blanching even yielded increased levels compared to the unheated control, whereas short-time water-blanching resulted in higher values than prolonged heat treatment. Thus, short-time water-blanching is recommended as the initial unit in the processing of coriander leaves and fruits into novel pasty products [Andrea Kaiser*, Dietmar R. Kammerer and Reinhold Carle (Hohenheim University, Institute of Food Science and Biotechnology, Chair Plant Foodstuff Technology, Garbenstrasse 25, D-70599 Stuttgart, Germany), *Food Chemistry*, 2013, **140** (1-2), 332–339].

NPARR 4(4), 2013-0400 Impact of Cumin variety (GC-4) under semi-arid conditions of Rajasthan

Impact assessment of demonstrations was carried out on cumin (variety-GC-4) and net

additional return over farmers practice during *Rabi* seasons of 2010–11 and 2011–12. The data revealed that the yield in demonstration plots increased from 16.22 to 18.91% over farmers practice during the study period. Similarly, the economic analysis of data indicated higher B:C ratio. The adoption of variety GC-4 ranged from 78 to 98% in operational as well as in nearby villages. The use of improved variety GC-4 of cumin under semi-arid conditions of Nagaur proved superior with respect to adoption by farmers and productivity levels [Garhwal Omprakash*, Arora Dinesh, Jakhar Mohan Lal*, Choudhary Mali Ram, (Department of Plant Breeding and Genetics, SKN College of Agriculture, Jobner, Jaipur, Rajasthan, India), *International Journal of Life Sciences*, 2013, **2**(2), 97-99].

NPARR 4(4), 2013-0401 HPTLC Profile of Important Indian spices used in Ayurvedic Formulations

Plant derived spices are generally used in foods for flavoring and medicinal purposes. Spices have been shown to possess medicinal value, such as antimicrobial activity, antioxidant, anticancer, anti-inflammatory activity etc. Several spices particularly Tejpatta (*Cinnamomum tamala*), Souff (*Foeniculum vulgare*), Jeera (*Cuminum cyminum*), Methi (*Trigonella foenum-graecum*), Ajwain (*Trachyspermum ammi*), Dhaniya (*Coriandrum sativum*), Kali Mirch (*Piper nigrum*), Kalonji (*Nigella sativa*) are used extensively in the Indian diet and in ayurvedic medicines. Development of standard procedure through HPTLC is a new approach which may lead to proper standardization of different spices and ayurvedic drugs based on fingerprinting characteristics. HPTLC Fingerprinting technique is widely employed in pharmaceutical industry in process development, identification and detection of adulterants in herbal product and helps in identification of pesticide content, mycotoxins and in quality control of spices and herbs. The

study revealed specific identities for spices/herbal drugs taken which will be useful in identification and control to adulterations of the drugs [Meena Ajay Kumar*, Sinha Anshul, Verma S. C, Gupta M. D, Padhi M. M. (National Research Institute for Ayurveda-Siddha Human Resource Development, Gwalior), *Research Journal of Pharmacognosy and Phytochemistry*, 2013, **5**(4), 188-193].

NPARR 4(4), 2013-0402 Post harvest storage losses by cigarette beetle (*Lasioderma serricornis* Fab.) in seed spice crops

A laboratory study was conducted to determine the damage and reproductive potential of *Lasioderma serricornis* Fab. on some seed spice crops, viz., cumin, coriander, fennel, *ajowan* and dill at different storage conditions. The result showed that beetle causes huge storage losses which were maximum in fennel seed (58.02%) and minimum in dill seed (39.0%). Population growth was also related to damaging potential on different seed spices. Maximum population of insect was recorded in fennel seed and minimum in dill seed. In case of quarter monthly observation, maximum damage and reproduction was noticed in July to September and minimum in the month of January to March in seed of coriander, *ajowan* and cumin and April to June in case of fennel and dill [Kant Krishna*, Ranjan J.K., Mishra B.K., Meena S.R., Lal G., Vishal M.K. (National Research Centre on Seed Spices, Tabiji, Ajmer 305206, Rajasthan), *Indian Journal of Horticulture*, 2013, **70**(3), 392-396].

NPARR 4(4), 2013-0403 Potential health benefits of major seed spices

The seed spices constitute an important group of agricultural commodities and play a significant role in our national economy. Historically, India has always been recognized as

a land of spices. The crops covered as major seed spices are coriander, cumin, and fennel are the member of umbelliferae and fenugreek is belongs to family Fabaceae. These spices are collections of a wide variety of volatile and non-volatile staple dietary additives. These spices have been known for ages as effective therapeutic food. The power of seed spices to impart biological activity is now slowly re-emerging as an area of interest for human health. Seed spices produce numerous secondary metabolites or phytochemicals, these are naturally occurring, biologically active chemical compounds in plants, where they act as a natural defence system for host plants and that have historically been used as pharmaceuticals, fragrances and flavor compounds. They are a gold mine of possibilities in our search for beneficial bioactive compounds for pharmacology and other health related issues. Seed spices influence various systems in the body such as gastrointestinal, cardiovascular, and reproductive and nervous systems resulting in diverse metabolic and physiologic actions. Seed spices have a diverse array of natural phytochemicals that have complementary and overlapping actions, including antioxidant effects, Anticancer, Antidiabetic, Antimicrobial Activity, Hypolipidemic effect, Insecticidal, useful in menstrual disorders, helping in digestion, Hypertension, Modulation of detoxification enzymes, stimulation of immune system, reduction of inflammation, modulation of steroid metabolism and helps in improve other several human disorder. The present review is an effort to present a consolidated report on the current status of research related potential human health benefits of four major seed spices namely Cumin, Coriander, Fennel and Fenugreek [S. S. Rathore*, S. N. Saxena and Balraj Singh (National Research Institute on Seed Spices, Tabiji, Ajmer-305206 (Raj.), *International Journal of Seed Spices*, 2013 **3**(2), 1-12].

SUGARS

NPARR 4(4), 2013-0404 Jaggery protects hepatorenal injury induced by acute exposure to carbon tetrachloride in Wistar rats

In this study, authors evaluated the protective activity of aqueous extract of jaggery against CCl₄-induced hepatic–renal damage in rats. Jaggery was administered in one group at doses of 250, 500 and 750 mg/ kg body weight (bwt) (p.o., once only), and CCl₄ was administered in another group at a dose of 1.5 ml/kg bwt (i.p., once only) to evaluate the protective effect of jaggery on induced oxidative damage in rats. Various blood and tissue biochemical studies were performed. The administration of toxicant significantly altered blood biochemical variables. Hepatic and renal lipid peroxidation (LPO) levels increased significantly, whereas considerable depletion was observed in reduced glutathione (GSH) level after intoxication. A remarkable decrease was observed in the activities of adenosine triphosphatase (ATPase) and glucose-6-phosphatase (G-6-Pase) after induction of toxicity. Treatment with extract at three different altered all measured biochemical variables, but greater hepatic-renal protection was observed at higher doses (750 mg/kg bwt) than at lower does (250 and 500 mg/kg bwt). Jaggery also reversed histopathological alterations. Thus, it may be concluded that jaggery can be used to reduce hepatic and renal damage and may serve as an alternative medicine in hepatic and renal etiology [Chandra Kant Sharma*, Monika Sharma and Vinay Sharma (Department of Bioscience & Biotechnology, Banasthali University, Banasthali, Rajasthan, India, 304022), *Journal of Environmental Pathology, Toxicology and Oncology*, DOI: 10.1615/J Environ Pathol Toxicol Oncol.2013006793 , pages 1-7] .

NPARR 4(4), 2013-0405 Effect of harvesting stages on juice quality and ethanol yield in

sweet sorghum (*Sorghum bicolor*) cultivars during rabi

A field experiment was conducted during rabi 2008 and 2009 in red sandy clay loam soil at Agriculture Research Station, Kathalagere, Karnataka to study the effect of harvesting stages on juice quality and ethanol yield in sweet sorghum [*Sorghum bicolor* (L.) Moench] cultivars. There were four cultivars ('NSSH 1', 'RSSV 9', 'SSV 84' and 'SSV 74') and three harvesting stages (50% flowering, milky stage and maturity). The cultivar 'NSSH 1' recorded significantly higher brix (14.5), pol (8.4), available sugar (4.4%), calculated sugar yield (132.7 kg/ha), millable stalk (29.5 t/ha), green biomass (32.9 t/ha), juice (10,914 l/ha) and ethanol yield (538.4 l/ha) as compared to 'RSSV 9', 'SSV 84' and 'SSV 74'. The crop harvested at maturity recorded significantly higher brix (14.8), pol (8.7), available sugar (4.7%), calculated sugar yield (136.6 kg/ha), millable stalk (29.1 t/ha) and green biomass yield (31.7 t/ha) compared to crop harvested at 50% flowering stage and milky stage. But, juice (9,777 l/ha) and ethanol yield (474.5 l/ha) were significantly higher when the crop harvested at milky stage. The 'NSSH 1' harvested at milky stage recorded significantly higher juice (11, 415 l/ha) and ethanol yield (591.0 l/ha) [Ramesha Y.M* and Sharanappa (Agronomy, College of Agriculture, University of Agricultural Sciences, GKVK, Bengaluru, Karnataka-560 065), *Indian Journal of Agronomy*, 2013, **58**(3), 368-371].

NPARR 4(4), 2013-0406 Effect of delayed extraction and storage on quality of sugarcane juice

A study was conducted to determine the quality of sugarcane juice extracted from stored canes, as well as changes in quality of fresh juice stored at different temperatures. Cane stems were stored at 10 and 30°C, while the fresh juice was stored at 5 and 30°C. The parameters studied were juice yield, total soluble solids, total sugar

content, titratable acidity, pH, viscosity, total microbial count and sensory evaluation for colour and flavor. Results showed that low temperature storage (10°C) of canes was able to maintain the quality of juice for 10 days, while low temperature storage (5°C) of juice could last for only 4 days. Spoilage of cane stored at 30°C occurred faster than that stored at 10°C. Fresh sugarcane juice became spoilt within a day when

stored at 30°C. Microbial count (bacteria, yeast, fungi) especially lactic acid bacteria count increased, during storage of cane juice [Krishnakumar T*, Thamilselvi C. and Devadas C.T. (Department of Food and Agricultural Process Engineering, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India), *African Journal of Agricultural Research*, 2013, **8**(10), 930-935].

THERAPEUTICS

NPARR 4(4), 2013-0407 Role of *Adhatoda vasica* (L.) Nees leaf extract in the prevention of aflatoxin-induced toxicity in Wistar rats

Aflatoxin contamination of various foodstuffs and agricultural commodities is a major problem worldwide. Several strategies have been reported for the detoxification of aflatoxins in contaminated foods and feeds, but all these methods have their own shortcomings. Traditional medicinal plants are potential sources of aflatoxin-detoxifying compounds. In this study a spray-dried formulation of *Adhatoda vasica* (L.) Nees leaf extract was prepared and its chemopreventive effect on aflatoxin B1 (AFB1)-induced biochemical changes in the liver and serum of Wistar rats was investigated.

Administration of AFB1 (1.5 mg kg⁻¹ body weight (BW) intraperitoneally) to rats significantly reduced the activities of superoxide dismutase and catalase in liver tissues and increased the activities of aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase and the levels of very-low-density lipoprotein, low-density lipoprotein and cholesterol in blood serum. However, pre-feeding of rats with *A. vasica* formulation (500 mg kg⁻¹ BW for 7 days) protected the animals from AFB1-induced biochemical changes during subsequent exposure to AFB1.

Pre-feeding of rats with *A. vasica* formulation counteracted the hepatic dysfunction induced by subsequent treatment with AFB1. This formulated *A. vasica* extract offers a biologically safe alternative to detoxify aflatoxin and has huge potential to be used in the poultry industry to reduce aflatoxicosis [Rajendran Brinda, Selvaraj Vijayanandraj, Doraiswamy Uma, Dorairaj Malathi, Vaikuntavasan Paranidharan and Rethinasamy Velazhahan* (Department of Plant Pathology, Centre for Plant Protection Studies,

Tamil Nadu Agricultural University, Coimbatore 641003, Tamil Nadu, India), *Journal of the Science of Food and Agriculture*, 2013, **93**(11), 2743-2748].

NPARR 4(4), 2013-0408 Antifertility effect of hydroalcoholic leaves extract of *Michelia champaca* L.: An ethnomedicine used by Bhatra women in Chhattisgarh state of India

Michelia champaca L. (family: Magnoliaceae), commonly known as Champa [Hindi], is traditionally used for fertility regulation by the women of Chhattisgarh state in India. No scientific evidence regarding the antifertility effect of this plant is available till date. The antifertility activity of the extract (HAEMC) administered at dose levels (100 and 200 mg/kg body weight, p.o.) was evaluated in two experimental animal models i.e. antiimplantation activity in female wistar rats and esterogenic/antiestrogenic activity in ovariectomized female rats. In anti-implantation activity, the extract (200 and 400 mg/kg body weight, p.o.) was administered to female rats from 1 to 7 days of pregnancy and on 10th day, laprotomy was performed to count the no. of implants. For estrogenic/anti-estrogenic activity, ovariectomized female rats were administered with the extract at both the doses alone as well as along with 17 α -ethinyl estradiol (1 μ /rat/day) for 7 consecutive days. On the 8th day, all animals were sacrificed and blood serum was further processed for the estimation of biochemical parameters such as estrogen level, alkaline phosphates, cholesterol, tryglycerides, total protein etc.

The extract (HAEMC) showed significant ($p<0.01$) 49.95% and 71.03% antiimplantation activities at 100 and 200 mg/kg doses respectively. The extract also exhibited significant ($p<0.01$) estrogenic activity as evidenced by increase in body weight, uterine weight, increased thickness and height of

endometrium, vaginal cornification and significant ($p < 0.01$) increase in estrogen, cholesterol, alkaline phosphate and triglycerides levels at higher dose when administered alone as well as along with ethinyl estradiol. Phytochemical screening showed the presence of steroids, flavonoids and alkaloids in the extract. Hydroalcoholic extract of *Michelia champaca* leaves possesses significant antifertility effect which might be due to the inhibition of implantation and estrogenic effect which in turn might be due to the presence of some phytoconstituents in the plant. Hydroalcoholic extract of *Michelia champaca* leaves possesses significant antifertility effect which might be due to the inhibition of implantation and estrogenic effect which in turn might be due to the presence of some phytoconstituents in the plant [Seema Taprial, Deepak Kashyap, Vineet Mehta, Sunil Kumar and Dinesh Kumar*, *Journal of Ethnopharmacology*, 2013, **147**(3), 671-675].

NPARR 4(4), 2013-0409 Protective effect of ethyl acetate fraction of *Acacia ferruginea* DC. against ethanol-induced gastric ulcer in rats

In traditional systems of medicine, stem bark of *Acacia ferruginea* DC. is used for the treatment of itching, leucoderma, ulcers, stomatitis and diseases of the blood. In the present study, we determined antioxidant and anti-ulcerogenic activities of *Acacia ferruginea* stem bark. Acetone extract and its sub-fractions of *Acacia ferruginea* stem bark were subjected to assess their antioxidant potential using various *in vitro* systems such as DPPH[•], ABTS^{•+} scavenging, FRAP and phosphomolybdenum reduction activities. Based on the antioxidant potential, the ethyl acetate fraction was used to evaluate the protective effect of ethanol-induced gastric damage in rat model. Enzyme activities such as superoxide dismutase, glutathione, catalase and lipid peroxidation were also determined in the stomach tissues.

Ethyl acetate fraction (AFE) of *Acacia ferruginea* stem bark registered higher antioxidant and free radical scavenging activities than the crude acetone extract and other fractions. In addition, AFE exhibited that the IC₅₀ values of DPPH (2.5 µg/ml) and ABTS (1.8 µg/ml) were lower when compared to the standard quercetin (12.4 µg/ml and 4.7 µg/ml, respectively). In ethanol induced gastric ulcer, administration of AFE at doses of 10 mg/kg, 50 mg/kg and 100 mg/kg body weight prior to ethanol ingestion significantly protected the stomach ulceration. Consequently significant changes were observed in enzyme activities such as SOD, CAT, GSH and LPO in the stomach tissues when compared with ethanol control group.

It is concluded that the ethyl acetate fraction of *Acacia ferruginea* stem bark possessed higher antioxidant and anti-ulcerogenic activities. Based on the results, we suggest that *Acacia ferruginea* stem bark has potential to provide a therapeutic approach to ethanol mediated ulcer as an effective anti-ulcer agent [Kandhasamy Sowndhararajan and Sun Chul Kang *(Department of Biotechnology, Daegu University, Gyeongsan, Gyeongbuk 712-714, Republic of Korea), *Journal of Ethnopharmacology*, 2013, **148**(1), 175-181].

NPARR 4(4), 2013-0410 Anti-diarrhoeal activity of aqueous extract of *Ocimum kilimandscharicum*

Ocimum kilimandscharicum Baker ex Gürke, commonly referred to as Kapur Tulsi, is a medicinal herb that belongs to the family of Lamiaceae. It is traditionally popular for its gastroprotective effects, including its use as a digestive and anti-diarrhoeal.

The present study aims to prove the anti-diarrhoeal activity of aqueous extract of leaves of *Ocimum kilimandscharicum* in animal models. The aqueous extract was tested at three different

dose levels (100, 200 and 400 mg/kg, p.o. in rats and the corresponding doses in mice) against castor-oil induced diarrhoea model and castor oil induced enteropooling assay in rats; and charcoal meal test/intestinal motility test in mice. The parameters observed were the onset of defecation, cumulative faecal weight and consistency of faeces in the castor oil induced diarrhoea model; the weight of intestinal content in castor oil induced enteropooling assay; and the distance travelled by charcoal in the intestinal motility test. A significant delay in the onset of defecation ($p < 0.05$), reduction in the cumulative faecal weight ($p < 0.001$), along with a change in the faecal consistency from watery to solid form was observed at the dose of 200 mg/kg in the castor oil-induced diarrhoea model. Similarly, the extract at the doses of 100 mg/kg ($p < 0.01$) and 200 mg/kg ($p < 0.001$) significantly decreased the weight of intestinal content in castor oil induced enteropooling assay. In the charcoal meal test the extract at the dose of 280 mg/kg (corresponding to 200 mg/kg in rats) significantly ($p < 0.01$) reduced the distance travelled by charcoal.

The aqueous extract of leaves of *Ocimum kilimandscharicum* showed anti-diarrhoeal activity, which may be due to its anti-motility and anti-secretory effects, which thus proved the traditional claims [Rajat V. Sarin*, Sumit Narwal, and Pallavi A. Bafna (Rayat Institute of Pharmacy, Rayat and Bahra Campus, Railmajra, Nawanshahar, Near Ropar, Punjab-144 533, India), *Journal of Ethnopharmacology*, 2013, **148**(1), 223-228].

NPARR 4(4), 2013-0411 Flavonoid composition, antibacterial and antioxidant properties of tartary buckwheat bran extract

The tartary buckwheat [*Fagopyrum tataricum* (L.) Gaench] bran, which is an important by-product during the production of tartary buckwheat tea, is a good source of flavonoids but has not been made full use of.

Some studies reveal its antioxidant activity. However no research is found for its antibacterial activities against *Propionibacterium* and *Staphylococci* species. The 60% (v/v) EtOH extract of the tartary buckwheat bran (TBBE) was prepared at room temperature and the flavonoids content was determined by HPLC. Rutin (541.3 ± 9.3 mg/g), isoquercetin (9.33 ± 0.16 mg/g) and quercetin (66.3 ± 1.14 mg/g) were detected in the TBBE. The inhibition zone of TBBE against four bacterial strains varied from 7.6 mm to 11.6 mm; minimum inhibition concentration (MIC) values were from 512 μ g/mL to 2048 μ g/mL. IC₅₀ of DPPH scavenging activity and relative ORAC values were 8.36 ± 0.27 μ g/mL and $11,090 \pm 1278$ μ mol TE/g, respectively. For the constituents of TBBE quercetin showed higher antioxidant and antibacterial properties than TBBE and its glycosides (isoquercetin and rutin). These results suggest that TBBE might be useful to develop new types of antibacterial substance and new skin care cosmetics to prevent or improve acne [Lijun Wang*, Xiushi Yang, Peiyou Qin, Fang Shan and Guixing Ren (Institute of Crop Science, Chinese Academy of Agricultural Sciences, No. 80 Xueyuan South Road, Haidian District, Beijing 100081, PR China.), *Industrial Crops and Products*, 2013, **49**, 312-317].

NPARR 4(4), 2013-0412 *Alpinia nigra* seeds: A potential source of free radical scavenger and antibacterial agent

The radical scavenging activity and the antibacterial properties of different solvent (hexane, ethyl acetate and methanol) extracts of *Alpinia nigra* seeds were investigated in the present study. All the extracts were used to assess their potential antioxidant activities using methods for scavenging of 2,2-diphenyl-1-picrylhydrazyl radical. Ethyl acetate and methanol extracts exhibited effective free radical scavenging activities compared to the standard

antioxidant butylated hydroxyl toluene. The efficacy of *A. nigra* seed extracts was tested against three gram positive and four gram negative bacteria. Flow cytometry and field emission scanning electron microscopy study reveals and confirms the bacterial cell membrane damage, pore formation and membrane depolarization when treated with different solvent extracts. Bacterial cell membrane damage and releasing of cytoplasmic content (nucleic acids) was monitored using UV/vis spectrophotometer at 260 nm. Current investigation highlights the antimicrobial potential of *A. nigra* seed extracts and its total antioxidant efficacy for the first time [Sudipta Ghosh, Guillermo F. Padilla-González and Latha Rangan* (Department of Biotechnology, Indian Institute of Technology Guwahati, Assam 781039, India), *Industrial Crops and Products*, 2013, **49**, 348-356].

NPARR 4(4), 2013-0413 Intra-specific genetic diversity, phytochemical analysis and antioxidant activities of a potential Himalayan Swertia (*Swertia bimaculata* Hook. f. & Thoms.)

Swertia chirayita as a substitute and adulterants. Continuous indiscriminate harvesting has enormously reduced its population strength in the natural habitat of Eastern Himalayas. The aim of the present work was to evaluate the level of genetic diversity, phytochemical constituents and antioxidant potential of different parts of *S. bimaculata*. Nineteen accessions of *S. bimaculata* collected from different locations of the Sikkim Himalayan region were analysed for genetic variation using 20 ISSR primers which generated 56 (93.3%) polymorphic amplicons. A high level of genetic diversity ($h = 0.22$ and $I = 0.32$) was detected among accessions. There was a moderate genetic differentiation ($Gst = 0.44$) observed among populations. Different parts of the species were evaluated in terms of total polyphenol, flavonoid, alkaloid, saponin and tannin contents. The study revealed that the level

of polyphenols, flavonoids and alkaloids in the methanol extracts of the leaf and stem of *S. bimaculata* was considerable. However, leaf extracts showed significantly higher content of phytochemicals than the other parts. Antioxidant potential of different parts was tested by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reducing antioxidant power (FRAP) model system. Methanolic extracts of leaf exhibited stronger radical scavenging ability and its percentage of inhibition reached to 93.14% with the lowest IC_{50} value of 4.80 $\mu\text{g/ml}$, which indicates its good antioxidant potential. Leaf of *S. bimaculata* can be used as a source of important phytochemicals like xanthenes and as a substitute of commonly used *S. chirayita* [Jayashankar Das*, Sandhya Thapa, Deepti Pradhan, Sunil S. Thorat and Narayan C. Talukdar (Plant Bioresources Division, Regional Centre of IBSD, Sikkim, Gangtok 737102, India), *Industrial Crops and Products*, 2013, **49**, 341–347].

NPARR 4(4), 2013-0414 Antioxidant properties of different edible mushroom species and increased bioconversion efficiency of *Pleurotus eryngii* using locally available casing materials

Total phenolics, radical scavenging activity (RSA) on DPPH, ascorbic acid content and chelating activity on Fe^{2+} of *Pleurotus citrinopileatus*, *Pleurotus djamor*, *Pleurotus eryngii*, *Pleurotus flabellatus*, *Pleurotus florida*, *Pleurotus ostreatus*, *Pleurotus sajor-caju* and *Hypsizygus ulmarius* have been evaluated. The assayed mushrooms contained 3.94–21.67 mg TAE of phenolics, 13.63–69.67% DPPH scavenging activity, 3.76–6.76 mg ascorbic acid and 60.25–82.7% chelating activity. Principal Component Analysis (PCA) revealed that significantly higher total phenolics, RSA on DPPH and growth/day was present in *P. eryngii* whereas *P. citrinopileatus* showed higher ascorbic acid and chelating activity. Agglomerative hierarchical clustering analysis revealed that studied mushroom species fall into

two clusters; Cluster I included *P. djamor*, *P. eryngii* and *P. flabellatus*, while Cluster II included *H. ulmarius*, *P. sajor-caju*, *P. citrinopileatus*, *P. ostreatus* and *P. florida*. Enhanced yield of *P. eryngii* was achieved on spent compost casing material. Use of casing materials enhanced yield by 21–107% over non-

cased substrate [K.K. Mishra, R.S. Pal, R. ArunKumar, C. Chandrashekara, S.K. Jain and J.C. Bhatt (Crop Protection Section, Vivekananda Institute of Hill Agriculture (Indian Council of Agricultural Research), Almora 263 601, Uttarakhand, India), *Food Chemistry*, 2013, **138**(2-3), 1557-1563].

VEGETABLES

NPARR 4(4), 2013-0415 Quality of carrots as affected by pre- and postharvest factors and processing

The aim of this review is to provide an update on factors contributing to quality of carrots, with special focus on the role of pre- and postharvest factors and processing. The genetic factor shows the highest impact on quality variables in carrots, causing a 7–11-fold difference between varieties in content of terpenes, β -carotene, magnesium, iron and phenolics as well as a 1–4-fold difference in falcarindiol, bitter taste and sweet taste. Climate-related factors may cause a difference of up to 20-fold for terpenes, 82% for total sugars and 30–40% for β -carotene, sweet taste and bitter taste. Organic farming in comparison with conventional farming has shown 70% higher levels for magnesium and 10% for iron. Low nitrogen fertilisation level may cause up to 100% increase in terpene content, minor increase in dry matter (+4 to +6%) and magnesium (+8%) and reduction in β -carotene content (–8 to –11%). Retail storage at room temperature causes the highest reduction in β -carotene (–70%) and ascorbic acid (–70%). Heat processing by boiling reduces shear force (–300 to –1000%) and crispiness (–67%) as well as content of phenolics (–150%), terpenes (–85%) and total carotenes (–20%) and increases the risk of furan accumulation. Sensory and chemical quality parameters of carrots are determined mainly by genetic and climate-related factors and to a minor extent by cultivation method. Retail temperature and storage atmosphere as well as heating procedure in processing have the highest impact in quality reduction [Randi Seljåsen*, Hanne L Kristensen, Charlotte Lauridsen, Gabriela S Wyss, Ursula Kretschmar, Inès Birlouez-Aragone, and Johannes Kahl (Bioforsk Norwegian Institute for Agricultural and Environmental Research, Reddalsveien 215, NO-

4886, Grimstad, Norway) *Journal of the Science of Food and Agriculture*, 2013, **93**(11), 2611–2626]

NPARR 4(4), 2013-0416 High-pressure water washing and continuous high humidity during storage and shelf conditions prolongs quality of red capsicums (*Capsicum annuum* L.)

In order to develop practical sea freight and marketing options for high quality red capsicums, we have investigated washing treatments that can minimize deterioration when fruit are subsequently stored under high humidity packaging conditions, at cool (6–8 °C) and warm (20 °C) temperatures. In small-scale trials using vented plastic bags to provide high humidity, fruit washed with unheated high-pressure water (517 kPa) had reduced incidence of flesh rots and deterioration of the calyx and stem compared to controls (unwashed or passed through a commercial packing line) or hot water drenched fruit (55°C for 30 s) following a high humidity storage regime of 2 weeks at 6–8 °C and a further 14 d at 20 °C. In a more extensive trial where 5 kg boxes of fruit were used as replicates, washing with high-pressure water, packing in unperforated plastic box-liners and storing at 6–8 °C for 2 weeks, then 21 d at 20 °C resulted in 84% acceptability. In contrast, acceptability of fruit treated in a commercial packing line stored under regular (uncontrolled humidity) conditions or inside box liners (high relative humidity) declined rapidly at 20 °C after 2 weeks cool storage, with final acceptabilities of 10% and 39% after 21 d, respectively. We conclude that high-pressure water washing is an effective cleaning step, permitting high humidity to be used to prevent shrivel during cool-storage and subsequent ambient conditions, while minimizing the incidence of flesh rots or calyx/stem deterioration. Extended capsicum quality in high humidity at room temperature suggests that (a) cool-storage during transport to some markets may not be necessary if fruit are cleaned to a high

standard and (b) fruit could remain within a box liner right up until the product is displayed on the supermarket shelves (Erin M. O'Donoghue, Sheryl Somerfield, Andrew McLachlan, Shane Olsson and Allan Woolf, *Postharvest Biology and Technology*, 2013, **81**, 73-80).

NPARR 4(4), 2013-00417 Home conservation strategies for tomato (*Solanum lycopersicum*): Storage temperature vs. duration – Is there a compromise for better aroma preservation?

Expression of dissatisfaction with tomato aroma prompted us to lead this study on the impact of domestic storage conditions on volatile compounds. Two storage modalities (20 and 4°C) and two cultivars (Levovil and LCx) were used. Volatile compounds were analysed by gas chromatography–mass spectrometry detection after accelerated solvent extraction. Physical characteristics, lipooxygenase activity, hydroperoxide lyase activity; linoleic acid and linolenic acid were monitored.

Storing tomatoes at 4 °C induced a drastic loss in volatiles, whatever their biosynthetic origin. After 30 days at 4 °C, the concentration of volatiles had decreased by 66%. Reconditioning for 24 h at 20 °C was able to recover some aroma production after up to 6 days storage at 4 °C. Volatile degradation products arising from carotenoids and amino acids increased when tomatoes were kept at 20 °C, while lipid degradation products did not vary.

Storing tomatoes at fridge temperature, even for short durations, was detrimental for their aroma. This should be taken into account to formulate practical advice for consumers [Catherine M.G.C. Renard*, Christian Ginies, Barbara Gouble, Sylvie Bureau and Mathilde Causse (INRA, UMR408 Sécurité et Qualité des Produits d'Origine Végétale, Domaine St Paul, CS40509, F-84914 Avignon, France), *Food Chemistry*, 2013, **139** (1-4), 825-836].

NPARR 4(4), 2013-0418 Storability of Primed Seeds of Brinjal (*Solanum melongena*)

Studies were conducted to study the effect of priming on storability of brinjal variety Bagyamati. Four different priming methods *viz.*, hydro priming, halo priming, sand matrix priming and osmo priming were used. The storage studies were conducted for 11 months after imposing the priming treatment. The results revealed that viability of primed seeds were dependent on the method of priming. However, irrespective of method all the priming methods were superior to control seeds throughout the storage period. Among the protocols studied sand matrix priming (80% water holding capacity, three days) for both the varieties is established as best method of priming treatment for brinjal, capable of improving seed vigour as well as viability [Pooja M*, Venkateswaran K, Kumari KVS Meena and Keshavulu K (College of Agriculture, Acharya NG Ranga University of Agriculture (ANGRAU), Hyderabad-500 030, Andhra Pradesh), *Indian Journal of Plant Genetic Resources*, 2013, **26**(2), 120-123].

WOOD

NPARR 4(4), 2013-0419 Heartwood, sapwood and bark content of teak trees grown in Karnataka, India

Authors evaluated heartwood, sapwood and bark content in teak trees. A total of 27 sample plots were laid out in teak plantations raised by State Forest Department in Karnataka covering different age groups (11-36 years), density (516–2061 trees/ha) and sites. From these plantations, a total of 130 trees were felled for estimating the yield and bark content in relation to diameter at breast height (DBH), age and density. Bark content ranged from 22.2%–54.3%. Heartwood and sapwood content were analyzed by sampling five trees each from two different plantations, one 30 years old at 553 trees·ha⁻¹ and the other 32 years old at 911 trees·ha⁻¹. The highest heartwood proportion of stem wood volume (over-bark) was 56.3% and the lowest was 37.1%. The sapwood proportion ranged from 12.9%–23.0%, while the bark content ranged from 27.8%–43.5%. The heartwood proportion increased with DBH, while the proportion of bark decreased. The sapwood proportion did not vary with DBH. The bark content decreased with increasing age, but increased with stand density. There was no significant difference in heartwood content with respect to age or stand density because the ages of the two stands were similar. A larger dataset from young to mature stands is needed to describe the relationships between age and stand density and heartwood, sapwood and bark content of trees [Vindhya Prasad Tewari and K. M. Mariswamy, *Journal of Forestry Research*, 2013, **24**(4), 721-725].

NPARR 4(4), 2013-0420 Specific gravity of some woody species in the Srinagar Valley of the Garhwal Himalayas, India

In this study, we investigated the specific gravity of wood samples collected from a total of 31 woody species, consisting of 20 trees, 10 shrubs and one species of bamboo from subtropical regions of Garhwal Himalayas, India. Results show that among these woody species, the specific gravity of trees ranged from 0.34 for *Erythrina suberosa* to 0.83 for *Albizia procera*. For shrub species the specific gravity of *Ricinus communis* was 0.39 and that of *Dodonaea viscosa* 0.93. The average specific gravity of trees was 0.58 and of shrubs 0.66 [Animesh Kanawjia, Munesh Kumar and Mehraj A. Sheikh, *Forest Science and Practice*, 2013, **15**(1), 85-88].

NPARR 4(4), 2013-0421 Influence of growth, wood anatomical properties and specific gravity on heartwood, sapwood and tension-wood in *Dalbergia sissoo* Roxb.

Heartwood (HW) and tension-wood (TW) significantly varied with the trees of different diameters and along the heights. Heartwood and tension-wood formation was positively affected by growth. Heartwood formation in proportion to sapwood (SW) was low during the early phase of the tree growth thereafter stabilized after DBH of 20 cm. The fiber dimensions also stabilized after the same period of growth. SW/HW (heartwood/sap-wood) and NW/TW (normal wood/tension wood) ratio showed decline trend with growth parameters. Tension-wood formation in proportion to normal-wood (NW) also stabilized as in case of heartwood after certain period of growth. SW/HW ratio showed negative relationship with fiber length. NW/TW also showed the similar type of relationship. However, specific gravity increased after certain period of growth then declined. Significant variations due to direction in wood anatomical properties and specific gravity indicated the influence of tension wood on the wood properties [P K Pande, *Journal of the Indian Academy of Wood Science*, 2013, **10**(1), 16-21].

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

CULTIVATION

NPARR 4(4), 2013-0422 Effect of Grafting Time and Environment on the Graft Success of Guava (*Psidium guajava* L.) under Wedge Grafting

The experiment was carried out to appraise the effect of grafting time and environment on the graft success of guava (*Psidium guajava* Linn.) under wedge grafting in 2009–2010. It was found that controlled environment (when scion shoot covered with poly tube) was best in all the attributes. The observations were recorded on days taken to graft sprouting, per cent graft sprouting, per cent graft survival and per cent graft mortality. It was found that maximum per cent graft sprouting and per cent graft survival was in 15th February grafting under controlled environment and minimum days taken to graft sprouting in 15th April under open field condition and mortality percentage was minimum in treatment seventh [Beer Karma A*, L Yadav and Akhilendra Verma (Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005, (U.P.), India), *Trends in Biosciences*, 2013, **6**(6), 770-772]

NPARR 4(4), 2013-0423 *Stevia rebaudiana* Bertoni as a source of bioactive compounds: the effect of harvest time, experimental site and crop age on steviol glycoside content and antioxidant properties

This study was aimed at identifying the effect of harvest time, experimental site and crop age on the no-calorie sweetener steviol glycosides (SG) and on the antioxidant properties of stevia leaf extracts. The experiment was conducted over two growing seasons at two sites

in the northeastern plain of Italy. The results showed that all analysed factors played an important role in defining the SG profile and the antioxidant properties of stevia extracts. A high level of phenols (78.24 $\mu\text{g GAE g}^{-1}$ DW by Folin–Ciocalteu method) and high antioxidant activity (812.6 $\mu\text{mol Fe}^{2+} \text{g}^{-1}$ DW by FRAP assay) were observed. The inhibition of DPPH free radicals was evaluated and an IC_{50} mean value of 250 $\mu\text{g mL}^{-1}$ was obtained. Significant relationships among the total antioxidant capacity and the analysed compounds were found. The results showed the possibility of obtaining, in the tested environments, very high SG yields thanks to the long-day conditions during the spring/summer season. The harvest time played a key role in determining the stevia quality, influencing the rebaudioside A/stevioside ratio. The strong antioxidant properties make very interesting the possibility of using stevia extracts to improve functional food properties [Silvia Tavarini and Luciana G Angelini* (Department of Agriculture, Food and Environment, The University of Pisa, Via S Michele degli Scalzi 2, I-56124 Pisa, Italy.) *Journal of the Science of Food and Agriculture*, 2013, **93** (9), 2121-2129].

NPARR 4(4), 2013-0424 Effect of chromium on root morphology of leafy vegetables: Spinach and cabbage

The effect of chromium (Cr) supplemented irrigation water on particular root morphological characteristics of two leafy vegetables, namely spinach and cabbage were studied in a pot culture experiment. The results showed that at 7.5 mg l^{-1} Cr level in irrigation water, the spinach did not survive in spite of germination. In spinach, root fresh weight was reduced from 26.9 (control) to 8.02 g plant^{-1} (0.5 mg l^{-1} cv), although it was reduced in cabbage from 26.3 (control) to 19.1 g plant^{-1} (0.5 mg l^{-1} cv) prior to 15.23 g plant^{-1} (7.5 mg l^{-1} cv). The presence of 0.1 mg l^{-1} Cr in irrigation water,

marginally increased root surface area, root volume and root tips in spinach, but in cabbage, these were significantly reduced. In both the crops, root morphological parameters in response to higher level of Cr exposure were significantly decreased. It is suggested that spinach being slightly tolerant as compared to cabbage could be grown in irrigation water with low level Cr ($< 0.1 \text{ mg l}^{-1}$) [Kumari Savita, Singh Anil Kumar*, Verma Ashok K. (Department of Botany, MMH College, Ghaziabad-201009, Uttar Pradesh), *Indian Journal of Horticulture*, 2013, **70** (4), 603-605].

NPARR 4(4), 2013-0425 *Vernonia amygdalina* Delile (Asteraceae) – An African medicinal plant introduced in India

The present paper deals with *Vernonia amygdalina* Delile, an African medicinal plant belonging to the family Asteraceae which has been found in cultivation in different places of Central and Eastern India as well as an escape from cultivation. The aim of this paper is to report its availability in India, facilitate identity of the species with detailed description and photo-plate and to explore the scope of commercialization of *V. amygdalina* in the country as health supplement and medicinal plant [Bandana Bhattacharjee, P. Lakshminarasimhan, Avishek Bhattacharjee*, D.K. Agrawala and M.K. Pathak (Central National Herbarium, Botanical Survey of India, P.O. – Botanic Garden, Howrah 711103, West Bengal), *ZOO'S PRINT*, 2013, **XXVIII** (5), 18].

NPARR 4(4), 2013-0426 Domestication of pink pleurotus (*Pleurotus eous*) collected from the forest of Wayanad, South India

A pink coloured oyster mushroom, later identified as *Pleurotus eous* was found growing on the dead decayed woods of *Jatropha curcas* and *Erythrina indica* in the forest of Wayanad in Kerala, India. A pure culture of this fungus was isolated from the pileus region and maintained in Potato Dextrose Agar (PDA) slants. The conventional substrate namely paddy straw was used for cultivation and it produced pink coloured sporocarps within 10-12 days of inoculation. The substrate was pasteurized with steam and the yield performance of this species grown on paddy straw was compared with that of *P. sajor-caju* and *P. citrinopileatus*. The spawn run period of *P. eous* was completed in 10 days and it produced a yield of 570g with a biological efficiency of 69.9% on paddy straw. The total cultivation period for *P. eous* was 32 days, whereas *P. sajor-caju* and *P. citrinopileatus* took 48 and 42 days respectively. A comparative sensory evaluation of *P. eous* with *P. sajor-caju* and *P. citrinopileatus* revealed that *P. eous* has got an excellent edibility and acceptability among mushroom growers and house wives [K. Madhusudhanan*, V. Balakrishnan and Ratheesh Narayanan (Department of Botany, St. Albert's College, Ernakulam, Cochin Kerala, MS Swaminathan Research Foundation, Kalpetta, Kerala), *Journal of Nature and Life Science*, 2013, **1**(1), 37 - 41].

POST HARVEST TECHNOLOGY

NPARR 4(4), 2013-0427 Effects of essential oils on sprout suppression and quality of potato cultivars

The replacement of synthetic chemical compounds used as potato sprout inhibitors with naturally occurring compounds has been studied in potato varieties used in the processing industry. Sprout suppressant capacity of caraway (*Carum carvi*, L.), peppermint (*Mentha piperita*, L.), coriander (*Coriandrum sativum*, L.) and eucalyptus (*Eucalyptus globulus*, Labill.) essential oils was studied and compared to the sprout suppressant capacity of chlorpropham (CIPC). For the particular conditions of this study, which used high concentrations, peppermint and coriander essential oils were the most effective sprout inhibitors with inhibition rates of more from 65 to 95% respect to their control. The use of these essential oils also prevented phytopathogenic damage. Analytical quality parameters, such as moisture content and total soluble solids, were not affected by treatment with any of the aromatic essential oils. Sensory analysis revealed no difference in appearance and taste between potatoes treated with essential oils and untreated tubers. [David Gómez-Castillo*, Esther Cruz, Asun Iguaz, Cristina Arroqui and Paloma Vírveda (Department of Food Technology, Public University of Navarra; Campus de Arrosadía s/n 31006, Pamplona, Spain), *Postharvest Biology and Technology*, 2013, **82**,15-21].

NPARR 4(4), 2013-0428 Calcium chloride extends the keeping quality of fig fruit (*Ficus carica* L.) during storage and shelf-life

The effects of postharvest application of fruit hardening chemical agents on fig (*Ficus carica* L. cv. Poona) fruit were compared with untreated figs during storage. The impact of calcium chloride (4%) was notable in terms of

retention of fruit color, texture and increased accumulation of ascorbic acid, compared to untreated control figs. Pretreatment with calcium chloride (4%) was found to be most effective in checking the growth of both mesophilic aerobic bacteria and yeast and molds at low temperature (1 ± 0.5 °C; 95–98% RH) storage and it further delayed ripening and senescence of figs and was beneficial in prolonging the postharvest life twofold. Treated figs without microbial spoilage could be used for short term storage, transportation, distribution and marketing for long distance domestic markets in India [P.K. Irfan, V. Vanjakshi, M.N. Keshava Prakash, R. Ravi and V.B. Kudachikar (Fruit and Vegetable Technology Department, Central Food Technological Research Institute, Mysore, India), *Postharvest Biology and Technology*, 2013, **82**, 70-75].

NPARR 4(4), 2013-0429 *Aloe arborescens* and *Aloe vera* gels as coatings in delaying postharvest ripening in peach and plum fruit

Recently harvested peaches and plums were coated with either *Aloe vera* or *Aloe arborescens* gels and allowed to ripen at 20 °C for six days. Both coatings significantly delayed ethylene production, the effect being higher in plum which had the highest ethylene production rates. Changes in quality parameters related to peach and plum postharvest ripening, such as colour changes, reduction of acidity and increasing in ripening index (total soluble solids/total acidity ratio), were significantly delayed in coated fruit. In addition, both coatings significantly reduced weight loss, especially the *A. arborescens* gel. Thus, *A. arborescens* gel could be even more effective than *A. vera* gel for use as an edible coating for preserving the quality of climacteric fruit [Fabián Guillén, Huertas M. Díaz-Mula, Pedro J. Zapata, Daniel Valero, María Serrano, Salvador Castillo and Domingo Martínez-Romero (Department of Food Technology, EPSO, University Miguel

Hernández, Ctra. Beniel km. 3.2, 03312 Orihuela, Alicante, Spain), *Postharvest Biology and Technology*, 2013, **83**, 54-57].

NPARR 4(4), 2013-0430 Effect of oxalic acid on ripening attributes of banana fruit during storage

The effect of exogenous oxalic acid treatment on ripening attributes of banana fruit during storage was investigated. Banana fruit were dipped into solutions of 0 (control) or 20 mM oxalic acid for 10 min and then stored at room temperature ($23 \pm 2^\circ\text{C}$) and 75–90% relative humidity. The application of oxalic acid reduced fruit deterioration during storage. The oxalic acid treatment also reduced the rates of respiration and ethylene production, and delayed the decreases in firmness, hue angle, and maximal chlorophyll fluorescence (F_v/F_m) of banana fruit during storage. Furthermore, fruit treated with oxalic acid exhibited higher

superoxide dismutase activity and antioxidant capability with a lower production of reactive oxygen species at the late storage period compared with non-oxalic acid-treated fruit. Overall, the oxalic acid treatment was effective in inhibiting postharvest ripening of banana fruit and exhibited the potential for commercial application to store the bananas at room temperature. It can be concluded that the delay in banana fruit ripening associated with oxalic acid treatment could be due to inhibition of respiration and ethylene production rates, and reduction of oxidative injury caused by reactive oxygen species through increased antioxidant activity [Hua Huang, Guoxing Jing, Lifang Guo, Dandan Zhang, Bao Yang, Xuwu Duan, Muhammad Ashraf, Yueming Jiang (Key Laboratory of Plant Resources Conservation and Sustainable Utilization, South China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, People's Republic of China) *Postharvest Biology and Technology*, 2013, **84**, 22–27].

Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. 3rd International Conference on Agricultural & Horticultural Sciences, October 27-29, 2014, Hyderabad International Convention Centre (HICC), India, Website: <http://omicsgroup.com/conferences/agricultural-horticultural-2014/#>
2. 3rd International Conference on Biodiversity & Sustainable Energy Development, June 24-26, 2014 Valencia Conference Centre, Spain, Website: <http://omicsgroup.com/conferences/agricultural-horticultural-2014/#>
3. 5th World congress on Biotechnology, June 25-27, 2014 Valencia, Spain, Website: <http://omicsgroup.com/conferences/agricultural-horticultural-2014/#>
4. Fourth International Conference on Holistic Medicine (ICHM-2014) from 24-26 October 2014, Kottayam, Kerala, India Website: <http://www.holistic.macromol.in/index.html>
5. International Conference on Development, Biodiversity and Climate Change: Issues and Challenges, 3rd to 5th October 2014, Chamba, Himachal Pradesh, India; Website: <http://www.conferencechamba.com/home.html>

ANNOUNCEMENTS**INDIAN JOURNAL OF NATURAL PRODUCTS AND RESOURCES**

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RAW MATERIALS HERBARIUM AND MUSEUM DELHI (RHMD)

Herbarium is a repository of dried specimens of plants collected from far and wide and is arranged in a systematic order. Plant specimens in herbaria and their raw material samples serve as reference materials for any plant-based research and as source materials for information on utilization, conservation, planning and management. The herbarium specimens have become resources for generating the profiles of chemical constituents and DNA fingerprinting. The herbarium specimens could be used as standard reference materials while identifying the plant specimens and the crude drug samples. Further, the herbaria could provide information on folk-lore, ethnomedicine or traditional medicine from which new medicines could be evolved.

Because of wide spread belief that herbal medicines are safer than synthetic drugs, demand for Indian medicinal plants has increased many fold in the national and international markets. Due to high demand but limited cultivation of medicinal plants in India, more than 95 per cent plants are being harvested from the wild. Consequently there is gap in demand and supply, therefore, the collectors and traders involved in commercialization of medicinal plants often mix other related plant materials to the genuine one or an altogether a distinct plant material is sold in the market in place of genuine one. Thus usage of such adulterated or spurious raw material for manufacturing medicine affects the efficacy of the finished product and could cause deleterious effect on human health.

Considering the demand for natural products including medicines and other products for various purposes, universities, colleges, institutes and various other R & D labs are focusing on research works especially pharmacological, phytochemical and ethnobotanical studies. First and foremost requisite for these findings is the correct identification of the plant/crude drug collection, preservation and identification. It is a fact that without correct name literature search is incomplete. Therefore, before starting actual R & D work, researchers need to have correct identification and nomenclature of the plant specimen for any novel finding or to validate an ethnobotanical report.

While starting the revised series of The Wealth of India-An Encyclopaedic Dictionary of Indian Raw Materials in 1978, National Institute of Science Communication and Information Resources (NISCAIR), formerly known as NISCOM, a constituent establishment of Council of Scientific Industrial Research (CSIR), has set up a Raw Materials Herbarium & Museum, housing authentic

samples of economically important raw materials of plant, animal and mineral origin of India as a whole, in one place, to disseminate and showcase knowledge on these resources through authenticated collection of samples, herbarium sheets borrowed and collected from fields from throughout India. It is open to the scientists, researchers, industries, entrepreneurs, traders, students and the public. **The NISCAIR Herbarium & Museum was assigned the acronym RHMD (Raw Materials Herbarium & Museum, Delhi) by the International Association for Plant Taxonomy and it appeared in the publication "Index Herbarium, New York, USA" (1990).** The RHMD houses over 8000 specimens comprising more than 5000 species of economic and medicinal plants of India and the Museum containing over 3500 samples of crude-drugs, animal and mineral specimens.

The facility backed up by the knowledge stored in the Wealth of India, is a veritable storehouse of information on the raw materials of India, and is a place useful to students to gain knowledge on economic biology and geology. Based on this facility and the available expertise, we do authentication/identification of the specimens/samples received under possible botanical or common names of the plant(s) and issue a certificate.

DECLARATION

- Authentication of herbarium specimen or crude drug sample (s) pertains to the quantity/quality of specimens/samples received in RHMD.
- Authentication is done on the basis of macroscopic studies followed by detailed scrutiny of literature and matching the samples with authenticated specimens preserved in RHMD.
- Samples/specimens submitted to RHMD are non-returnable.
- This service is provided for societal intervention and facilitate biological science students/entrepreneurs/ institutes, etc.
- Nominal service charges are taken to maintain the received samples and specimens for further reference and consultation.
- For the identification of dried well pressed plant specimens properly fixed on a herbarium sheet with leaves, flower, fruit, etc., Rs.250/- per plant are charged.
- For crude drug (Leaves, fruits, flowers, root, rhizome etc.) identification, we charge Rs.500/- per sample.

REQUEST FORM FOR AUTHENTICATION (Download)

Sir/Madam,

I/would like to get done authentication of enclosed herbarium specimen(s)/crude drug sample (s) from Raw Materials Herbarium & Museum, Delhi (RHMD). Detailed information about the specimen(s)/crude drug sample (s) available with me is given below:

1. Botanical Name (Possible):-----
2. Market/Trade/Local/Hindi/Vernacular name:-----
3. Part of specimen: Root/Rhizome/Stem/Aerial part/Leaves/Flowers/Fruits/Seeds, Bark,etc.-----
4. Date/Season of Collection:-----
5. Place of collection:-----
6. Use (if known)-----
7. Purpose of Authentication-Research/Academic/Trade/Cultivation/Drug preparation, etc.-----

I am enclosing herewith DD (No. & date and amount
in the favour of the Director NISCAIR/Depositing the cash Rs.------(Rs.-----
-----towards the prescribed charges for authentication of -----(No.) Herbarium Specimen and/or
------(No.) Crude Drug samples.

Signature

Name:
Address:
Phone, Mobile No.:
E-mail ID:

SEND TO:

Dr. (Mrs) Sunita Garg
Head
Raw Materials Herbarium & Museum, Delhi (RHMD)
National Institute of Science Communication And Information Resources (CSIR-NISCAIR)
Dr. K. S. Krishnan Marg (inside Pusa campus)
New Delhi-110012
E-mail: sunitag@niscair.res.in; sunita.niscair@gmail.com; rhmd@niscair.res.in;
Phone: 011-25846301-7, Ext. 258, 263; 25846001 (Direct)

RHMD, CSIR-NISCAIR

FEEDBACK

(Please send by E-mail to: sunitag@niscair.res.in; prb@niscair.res.in)

Dear Sir /Madam

1. How did you learn about the facility for authentication of Indian Raw Materials of Plant origin (crude drugs) samples and Herbarium specimens at Raw Materials Herbarium and Museum, Delhi (RHMD), NISCAIR?

- a) Through personal contact:
- b) Through Institute/College/University:
- c) Through NISCAIR Website:

2. Have you ever visited RHMD, NISCAIR? Yes/No

3. Have you availed the authentication services provided by RHMD Yes/No

4. Are you satisfied by the identification/authentication service provided by RHMD, NISCAIR?

Yes/No

If not satisfied, would you like to suggest some improvement?

.....

5. Do you know any other Institute/Dept. providing authentication service similar to RHMD, NISCAIR..... Yes/No

If yes, please provide address:

Signature

Name:

Address:

Phone, Mobile No.:

E-mail ID: