

From the Director's Desk

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

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Gangan Prathap

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

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

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)

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

NPARR 4(2), 2013-0120 Non dairy probiotic beverages (Short Survey)

The beneficial effects of food with added live microbes (probiotics) on human health are being increasingly promoted by health professionals. Probiotic products available in the markets today, are usually in the form of fermented milks and yoghurts; however, with an increase in the consumer vegetarianism throughout the developed countries, there is also a demand for the vegetarian probiotic products. And, owing to health considerations, from the perspective of cholesterol in dairy products for the developed countries, and economic reasons for the developing countries, alternative raw materials for probiotics need to be searched. Considering the above mentioned facts cereals, legumes, fruits and vegetables may be potential substrates, where the healthy probiotic bacteria will make their mark, both in the developing and the developed countries. This review aims at highlighting the research done on probiotic beverages from non dairy sources. These non dairy probiotic beverages can serve as a healthy alternative for dairy probiotics and also favor consumption by lactose intolerant consumers [Vasudha, S. and Mishra, H.N.* (Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur-721 302, India), *International Food Research Journal*, 2013, **20**(1), 7-15].

NPARR 4(2), 2013-0121 Studies on the preparation and storage stability of blended ready-to-serve from ber (*Zizyphus mauritiana* Lamk.) and jamun (*Syzygium cuminii* Skeels.) pulp

An experiment was conducted to study the feasibility of blending of ber and jamun fruit

juices in different blending ratios and recipes for the preparation of blended ready-to-serve (RTS) beverage and assess their storage life at ambient temperature. The prepared blended RTS were organoleptically evaluated by adopting 9 point Hedonic scale. Among the different blending ratios and recipes tried for RTS beverage, 10% blended pulp (25% ber pulp + 75% jamun pulp) with, 13% TSS and 0.2% acidity was found to be the best on overall sensory score. Blended RTS stored in glass bottles and physico-chemical changes during storage were also studied at monthly intervals. Total soluble solids and acidity did not change upto one month and two month, respectively then increased gradually whereas browning increased continuously during storage. Ascorbic acid content did not change upto one month and then decreased gradually whereas organoleptic score decreased continuously during entire period of storage. The appearance, colour, flavour, taste and overall acceptability of blended RTS were found to be good upto five months of storage at ambient temperature [Jakhar, M.S. and Pathak, S.* (Department of Post Harvest Technology, College of Horticulture and Forestry, Narendra Deva University of Agriculture and Technology, Kumarganj - 224 229, Faizabad (U.P.), India), *Plant Archives*, 2012, **12**(1), 533-536]

NPARR 4(2), 2013-0122 Development of a cost-effective, palatable and shelf-stable blended beverage of pummelo (*Citrus grandis* Linn.)

Natural beverages face strong competition from synthetic drinks in the open market. Creation of diversity in natural products is a key strategy to withstand this competition. Pummelo (*Citrus grandis* Linn.) is one such potential fruit which could be exploited on a commercial scale if processed properly. The bitterness of pummelo juice is a serious handicap in its utilization. The present study aimed at preparation of a cost-

effective, palatable blended beverage of pummelo. To overcome this problem, pummelo was blended with mango ginger and kokum juice in the ratio of [65:30:5] for the preparation of syrup. The product was stored for 120 days in ambient conditions of storage and analyzed for changes in its physicochemical constituents. Total soluble solids and total sugar increased during storage, while titratable acidity and ascorbic acid content decreased slightly during storage. Organoleptically, the best recipe was 25% juice, 70 °Brix total soluble solids and 1.5% acidity with a score of 6.3 out of 7.0 for overall acceptability. Mango ginger juice suppressed the bitter aftertaste of pummelo juice and imparted its characteristic taste and flavor to the product. The product was shelf-stable and had important medicinal constituents in it. The [total revenue/total cost] ratio of the product was 2.90 [Bohra, P., Sreenivas, K.N., Sreeramu, B.S* (Univ. Agric. Sci., GKVK Campus, Bengaluru-560065, India), *Fruits*, 2012, **67**(4), 249-256].

NPARR 4(2), 2013-0123 Cashew apple (*Anacardium occidentale* L.) extract from by-product of juice processing: A focus on carotenoids

Cashew apple fibrous residue is a by-product of the cashew juice industry. After pressing using a helical type continuous press followed by crossflow microfiltration, an aqueous extract was obtained from these cashew apple fibres. It was characterised by an intense yellow colour due to carotenoid pigments. Carotenoids were identified and quantified in the cashew apple before extraction, in its aqueous extract and in the concentrate obtained by microfiltration. Cashew apple aqueous extract and its concentrate presented a carotenoid profile with 11 carotenoids, most of them were tentatively identified by HPLC-DAD-MS and are xanthophylls present under an esterified form. Auroxanthin and β -cryptoxanthin represented around 50% of total carotenoids. Concentration of the extract by microfiltration led to epoxy-

furanoxo rearrangement of violaxanthin and antheraxanthin. The process allowed an increase of 10 times total carotenoid content compared with initial cashew apple. Total carotenoid content of the final concentrated extract reached 54 mg/kg [De Abreu, F.P., Dornier, M., Dionisio, A.P. Carail, M., Caris-Veyrat, C., Dhuique-Mayer C*. (CIRAD, Montpellier SupAgro, UMR QualiSud, TA-B95/16, 34398 Montpellier cedex 5, France), *Food Chemistry*, 2013, **138**(1), 25-31].

NPARR 4(2), 2013-0124 Studies on development of soymilk based mango RTS beverage

In the present investigation aim to reduce the beany flavor of soymilk and develop fruit flavored soy beverage. The RTS (Ready-to-serve) beverage was prepared by blending soymilk with mango pulp in different combinations such as 80:20, 70:30, 60:40 and 50:50 and analyzed for various physico-chemical and sensory characteristics for its overall acceptability. The study revealed that the RTS beverage prepared by blending the soymilk and mango pulp in the equal proportion (50:50) was found better in almost all physico-chemical and sensory quality parameters as compared to the other combinations [Sakhale, B.K*. Pawar, V.N. and Ranveer, R.C. (Food Technology Division, Department of Chemical Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad-431004 (MS), India), *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 2012, **11**(5), 523-528].

NPARR 4(2), 2013-0125 Utilization of Whey for the Production of Instant Energy Beverage by Using Response Surface Methodology

Whey is obtained from dairy industries. It is generally disposed into sewage which creates major problem of pollution besides the loss of valuable nutrients. The process of whey utilization involves higher processing cost. Therefore, the aim of the present work was to

develop low cost nutritious whey beverage for hard working group of people. Instant energy Ready To Serve (RTS) whey beverage was prepared by hydrolyzing lactose with immobilized β -galactosidase enzyme, isolated from yeast culture *Kluyveromyces marxianus*. Sensory attributes, appearance, taste, aroma, overall acceptability and viscosity were the quality control parameters employed for beverage evaluation. Mango pulp concentration, stabilizer and sucrose added in beverage were optimized by the utilization of Response Surface Methodology (RSM). Based on contour plots and variance analysis, optimum values for mango pulp, stabilizer and sucrose were found to be 17.72, 0.17 and 12.0% respectively. The final product exhibited viscosity 1.753 cp. The energy value of prepared beverage was 322 ± 3.08 KJ per 100 mL of product. The electrolyte composition was also found to be almost similar to the desired level [Singh, A.K and Singh, K* (Biochemical Engineering and Food Technology Department, Harcourt Butler Technological Institute, Nawabganj, Kanpur (U.P.) 208002, India), *Advance Journal of Food Science and Technology*, 2012, **4**(2), 103-111]

NPARR 4(2), 2013-0126 Optimization of process and physico-chemical properties of Ready-to-Serve (RTS) beverage of cane juice with curd

Sugarcane juice was extracted in the month of February from matured fresh sugarcane variety CoS 95255, which was raised using standard agronomical practices. Juice was extracted after thorough cleaning of cane stalks using standard methods. Cane juice from sugarcane variety was used in this study having 18.3-19.5 °brix total soluble solid (TSS), 0.13-0.18 % acidity, 6.05-6.16 mg/100 g ascorbic acid, 59.14-63.18 °brix sucrose, 5.1-5.4 pH and 4.36-5.43 °brix reducing sugar. The proportions of sugarcane juice with curd in the RTS beverage

was optimized using various cane juice to curd proportions. Sugarcane juice with curd was preserved and packed in 200 ml glass bottles and kept for different storage periods (0, 5, 15 and 20 days). Beverages prepared from 4:1 proportion of juice: curd were found superior after 15 days of storage [Singh, R.K., Jha, A., Singh, C.K and Singh, K*(Department of Agronomy, BHU, Varanasi 221 005, India), *Sugar Tech*, 2012, **14**(4), 405-411]

NPARR 4(2), 2013-0127 Innovative use of sweet sorghum juice in the beverage industry

Sweet sorghum juice, obtained from low water consuming, drought resistant, short duration and seed-propagated sweet sorghum crop, was explored as a source to obtain syrup which can be used as sugar alternative for meeting certain requirements of the beverage industry. Value addition, through conversion of the juice to syrup and beverages, offers farmers an excellent opportunity to improve farm income and productivity in semi arid regions. In this study a new method to produce clarified sweet sorghum juice is demonstrated. The sweet sorghum juice was clarified using pre heating followed by vacuum filtration using a filter aid. The clarified juice was concentrated to syrup with acceptable sensory qualities. Flavoured beverage formulations were optimised using the clarified juice and syrup. Nutritional and sensory properties of the developed beverages showed that the samples were acceptable to the consumers and rated at par with a commercially available beverage. This work has immense industrial and social significance. [Datta Mazumdar, S. *, Poshadri, A., Srinivasa Rao, P., Ravinder Reddy, C.H., and Reddy, B.V.S. (NutriPlus Knowledge (NPK) Program, Agribusiness and Innovation Platform AIP, India), *International Food Research Journal*, 2012, **19**(4), 1361-1366].

COSMETICS/COSMECEUTICALS

NPARR 4(2), 2013-0128 *In-vitro* Characterization of silk sericin as an anti-aging agent

Silk sericin is a natural macromolecular protein derived from the silkworm, *Bombyx mori*. It is also a by-product of silk-making. From previous reports, many cosmeceuticals and other cosmetic products have been developed with silk sericin. This study aimed to investigate an anti-aging property of silk sericin by *in-vitro* characterization using fibroblast cell culture model. The results showed that silk sericin can stimulate collagen type I synthesis, suppress the regulation of nitrite, which nitrite may induces oxidative stress, and up-regulate the expression of b-cell lymphoma 2 (bcl-2) to inhibit cell apoptosis, without altering fibroblast growth kinetics or cellular ultrastructure. Sericin anti-aging properties were comparable to vitamin C, except for oxidative stress, where silk sericin was superior. The results suggested that silk sericin possesses anti-aging properties that could be usefully incorporated into high-quality cosmetics, cosmeceuticals, and food supplements [Thitinan Kitisin*, Pannamas Maneekan and Natthanej Luplertlop (Mahidol University, Department of Anatomy, Faculty of Science, Mahidol University, Bangkok, Thailand), *Journal of Agricultural Science*, 2013, 5(3)]

NPARR 4(2), 2013-0129 *In vivo* skin irritation potential of a cream containing *Moringa oleifera* leaf extract

The aim of the present study was to evaluate the skin irritation potential of a cream containing *Moringa oleifera* leaf extract. Skin irritation potential of a cream containing *M. oleifera* leaf extract (3%) versus base was investigated by performing an *in-vivo* visual scoring (skin irritation), patch test and erythema index for long term study by using non-invasive instrumental assessment Mexameter in 11 volunteers in a single blinded study. The active

cream and base were applied twice daily to the face (cheeks) for a period of 12 weeks. The instrumental measurements were carried out under a draught free room, with controlled temperature (18.0 to 20.6°C) and relative humidity (55to 65%). No serious adverse effects were observed. The *M. oleifera* leaf extract cream was not-irritant according to 48 h semi-occluded patch test. There was a significant decrease in skin erythema and base showed insignificant results when applied ANOVA. The results suggested that the *M. oleifera* leaf extract cream was very well accepted by all volunteers and decreased erythema content. Additionally, product can be regarded as safe for topical application [Atif Ali*, Naveed Akhtar, Ahmad Mahmood Mumtaz, Muhammad Shoab Khan, Furqan Muhammad Iqbal and Syed Saoud Zaidi (Department of Pharmacy, Faculty of Pharmacy and Alternative Medicine, The Islamia University of Bahawalpur, Bahawalpur), *African Journal of Pharmacy and Pharmacology*, 2013, 7(6), 289-293].

NPARR 4(2), 2013-0130 *In vitro* evaluation of the efficacy of commercial green tea extracts in UV protection

Plants with antioxidant properties are beneficial for preventing the ageing events evoked by UV light, and numerous products based on *Camellia sinensis* (green tea) are commercially available, many of which claiming to contain bioactive compounds that would prevent UV-induced skin damage. In this study, we tested the efficacy of five commercial green tea extracts used to enrich cosmetic formulations for protecting human and mouse fibroblasts against UV radiation effects and compared with a fluid one prepared according to the Brazilian Pharmacopoeia recommendations. Taking into consideration that the ageing process can be accelerated by solar radiation by excessive free radical generation, leading to depletion of skin antioxidant defences, and its collapse caused by disruption of the metalloproteinase metabolism, we have used their individual (-)-epigallocatechin-3-gallate (EGCG) content, the catalase and SOD status and the

matrix-degrading metalloproteases (MMP)-1, MMP-9 and MMP-13 levels as comparative parameters. The EGCG content of the commercial products showed wide variability, ranging from undetectable levels to $58.65 \pm 1.12 \mu\text{g mL}^{-1}$, in contrast with the fluid extract ($87.82 \pm 1.35 \mu\text{g mL}^{-1}$). Moreover, only the pharmacopoeic extract was able to significantly reduce MMP degradation while enhancing the levels of SOD and catalase. These results indicate, for the first time, that the methodologies for preparing herbal mixtures can interfere significantly with compounds endowed with photoprotective effects, and the efficacy of products containing *C. sinensis* extracts thought to act against effects of solar radiation can be compromised [A. R. Silva, C. Seidl, A. S. Furusho, M. M. S. Boeno, G. C. Dieamant, A. M. Weffort-Santos* (Laboratory of Hematology, Medical Pathology Department, Federal University of Paraná, Curitiba, PR, Brazil), *International Journal of Cosmetic Science*, 2013, **35**(1), 69-77].

NPARR 4(2), 2013-0131 Development of skin-friendly dermatological water-in-oil emulsion of Pomegranate juice

This study was designed to develop a topical skin-care cream (w/o emulsion) of 4%

pomegranate extracts versus its vehicle (the base) as control and evaluate its effects on skin-melanin, skin erythema, skin moisture, skin sebum and TEWL. Concentrated pomegranate (*Punica granatum*) juice was entrapped in the inner aqueous phase of w/o emulsion. The base containing no extract and a the formulation containing 4% concentrated juice of pomegranate was formulated. The odour was adjusted with few drops of lemon oil. Both the base and the formulation were stored at different storage conditions for a period of four weeks to predict their stability. The stability parameters, i.e., physical stability, centrifugation and pH, were monitored at different time intervals. Both the base and the formulation were applied to the cheeks of 25 healthy human volunteers for a period of 8 weeks. The pharmaceutical stability of creams was achieved from 4 weeks in-vitro study period. Odour disapperaed with the passage of time due to volatilization of lemon oil [Naveed Akhtar, Rashida Parveen, Barkat Ali Khan*, Muhammad Jamshaid, and Haroon Khan (Department of Pharmacy, Islamia University, Bahawalpur, Pakistan), *Proceedings of the Pakistan Academy of Sciences*, 2012, **49**(4), 269-278].

DYES (incl. Food colorants)

NPARR 4(2), 2013-0132 **Environmentally friendly natural dyeing of organic cotton**

In this study, organic cotton fabrics were dyed with different natural dye sources (madder root, walnut shell, henna, horse chestnut, pomegranate peel, berberis vulgaris root, thyme, and sage tea). The dyeing was carried out with different mordants (copper sulphate, potassium aluminum sulphate, potassium tartrate, and citric acid), using pre-mordanting dyeing methods. The color of the fabrics was investigated in terms of color strength (K/S) and fastness properties against light, washing, rubbing, and perspiration. The color and fastness properties obtained from the dyed organic cotton fabrics were between good to excellent [Tutak, M. and Ebru Korkmaz, N.* (Department of Textile Engineering, Erciyes University, Kayseri, Turkey), *Journal of Natural Fibers*, 2012, **9**(1), 51-59].

NPARR 4(2), 2013-0133 **Ecofriendly colouring of silk fabric with croton (*Croton* Species) leaves**

The great appeal of textiles lies in their colours and the way that colour is used to create patterned effects. Colour is applied by the process of dyeing, which in its simplest form involves the immersion of a fabric in a solution of a dyestuff in water. The amount of dyestuff required is very small, but its production and application require considerable skill. Changes in the ways of producing dyes during the nineteenth century heralded modern science. The uses of natural dye on textile materials are now being popularised globally by the continuous efforts of nature lovers. The problems caused by synthetic dye in human lives and environments, since the introduction of synthetic dye more than a century ago, has come to an alarming level today. Hence there is an urgent need to find an alternative to the hazards of synthetic dyes. To explore the use of natural dyes is one such immediate solution.

However, the limitations with the natural dye are their poor fastness properties, limited shades, low brilliancy, etc. To some extent, adding selected mordants/chemicals in natural dyeing is accepted, provided the character of the natural dye is unaltered and the eco-system is not damaged. The present study explored the development of a process for the extraction of natural dyes from abundantly occurring plants, flowers namely Croton (*Croton* species) leaves. The study showed that this source can produce different shades of brown and peach colour. A series of experiments was conducted to optimise the different variables for dyeing. Acidic medium was optimized for dye extraction. For Croton dye, 8% dye concentration, 60 minutes extraction time and 75 minutes dyeing time were optimized. Test of colour fastness to light, washing, perspiration and crocking were also carried out. The results concluded that the light fastness, washing, fastness, perspiration and crocking fastness of the Croton dye were good and samples that were mordanted showed better fastness properties as compared to control. This dye source is abundantly available throughout the year and does not cause environmental depletion. Experiments proved that the Croton dye is the good source for dyeing silk in shades of brown and peach. Thus it can be concluded that this dye has a lot of commercial potential [Tiwari, R. and Paul, S*. (Department of Clothing and Textiles, College of Home Science, GB Pant University of Agriculture and Technology, Pantnagar, India), *International Dyer*, 2012, **197**(1), 35-38].

NPARR 4(2), 2013-0134 **Eco-Dyeing of wool using aqueous extract of the roots of Indian madder (*Rubia cordifolia*) as natural dye**

The aqueous extract obtained from the powdered roots of Indian madder (*Rubia cordifolia*) was used for dyeing of woolen yarns. The effect of pH, dye concentration, and mordants on the colorimetric and fastness properties has been studied. Brilliant shades of bright red to scarlet were obtained with

significant variation in hue and tone of shades depending on mordants and dye concentrations used. The color coordinates of the dyed samples were found to be in the red-yellow quadrant of the CIELab color space. It was found in all cases that mordanting with alum as well as ferrous sulfate has caused decrease in lightness (L^*) values and increase in K/S values. All the dyed samples exhibited commercially acceptable fastness to light, washing, and rubbing. Scanning Electron Microscopy (SEM) morphological studies have also been performed on different woolen yarns [Yusuf, M*, Shahid, M., Khan, S.A., Khan, M.I., Islam, S.-U., Mohammad, F., Khan, M.A. (Natural Dyes Lab, Department of Chemistry, Jamia Millia Islamia, New Delhi, 110025, India), *Journal of Natural Fibers*, 2013, **10**(1), 14-28].

NPARR 4(2), 2013-0135 Antibacterial properties and color fastness of silk fabric dyed with turmeric extract

The use of non-toxic and eco-friendly natural dyes on textiles has received much attention due to the increased environmental awareness in order to avoid some hazardous synthetic dyes. In the present study, an eco-friendly approach was developed to impart color and antibacterial properties to silk fabrics dyed with turmeric extract as a non-toxic natural colorant. The natural colorant was extracted from *Curcuma longa* rhizome. Copper sulfate, ferrous sulfate and potassium aluminium sulfate were applied in a pre-metallization process as mordanting agents. Antibacterial properties of treated fabrics were evaluated against common pathogenic bacteria, *Staphylococcus aureus* (Gram-positive) and *Escherichia coli* (Gram-negative). The effects of dye concentration and mordant types on the obtained color hues, antibacterial efficiency and color fastness of the fabrics were investigated. The results indicated that mordanted and dyed fabrics possessed desirable antibacterial properties. Complete antibacterial activity of the treated fabrics was

obtained with 3 % wf (on weight of the fabric) copper sulfate. It was also shown that increasing the dye concentration could lead to a more efficient antibacterial activity on the mordanted dyed fabrics. An optimum level of the antibacterial activity was observed in the sample treated with 30 % wf of turmeric. Furthermore, the results of CIE L^* , a^* , b^* values, FTIR, washing, light and rubbing fastnesses of the dyed fabrics were reported. The mordanted dyed silk fabrics exhibited desirable color fastness properties. These studies proved a direct relationship between the degree of antibacterial activity of the fabrics treated with turmeric and the metals ion concentration [Ghoreishian, S.M., Maleknia, L., Mirzapour, H. and Norouzi, M. (Young Researchers Club, South Tehran Branch, Islamic Azad University, Tehran, Iran), *Fibers and Polymers*, 2013, **14**(2), 201-207].

NPARR 4(2), 2013-0136 Studies on the dyeing processes of cassia seed

In order to learn the influence of dyeing conditions on dyeing characteristics, cassia seed was used to dye cotton, wool, ramie and silk under the different temperature with different types and concentration of mordant. By testing color eigen value and color fastness, the conclusions were drawn that high temperature will cause the color darken. And different materials should be dyed under their proper temperature. The concentration and the types of mordant can change the dyed color by cassia seed. The anions of mordant have little influences on the dyeing results, however, metallic cations would play an important role in the color hue and color fastness. It is hoped that the results will give a reference in natural dyeing [Wang, F. Q. and Wang, Y. P. (Beijing Institute of Clothing Technology, Beijing 100029, China), *Wool Textile Journal*, 2013, **41**(2), 49-53].

NPARR 4(2), 2013-0137 The use of vanadium for dyeing technology

Mordant technology is often required for dyeing by natural dyes. The major problem with natural dyes is deepness of black color. Authors

analyzed the characteristic chromaticness with four kinds of natural dyes and three metals to improve it. We focused on vanadium, which is a transition element in a same period with iron or copper. Effective methods were found for the improvements of the dyeings with tetravalent vanadium compounds, vanadyl sulfate and tannin. Especially, tannic acid and gallic acid were hypochromically and fastly dyed on wool for the first time in the history of dyeing [Uegaki Y.*, Watanabe M., Utada M., Sato T., Togawa, M., and Hasegawa T.(Yamanashi Prefectural Fuji Industrial Technology Center, 2095, Shimoyoshida, Fujiyoshida, Yamanashi 403-0004, Japan), *Sen'i Gakkaishi*, 2013, **69**(3), 55-59].

NPARR 4(2), 2013-0138 Dyeing behaviour of γ -irradiated cotton using Amaltas (*Cassia fistula*) bark extracts

Amaltas bark (*Cassia fistula*) has been used as natural colourant for dyeing of un-irradiated and irradiated cotton fabric. Both

cotton fabric and dye powder has been exposed to absorbed doses of 2, 4, 6, 8 and 10 kGy using Cs 137 γ -irradiator. Dyeing parameters such as temperature and time were optimized. To improve colour strength pre and post mordanting using copper and iron as mordants was carried out. Suggested ISO standard methods for colour, fastness to light, washing and rubbing were employed to observe fastness properties. It is observed that dyeing of irradiated fabric at 50 °C for 50 min using Cu as pre-mordant (4 %) has not only given good colour strength with darker shades but also acceptable fastness properties are obtained. It is concluded that γ -irradiation has a promising effect in improvement of colour strength and colourfastness properties and it can be applied on other fabrics dyed with other natural colourants [Adeel S.*, Fazal-Ur-Rehman, Gulzar, T., Bhatti, I.A., Qaiser, S. and Abid, A. (Department of Chemistry, Government College University, Faisalabad-38000, Pakistan), *Asian Journal of Chemistry*, 2013, **25**(5), 2739-2741].

ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 4(2), 2013-0139 Essential oil of flowers of *Anaphalis contorta*, an aromatic and medicinal plant from India

The hydro-distilled essential oil of dried flowers of *Anaphalis contorta* Hook f. has been examined by means of gas chromatography-mass spectrometry (GC-MS). The oil constituents were identified according to their mass spectra and their relative retention indices determined on a non-polar stationary phase capillary column. Fifty-one constituents have been identified representing 97.0% of the total oil. The major constituents were β -caryophyllene (19.2%), γ -curcumene (17.5%), δ -cadinene (10.2%), labda-7,14-dien-13-ol (4.8%), epi- α -cadinol (4.3%), bulnesol (4.3%), α -cadinol (3.8%), β -bisabolol (3.7%) and labda-8,14-dien-13-ol (3.3%). The oil was rich in sesquiterpene hydrocarbons (60.5%), followed by oxygenated sesquiterpenes (26.6%), oxygenated diterpenes (8.1%) and diterpene hydrocarbons (1.8%) [Joshi, R.K.(Department of Phytochemistry, Regional Medical Research Centre (Indian Council of Medical Research), Belgaum, Karnataka-590 010, India), *Natural Product Communications*, 2013, **8**(2), 225-226].

NPARR 4(2), 2013-0140 Chemical composition of the essential oil of *Baccharoides lilacina* from India

The essential oil composition from the aerial parts of *Baccharoides lilacina* (Dalzell & A. Gibson) M. R. Almeida was analyzed by gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS). A total of 41 compounds have been identified, representing 97.4% of the total oil. The main constituents were identified as β -caryophyllene (27.7%), epi- α -cadinol (25.1%), caryophyllene oxide (9.9%), α -muurolol (7.6%), α -cadinene (6.1%) and α -cadinol 4.5%). The oil was found to

be rich in oxygenated sesquiterpenes (47.1%) and sesquiterpene hydrocarbons (46.2%) [Joshi, R.K. (Department of Phytochemistry, Regional Medical Research Centre (Indian Council of Medical Research), Belgaum, Karnataka-590 010, India), *Natural Product Communications*, 2013, **8**(3), 401-402].

NPARR 4(2), 2013-0141 Chemical composition and antioxidant activity of essential oil and oleoresins of nutmeg (*Myristica fragrans* Houtt.) fruits

Essential oil and oleoresins (ethanol, ethyl acetate, and iso-propyl alcohol) of *Myristica fragrans* were extracted by using Clevenger and Soxhlet apparatus, respectively. Gas chromatography-mass spectrometry analysis of essential oil showed the presence of 38 components representing about 99.6% of the total weight. Sabinene (29.4%) was found to be a major component along with beta pinene (10.6%), alpha pinene (10.1%), terpene-4-ol (9.6%), and several other minor components. The major component of all oleoresins contained elemicin. It has been observed that the essential oil and ethanol oleoresin showed better activity compared to other tested oleoresins and synthetic antioxidants, butylated hydroxyl anisole and butylated hydroxyl toluene. Furthermore, the activity of essential oil and oleoresins was measured for the inhibition of primary and secondary oxidation products in mustard oil by using peroxide, thiobarbituric acid, and p-anisidine values. In addition, these experiments were further supported by other complementary antioxidant assays, such as ferric thiocyanate method in a linoleic acid system, reducing power, chelating effect, and scavenging effects on 1,1'-diphenyl-2-picrylhydrazyl radical. Hence, the essential oil and ethanol oleoresin of *M. fragrans* could be considered as a natural food preservative [Kapoor, I.P.S. *, Singh, B., Singh, G., De Heluani, C.S., De Lampasona, M.P. and Catalan, C.A.N. (Chemistry Department, D.D.U.

Gorakhpur University, Gorakhpur 273009, India), *International Journal of Food Properties*, 2013, **16**(5), 1059-1070].

NPARR 4(2), 2013-0142 Chemical composition and antifungal activity of *Artemisia nilagirica* essential oil growing in northern hilly areas of India

Essential oil extracted from aerial parts of *Artemisia nilagirica* was analysed by gas chromatography-mass spectroscopy. Forty-three constituents amounting to 98.16% of the total essential oil contents were identified. The essential oil contained approximately 79.91% monoterpenoids and 18.25% sesquiterpenoids. α -Thujone (36.35%), β -thujone (9.37%), germacrene D (6.32%), 4-terpineol (6.31%), β -caryophyllene (5.43%), camphene (5.47%) and borneol (4.12%) were identified as the major constituents. The essential oil exhibited significant antifungal activity against *Rhizoctonia solani* (ED₅₀, 85.75 mg L⁻¹), *Sclerotium rolfsii* (ED₅₀, 87.63 mg L⁻¹) and *Macrophomina phaseolina* (ED₅₀, 93.23 mg L⁻¹). This study indicated that *A. nilagirica* essential oil can be used to control phytopathogenic fungi infesting agricultural crops and commodities [Sati, S.C.*, Sati, N., Ahluwalia, V., Walia, S. and Sati, O.P (Department of Chemistry, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand,

India), *Natural Product Research*, 2013, **27**(1), 45-48].

NPARR 4(2), 2013-0143 Chemistry and antioxidant properties of essential oil and oleoresins extracted from the seeds of tomer (*Zanthoxylum armatum* DC)

The seeds of *Zanthoxylum armatum* DC, on hydro distillation, yielded 1.2% of the essential oil. The oleoresins were extracted by a Soxhlet extractor using ethanol, ethyl acetate, and isopropyl alcohol. Gas chromatography-mass spectrometry analysis of the essential oil resulted in the identification of 38 components, of which linalool (62%) and limonene (18.1%) were the major components. The major components of oleoresins were linoleic acid, palmitoleic acid, and linalool. The antioxidant potential of essential oil and oleoresins were evaluated by 2, 2-diphenyl picrylhydrazyl radical scavenging, Fe²⁺ chelating, ferric thiocyanate method, and various lipid peroxidation assays. The essential oil showed maximum antioxidant potential, whereas oleoresins showed moderate antioxidant activity [Singh, G., Kapoor, I.P.S., Singh, P., De Heluani, C.S., De Lampasona, M.P. and Catalan, C.A.N. (Department of Chemistry, DDU Gorakhpur University, Gorakhpur 273009, India), *International Journal of Food Properties*, 2013, **16**(2), 288-300].

FEED/FODDER

NPARR 4(2), 2013-0144 Feeding value of sweet sorghum bagasse and leaf residues after juice extraction for bio-ethanol production fed to sheep as complete rations in diverse physical forms

The fodder value of sweet sorghum bagasse with leaf residues (SSBLR) remaining after juice extraction for bio-ethanol production as major diet ingredient was assessed in male growing sheep measuring intake, digestibility and growth rates. The SSBLR contributed about 450 g/kg in total mixed rations and was offered as mash (8. mm), pellets (16 mm) and feed block (SSBLR chopped). Chaffed SSBLR supplemented with the remaining concentrate components of the total mixed ration-offered for 2 h before the chaffed SSBLR-served as a control. Six sheep were randomly allocated to each treatment, balancing the group weight. Intake of all SSBLR based rations was generally very high exceeding 42 g/kg of sheep live weight in the control and feed block ration and intake was further increased to 52 and 56 g/kg in the mash and pellets rations, respectively. Observed live weight gain in sheep fed mash and pellets were 133 g/d and 130 g/d, respectively, compared to 90 g/d and 81 g/d observed in the feed block and control group, respectively. Organic matter digestibility was 0.59 and 0.58 in the mash and pellet group compared to 0.62 and 0.61 in the feed block and control group, respectively. All comparisons in mash and pellet versus feed block and control group were different ($P < 0.05$). SSBLR can be utilized as major ration component thereby mitigating fodder shortages likely to arise from using sweet sorghum stalks for juice extraction for bio-ethanol production. Use of SSBLR as ration component for will also add to the economic viability of sweet sorghum ethanol value chains. In decentralized systems where juice is extracted from sweet sorghum stalks in the villages and options of processing

SSBLR are limited, SSBLR can be used in chopped form with similar efficiency than as component of processed feed block. In centralized system, generating large quantities of SSBLR, processing feed into mash and pellets would be advantageous for supporting higher livestock productivity and lower feed transport costs [Anandan, S. , Zoltan, H., Khan, A. A., Ravi, D. and Blümmel, M. (International Livestock Research Institute, Patancheru 502324, India), *Animal Feed Science and Technology*, 2012, **175**(3-4), 131-136].

NPARR 4(2), 2013-0145 Assessment of *Grewia oppositifolia* leaves as crude protein supplement to low-quality forage diets of sheep

In the tropical arid and semi-arid regions of many developing countries, sheep are predominantly grazed on low-quality pastures and stall-fed on crop residues. This study evaluated the potential of *Grewia oppositifolia* tree leaves as crude protein (CP) supplement to the low-quality diets of sheep in comparison with cottonseed cake (CSC). Changes in the chemical composition of the leaves with progressive maturation (December to March) were studied. The leaves maintained a high CP content (>164 g/kg dry matter (DM)) during the prolonged maturation in the winter feed scarcity period. The leaves were rich in Ca (41 g/kg DM) and K (89 g/kg DM). The rate of degradation and effective degradability of CP were consistently higher ($P < 0.001$) in CSC than in *G. oppositifolia*. A balance trial in a 4×4 Latin square design with four mature Ramghani wethers showed that DM intake, DM and CP digestibility, and N retention did not differ with the substitution of CSC with *G. oppositifolia* leaves, as a supplement to a basal diet of sorghum hay. Body weight (BW) gain and wool yield responses to the supplements were examined with 36 lambs (27 ± 3 kg BW; age 11 \pm 1 month) for 15 weeks. The lambs were only grazed on local pasture (control group) or

supplemented with CSC, *G. oppositifolia* leaves, and their mixture on iso-N basis. Addition of the supplements increased ($P < 0.05$) BW gain and wool yield, and the leaves were as effective as CSC. These results demonstrated that *G. oppositifolia* leaves provide good quality green fodder during the prolonged winter feed scarcity period, and that the leaves can be efficiently utilized as a CP supplement to the low-quality diets of sheep [Khan, N.A.* and Habib, G. (Animal Nutrition Group, Department of Animal Sciences, Wageningen University, PO Box 338, 6700 AH Wageningen, Netherlands), *Tropical Animal Health and Production*, 2012, **44**(7), 1375-1381].

NPARR 4(2), 2013-0146 Different species of legumes grown in combination with oats as green forage

Green fodder mixture trials were carried out with GK Impala, a winter hardy, fall sown oat variety registered in 2005 intercropped either with winter vetch or winter pea in a crop year when the spring was dry (2003) and in another one (2004) when the precipitation was optimal in spring. The two components of mixtures were sown 50% each. A four-replicate randomized complete block design was used with 50 m² plots. The results were compared to the mixtures of spring oats and vetch; and spring oats and pea, respectively. The green matter of fall sown crops was cut by scythe late May, whereas that of spring crops early June. Data demonstrate that the green forage yield and protein production of fall sown oats as a monocrop and intercropped with vetch was higher than those of spring types. Green matter and dry matter yield varied with season, and were more advantageous in the year 2004, when there was more precipitation. The crude protein content of winter vetch and the crude protein production of the mixture fall sown oats + winter vetch were the highest. The mixtures with winter or spring pea yielded less green matter and, as a matter of fact, less crude

protein. The fodder mixtures cereals - legumes are conventionally and widely used as feed for livestock in North-America, and the results of our two-year experiment suggest that their use should be intensified in Hungary as well, mainly in the provisional feeding of ruminants. To date, oat varieties with reliable winter hardiness are offered for fall sowing [Palágyi, A.*, Palágyi, A. and Móroczné Salamon, K. (Cereal Research Non-Profit Ltd., Alsó Kikötő sor 9, H-6726 Szeged, Hungary), *Cereal Research Communications*, 2012, **40**(3), 436-447].

NPARR 4(2), 2013-0147 Nutritive evaluation of foliage from fodder trees and shrubs characteristic of algerian arid and semi-arid areas

The chemical composition and digestibility of foliage from nine browse plant species (*Artemisia herba-alba*, *Atriplex halimus*, *Acacia nilotica*, *Acacia horrida*, *Acacia saligna*, *Faidherbia albida*, *Albizia julibrissin*, *Vicia faba* and *Punica granatum*) grown in arid and semi-arid areas of Algeria were evaluated. Feed components were determined by proximate analysis, whereas phenolic and tannin compounds were analysed by colorimetric procedures and their activity tested using a biological assay. Digestibility was assessed by conventional gravimetric in vitro and in situ methods, and rumen fermentation kinetics were estimated from the in vitro gas production technique. The foliage from *Acacia* species was found to be a protein-rich fodder for ruminants, although the high lignin and tannin content of some species is an important constraint limiting its digestive utilization in the gastrointestinal tract. The leguminous fodder tree, *A. julibrissin*, has a high protein content and its foliage is highly digestible owing to its low tannin content. Foliage from *P. granatum* is a highly digestible browse for ruminants [Bouazza, L.*, Bodas, R., Boufennara, S., Bousseboua, H. and López, S. (University of Leon, Instituto de Ganadería de Montaña

(CSIC-ULE), Department of Anima Production, E-24071 León, Spain), *Journal of Animal and Feed Sciences*, 2012, **21**(3), 521-536].

NPARR 4(2), 2013-0148 Nutritional evaluation of fodder tree leaves

The present study indicated that pipal and jack tree leaves had the optimum energy and protein contents to meet the maintenance requirement and support a body weight gain in small ruminants. Bamboo leaves, which provided nutrients for maintenance and marginal gain of 15 g per day was regarded as maintenance type

roughage. The negative effect of tannins present in jack and jamun could be overcome by use of tannin binder, which increased the energy density of the tree leaves. Since the chemical and *in vitro* procedures used in this study had predicted the energy and protein value comparable to those of *in vivo* studies, these procedures can be used as rapid and economical methods for evaluating feeds for goats [Jamuna, K.V., Remadevi, O.K., Prabhu, T.M. and Singh, C.K. (Department of Animal Nutrition, Veterinary College, KVAFSU, Hebbel, Bangalore 560024, Karnataka, India), *Indian Veterinary Journal*, 2012, 89(12), 35-38].

FIBRES (incl. Textile and other utility fibres)

NPARR 4(2), 2013-0149 Performance of Sunnhemp (*Crotalaria juncea* L.) as a summer season (pre-monsoon) crop for fibre

The field experiments were conducted during the summer (pre-monsoon) seasons of 2008-2009 and 2009-2010 at Sunnhemp Research Station, CRIJAF-ICAR, Pratapgarh, U.P., India to assess the feasibility of sunnhemp cultivation for fibre purpose during summer season after harvest of wheat crop. The experiments were laid out in randomized block design. The data from different experiments indicated that sowing of sunnhemp crop for fibre purpose during 2nd fortnight of April at the spacing of 15cm x 10cm and harvesting at 90 days after sowing recorded higher fibre yield. The summer season crop escaped from the attack of most of the insect pest besides allowing time for the transplanting of rice crop also. The results indicated that sunnhemp could be easily accommodated in prevailing rice-wheat cropping system during summer season [M K Tripathi*, Babita Chaudhary, S K. Sarkar, S. R. Singh, H. R. Bhandari and B. S. Mahapatra (Sunnhemp Research Station (CRIJAF, ICAR), Pratapgarh, U. P., India), *Journal of Agricultural Science*, 2013, 5(3), 236-242].

NPARR 4(2), 2013-0150 Growth and yield of sunnhemp (*Crotalaria juncea* L.) as influenced by spacing and topping practices

Field experiment were conducted during rainy (kharif) season of 2009 and 2010 to study the effects of various spacing and topping practices on growth and seed yield of sunnhemp. Spacing (30 × 10 cm, 30 × 20 cm, 45 × 10 cm and 45 × 20 cm) in main plots and topping (no topping, topping at 30 days after sowing and topping at 45 days after sowing) in sub plots were studied in split plot design with three replications.

The individual plant performance with respect to plant height, basal diameter, dry matter accumulation, number of branches and yield attributes was found maximum under the spacing of 45 × 20 cm whereas total biomass and seed yield per unit area was obtained highest with the spacing of 30 × 10 cm. Topping at 30 days after sowing gave higher yield attributes and seed yield being at par with topping at 45 days after sowing. Thus sunnhemp grown at the spacing of 30 × 10 cm coupled with top ping at 30 days after sowing realized higher yield [M. K. Tripathi, Babita Chaudhary, S. R. Singh and H. R. Bhandari (Sunnhemp Research Station (CRIJAF, ICAR), Pratapgarh, U.P., India), *African Journal of Agricultural Research*, 2013, 8(28), 3744-3749].

NPARR 4(2), 2013-0151 Assessment of the changes in the cellulosic surface of micro and nano banana fibres due to saponin treatment

The effect of saponin on the surface properties of banana fibres was studied by Inverse Gas Chromatography (IGC). Parameters including the dispersive component of the surface energy, surface heterogeneity, surface area, as well as acid–base surface properties were determined for saponin modified banana micro and nanofibres. These parameters show a more extensive saponin coating on the nanofibres with a network formation which is explained by the higher reactivity of nanofibres due to the higher surface energy, specific interaction and higher surface area presented by the nanofibres. The energetic profile indicates that both micro and nanofibres coated with saponin interact with the same, or similar, energy active sites. Saponin treatment reduces considerably the surface area of the fibres, with the consequent decrease in the monolayer capacity. The interaction with the polar probes clearly indicates that saponin treatment creates new polar active sites for specific interactions in both samples. However, the treatment increases predominately the basicity of the fibre surface with more relevance

to the nanofibres. This behaviour will lead to better polymer/fibre interaction during composite preparation [Nereida Cordeiro*, Marisa Faria^a, Eldho Abraham and Laly A. Pothan (Competence Centre in Exact Science and Engineering, University of Madeira, 9000-390 Funchal, Portugal), *Carbohydrate Polymers*, 2013, **98**(1), 1065-1071].

NPARR 4(2), 2013-0152 Effect of jute fibre loading on the mechanical and thermal properties of oil palm–epoxy composites

Bilayer hybrid composites fabricated by hand lay-up technique by impregnating oil palm empty fruit bunch and jute fibre mats with epoxy resin and cured at 100°C for 1 h followed by post curing at 105°C. Bilayer hybrid composites were prepared by varying the relative weight fraction of the two fibres. The mechanical, morphological and thermal properties of oil palm/jute bilayer hybrid composites were carried out. When the jute fibre loading is increased in the bilayer hybrid composites, flexural strength and modulus of the hybrid composites will be higher. The hybridization of the jute fibres with oil palm composite decreased the impact strength of the bilayer hybrid composites. Analysis of variance statistical of flexural and impact properties were also carried out; there is a statistically significant difference between the mean flexural strength, flexural modulus and impact strength from one level of composite to another at the 95.0% confidence level. Thermogravimetric analysis showed that thermal stability of oil palm composites increased with development of bilayer hybrid composites. Scanning electron micrographs of impact fracture samples are taken to study the failure mechanism, and fibre/matrix interface adhesion [M Jawaid, HPS Abdul Khalil*, A Abu Bakar, Azman Hassan and Rudi Dungani (HPS Abdul Khalil, School of Industrial Technology, University Sains Malaysia, 11800 Penang, Malaysia), *Journal of Composite Materials*, 2013, **47**(13), 1633-1641].

NPARR 4(2), 2013-0153 Sustainable concrete using hemp fibres

This paper reports a study encapsulating natural industrial hemp fibres in plain concrete mixes. It targets a green concrete material by reducing the coarse aggregate content while maintaining its performance. Small cubes, beams and cylinders were tested to evaluate the performance of concrete mixes prepared with different volumetric ratios of fibres and different proportions of aggregates reduction. Results with hemp fibres are compared with samples with steel and polypropylene fibres, as well as control samples without fibres. Although the compressive strength is partially reduced, the presence of hemp fibres allows ductile flexural performance, instead of the brittle failure found in plain concrete. The hemp fibre mixes show similar performance with respect to polypropylene mixes. The use of industrial hemp fibres may allow for the reduction of coarse aggregates while providing a ductile flexural performance. The adoption of agricultural fibres in concrete will encourage farming activities to prosper, leading to rewarding economic benefits [Elie Antoine Awwad*, Bilal Hamad; Mounir Mabsout and Helmi Khatib, *Proceedings of the ICE-Construction Materials*, 2012, **166**(1), 45-53].

NPARR 4(2), 2013-0154 Mechanical Properties of Short Banana Fiber Reinforced Natural Rubber Composites

Natural fibers reinforced bio-degradable composites are good alternative for conventional materials. Natural fibers are cheaper in cost, environmental friendly and biodegradable. In the present work composites are made using short Banana fibres and natural rubber. Composites are prepared using vulcanizing technique at 1500c. And composites obtained were determined for mechanical properties like tensile strength, tear

strength were studied. The effect of different lengths of fiber content with natural rubber were determined .also matrix fiber interface were studied using SEM [S.Raghavendra*, Lingaraju, P Balachandra Shetty, PG Mukunda, (Dept of Mechanical Engg, Acharya Institute of Technology, Bangalore, India), *International Journal of Innovative Research in Science, Engineering and Technology*, 2013, 2(5), 1652-1655].

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

NPARR 4(2), 2013-0155 Wine grape pomace as antioxidant dietary fibre for enhancing nutritional value and improving storability of yogurt and salad dressing

Wine grape pomace (WGP) as a source of antioxidant dietary fibre (ADF) was fortified in yogurt (Y), Italian (I) and Thousand Island (T) salad dressings. During the 3 weeks of storage at 4 °C, viscosity and pH of WGP-Y increased and decreased, respectively, but syneresis and lactic acid percentage of WGP-Y and pH of WGP-I and WGP-T were stable. Adding WGP resulted in 35-65% reduction of peroxide values in all samples. Dried whole pomace powder (WP) fortified products had dietary fibre content of 0.94-3.6% (w/w product), mainly insoluble fractions. Total phenolic content and DPPH radical scavenging activity were 958-1340 mg GAE/kg product and 710-936 mg AAE/kg product, respectively. The highest ADF was obtained in 3% WP-Y, 1% WP-I and 2% WP-T, while 1% WP-Y, 0.5% WP-I and 1% WP-T were mostly liked by consumers based on the sensory study. Study demonstrated that WGP may be used as a functional food ingredient for promoting human health and extending shelf-life of food products [Tseng, A., and Zhao, Y* (Department of Food Science and Technology, 100 Wiegand Hall, Oregon State University, Corvallis, OR 97331-6602, United States), *Food Chemistry*, 2013, **138** (1), 356-365].

NPARR 4(2), 2013-0156 Quality of bread supplemented with mushroom mycelia

Mushroom mycelia of *Antrodia camphorata*, *Agaricus blazei*, *Hericium erinaceus* and *Phellinus linteus* were used to substitute 5% of wheat flour to make bread. Bread quality, including specific volume, colour property, equivalent umami concentration (EUC), texture profile analysis, sensory evaluation and functional components, was analysed. Mycelium-

supplemented bread was smaller in loaf volume and coloured, and had lower lightness and white index values. White bread contained the lowest amounts of free umami amino acids and umami 5'-nucleotides and showed the lowest EUC value. Incorporating 5% mushroom mycelia into the bread formula did not adversely affect the texture profile of the bread. However, incorporating 5% mushroom mycelia into the bread formula did lower bread's acceptability. After baking, mycelium-supplemented bread still contained substantial amounts of γ -aminobutyric acid and ergothioneine (0.23-0.86 and 0.79-2.10 mg/g dry matter, respectively). Overall, mushroom mycelium could be incorporated into bread to provide its beneficial health effects [Ulziijargal, E.*, Yang, J.-H., Lin, L.-Y., Chen, C.-P., Mau, J.-L. (Department of Food Science and Biotechnology, National Chung Hsing University, 250 Kuokuang Road, Taichung 40227, Taiwan), *Food Chemistry*, 2013, **138**(1), 70-76].

NPARR 4(2), 2013-0157 Rheological, microstructural and sensorial properties of durum wheat bread as affected by dough water content

In this paper the influence of water content on the rheological, microstructural and sensorial properties of durum wheat bread was evaluated. In order to evaluate bread quality, oscillation measurements, stress relaxation test and creep-recovery measurements were performed on dough samples, whereas tomographic and sensorial analyses were performed on baked bread samples. Results of the rheological analysis highlighted that both the storage and loss moduli (G' , G'') showed a descending trend with the increase of the water content. This is also confirmed by stress relaxation tests. Creep-recovery tests for strong doughs (with low water content), recorded greater resistance to deformation, therefore a smaller creep strain than the softer doughs. These results were reflected in the microstructural properties of the bread; an increase in water

content caused an increase in the percentage volume of pores. Regarding the sensorial properties, the overall acceptability of the investigated bread samples was low for both the lowest and the highest water contents, and this was due primarily to the compact crumb with small bubbles and high crust firmness for the former and to the loaf volume collapsed with irregular distribution of very large bubbles for the latter. Therefore, the bread samples with intermediate water content were preferred by the panelists [[Mastromatteo, M., Guida, M., Danza, A., Laverse, J., Frisullo, P., Lampignano, V., Del Nobile, M.A* (Department of Food Science, University of Foggia, Via Napoli, 25, 71100 Foggia, Italy), *Food Research International*, 2013, **51** (2), 458-466].

NPARR 4(2), 2013-0158 Valuable compounds in macroalgae extracts

Bioactive compounds present in ethanolic extracts from 18 macroalgae of the Portuguese coast were analysed by gas chromatography-mass spectrometry (GC-MS), leading to the characterization of 14 compounds: proline, phloroglucinol, mannitol, 8 fatty acids and 3 sterols. A dose-dependent response against enzymes with biological significance (α -glucosidase, acetylcholinesterase and butyrylcholinesterase) and free radicals (DPPH, nitric oxide, superoxide and hydroxyl) was found, Phaeophyta being the most promising group. A PCA analysis was performed and allowed the establishment of a correlation between the algae chemical composition and the biological activity. *Cystoseira tamariscifolia* (Hudson) Papenfuss, *Cystoseira nodicaulis* (Withering) M. Roberts, *Cystoseira usneoides* (Linn.) M. Roberts and *Fucus spiralis* Linn. are among the most active species, which is in accordance with their higher contents in phloroglucinol, mannitol, oleic, arachidonic and eicosapentaenoic acids, and fucosterol. The results point to the potential interest of the use of Phaeophyta species as food additives, due to their potent antiradical activities, and especially highlights

the importance of *F. spiralis* in the food chain of Mediterranean countries. Moreover, the incorporation of the extracts of these species in food products, nutraceutical and pharmaceutical preparations for human health should also be instigated, since they can suppress hyperglycemia and inhibit cholinesterases [Andrade, P.B*, Barbosa, M., Matos, R.P, Lopes, G., Vinholes, J., Mouga, T. and Valentão, P. (REQUIMTE/Laboratório de Farmacognosia, Departamento de Química, Universidade Do Porto, Rua de Jorge Viterbo Ferreira No 228, 4050-313 Porto, Portugal), *Food Chemistry*, 2013, 138 (2-3), 1819-1828].

NPARR 4(2), 2013-0159 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 [Gawlik-Dziki, U*, Świeca, M., Dziki, D., Baraniak, B., Tomiło, J., and Czyz, J., (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].

FRUITS

NPARR 4(2), 2013-0160 Geographic variation in the flavour volatiles of Alphonso mango

Alphonso, one of the most popular cultivars of mango in India is known to exhibit geographic variation in the flavour of ripe fruits. To get chemical insight into this difference, volatiles were studied in the ripening fruits of Alphonso mangoes from three cultivation locations in India. Ripe fruits from Deogad had lower content of mono- and sesquiterpenes and higher content of lactones and furanones as compared to the fruits from Dapoli; whereas fruits from Vengurle had average quantities of these chemicals in comparison with Deogad and Dapoli fruits. This variation was clearly reflected as separate clustering of the localities in the Principal Component Analysis. The localities were indistinguishable from each other in terms of raw fruit volatiles. This study exemplifies a case of phenotypic plasticity; since the plants chosen were clonally propagated, such geographic variation in the volatiles can be attributed to varied abiotic conditions at these three localities [Kulkarni, R.S., Chidley, H.G., Pujari, K.H., Giri, A.P., Gupta, V.S.* (Plant Molecular Biology Unit, Division of Biochemical Sciences, National Chemical Laboratory, Pune 411 008, India), *Food Chemistry*, 2012, **130** (1), 58-66].

NPARR 4(2), 2013-0161 Aloe vera gel coating for post harvest quality maintenance of fresh fig fruits

The present investigation was undertaken to evaluate the effect of Aloe gel on the post harvest quality characteristics of fig fruits. One set of fruits were coated with *Aloe vera* gel and other set served as control (dipped in distilled water). The figs were stored at room temperature ($29 \pm 30^\circ\text{C}$) and analysis was carried out every second day. The results revealed Aloe gel coating to be very beneficial in reducing the weight loss, minimizing changes in physico-chemical parameters (pH, titrable acidity and total soluble

solids) of the fresh fruits and also in reducing fruit decay. The sensory characteristics of the coated fruits were also found to be better than the control as evidenced by lesser shriveling and browning of the fruit peel. The study thus indicates the potential of using an economical and eco-friendly biopolymer for maintaining the quality characteristics and extending the shelf life of fig fruits. The positive results obtained in the present study could further confirmed in larger market simulated experiments and extended to other tropical/subtropical fruits and vegetables [Marpudi, S.L., Ramachandran, P., Srividya, N.* (Food Science and Technology Division, Department of Home Science, Sri Sathya Sai Institute of Higher Learning, Anantapur-515001, Andhra Pradesh, India), *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 2013, **4**(1), 878-887]

NPARR 4(2), 2013-0162 Drying characteristics of wild apricot (*Prunus armeniaca*) fruit bar and economic evaluation of market potential of the enterprise

An experiment was conducted to study the drying characteristics of wild apricot (*Prunus armeniaca* L.) fruit bar and evaluation of the economic feasibility of the enterprise. Wild apricot fruits were harvested at optimum maturity from Distt Tehri-Garhwal, Uttarakhand and after thorough sorting and proper washing, used for hot extraction of pulp through a pulper. Pulp was preserved in 500 ppm SO_2 . Wild apricot fruit bar was prepared by pre-standardized recipe using wild apricot pulp + 60 % sugar + 0.30 % pectin and drying the mixture in a mechanical dehydrator at $55 \pm 2^\circ\text{C}$ for 6 hours. Dried fruit bar sheets were cut into rectangular shapes ($1.0 \times 1.5 \text{ in}^2$) using a stainless steel knife and wrapped in polythene paper. Results on the drying rate indicate that for preparation of fruit bar we can dry the mixture of pulp, sugar and pectin within six hours in a mechanical dehydrator after boiling for 20 min over the flame. It was also observed that most of the

moisture loss occurs during the process of heating / boiling over the flame and the product stabilizes and sets into a bar during mechanical dehydration with only small percentage of moisture loss. The mass balance thus indicates that about 9.11 kg of wild apricot fruit bar is obtained from 10 kg of pulp. The economic indicators such as B/C (3.55), PBP (1.68 years), IRR (55.4%) revealed the sound financial position of wild apricot fruit bar production unit and hence existing (fruit processing unit) as well as potential entrepreneurs in various hill states of India including Uttarakhand, Himachal Pradesh, Jammu and Kashmir etc. can enter into this venture [Sharma, S.K.*, Chaudhary, S.P., Dixit, A.K, Rao, V.K., Yadav, V.K and Bisht, T.S. (G B Pant University of Agriculture and Technology Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand 249 199, India), *Indian Journal of Agricultural Sciences*, 2013, 83(3), 321-325].

NPARR 4(2), 2013-0163 Mango - Postharvest Biology and Biotechnology

Mango is one of the choicest fruits in the world and popular due to its delicate taste, pleasant aroma and nutritional value. Mango is indigenous to north-east India and north Burma, but now grown in over 90 countries. In the past two decades, mango production has increased appreciably with international trade jumping approximately four-fold valued close to US\$ 950 million. Mango belongs to the category of climacteric fruits and its ripening is initiated and proceeded by a burst in ethylene production and a dramatic rise in the rate of respiration. Although there are a few hundred mango cultivars grown in the Indian subcontinent and other parts of the world, the most popular cultivars are generally highly perishable and ripen within 7 to 9 days of harvest at ambient temperature. Currently, the export potential and international trade of mango is limited due to several factors such as its perishable nature, disease and pest infestation, and susceptibility of certain premium cultivars to chilling injury when stored at low temperatures.

Efforts are ongoing to develop technologies for improved storage and packaging, and overcome limitations encountered during storage and transit. Controlled atmosphere (CA) and hypobaric storage of mango are powerful means to overcome its perishable nature. The composition of CA varies among cultivars to ensure its original taste, flavor and aroma. Edible coating on the fruit skin may further cut down the rate of deterioration. Recently, significant advances have been made in understanding ripening characteristics of mango at the molecular level. Candidate genes related to ethylene biosynthesis and signalling, cell wall modification, aroma production and stress response have been cloned and characterized for future use in mango improvement. Efforts are also being made to establish a suitable transformation and plant regeneration system so that transgenic mango with added value and increased shelf life for long distance transportation could be developed [Singh, Z. *, Singh, R.K., Sane, V.A. and Nath, P. (Curtin Horticulture Research Laboratory, Department of Environment and Agriculture, School of Science, Faculty of Science and Engineering, International Institute of Agri-Food Security (IIAFS), Curtin University, GPO Box U1987, Perth 6845, WA, Australia), *Critical Reviews in Plant Sciences* , 2013, 32(4), 217-236].

NPARR 4(2), 2013-0164 Optimization of frozen sour cherries vacuum drying process

The objective of this research was to optimize the vacuum-drying of frozen sour cherries in order to preserve health-beneficial phytochemicals, as well as textural characteristics. Investigated range of temperature was 46-74°C and, of pressure, 17-583 mbar, in a new design of vacuum-dryer equipment. The total solids, a_w value, total phenolics, vitamin C, antioxidant activity, anthocyanin content, total colour change and firmness were used as quality indicators of dried sour cherry. Within the experimental range of studied variables, the optimum conditions of 54.03°C and 148.16 mbar

were established for vacuum drying of sour cherry. Separate validation experiments were conducted, under optimum conditions, to verify predictions and adequacy of the second-order polynomial models. Under these optimal conditions, the predicted amount of total phenolics was 744 mg CAE/100 dw, vitamin C 1.44 mg/100 g per dry weight (g dw), anthocyanin content 125 mg/100 g dw, IC_{50} 3.23 mg/ml, total solids 70.72%, a_w value 0.646, total colour change 52.61 and firmness 3395.4 g. The investigated parameters had a significant effect on the quality of the dried sour cherries [Šumić, Z.*, Tepić, A., Vidović, S., Jokić, S., Malbaša, R. (University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia), *Food Chemistry*, 2013, **136**(1), 55-63].

NPARR 4(2), 2013-0165 Effects of rind removal on physicochemical quality characteristics of fresh-cut watermelon [*Citrullus lanatus* (Thunb) Matsum & Nakai] during cold storage

The impact of removing the rind from fresh-cut watermelon slices was assessed on the

quality of the product during storage at 4 °C for 9 days. Flesh lycopene declined from 55.4 to 47.9 mg kg⁻¹ f.w. and colour lightness (L*) increased from 43.2 to 45.8 after 2 days of storage. Initial heart and placental flesh firmness increased from 7.3 and 9.8 N, respectively, to 9.5 and 12.8 N after 9 days, but were unaffected by rind processing. Electrolyte leakage from placental tissue was unaffected by storage and rind. Rind presence limited juice run-off by 47.2% and maintained mean total soluble sugar concentration in the slices at 86.0 mg mL⁻¹ as opposed to 76.8 mg mL⁻¹ in rind-less slices. Change in the quality was most pronounced between 0 and 2 day of storage. Removing the rind accelerated senescence and off-flavour production, while the presence of rind improved the overall storage stability of fresh-cut watermelon slices [Petrou, P.*, Soteriou, G., Schouten, R.E. and Kyriacou, M.C. (Horticultural Supply Chains Group, Wageningen University, Droevendaalsesteeg 1, 6708 PD, Wageningen, Netherlands), *International Journal of Food Science and Technology*, 2013, **48**(2), 357-362].

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

NPARR 4(2), 2013-0166 Mass-cultivation of carbohydrate rich macroalgae, a possible solution for sustainable biofuel production

Global demand for bio-fuels continues unabated. Rising concerns over environmental pollution and global warming have encouraged the movement to alternate fuels, the world ethanol market is projected to reach 86 billion litres this year. Bioethanol is currently produced from land-based crops such as corn and sugar cane. A continued use of these crops drives the food versus fuel debate. An alternate feed-stock which is abundant and carbohydrate-rich is necessary. The production of such a crop should be sustainable, and, reduce competition with production of food, feed, and industrial crops, and not be dependent on agricultural inputs (pesticides, fertilizer, farmable land, water). Marine biomass could meet these challenges, being an abundant and carbon neutral renewable resource with potential to reduce green house gas (GHG) emissions and the man-made impact on climate change. Here we examine the current cultivation technologies for marine biomass and the environmental and economic aspects of using brown seaweeds for bio-ethanol production [Kraan, S. (Ocean Harvest Technology Ltd., N17 Business Park, Milltown, Co, Galway, Ireland), *Mitigation and Adaptation Strategies for Global Change*, 2013, 18(1), 27-46].

NPARR 4(2), 2013-0167 Optimizing esterification of safflower, cottonseed, castor and used cottonseed oils

Depletion of fossil fuels warrants the use of biofuels as an alternate source to minimize the usage of petroleum reserves. Biodiesel fuels are renewable source of energy derived from plant oils or animal fats. They are mono alkyl esters of long chain fatty acids formed by

transesterification of oils/fats. Efficiency of transesterification of oils from four sources (safflower, cottonseed, castor, used cottonseed oil) was determined in this study with both methanol and ethanol as alcohols and sodium hydroxide and potassium hydroxide as catalysts. Methanol was found to be a better solvent and sodium hydroxide a better catalyst. The highly viscous nature of raw vegetable oils has been shown to decrease through transesterification process. In our experiments, the highest viscosity reduction was observed for castor oil even though it was the most viscous among four oils, both methyl and ethyl esters of safflower was shown to have a similar viscosity as No. 2 diesel [Thomas, T.P.*, Birney, D.M. and Auld, D.L. (Department of Plant and Soil Sciences, Texas Tech University, Lubbock, TX, United States), *Industrial Crops and Products*, 2013, 41(1), 102-106].

NPARR 4(2), 2013-0168 Starch saccharification and fermentation of uncooked sweet potato roots for fuel ethanol production

An energy-saving ethanol fermentation technology was developed using uncooked fresh sweet potato as raw material. A mutant strain of *Aspergillus niger* isolated from mildewed sweet potato was used to produce abundant raw starch saccharification enzymes for treating uncooked sweet potato storage roots. The viscosity of the fermentation paste of uncooked sweet potato roots was lower than that of the cooked roots. The ethanol fermentation was carried out by *Zymomonas mobilis*, and 14.4. g of ethanol (87.2% of the theoretical yield) was produced from 100. g of fresh sweet potato storage roots. Based on this method, an energy-saving, high efficient and environment-friendly technology can be developed for large-scale production of fuel ethanol from sweet potato roots [Zhang, P., Chen, C., Shen, Y., Ding, T. , Ma, D., Hua, Z., and Sun, D. (School of Life Sciences, Jiangsu Normal University, Xuzhou, Jiangsu 221116, China), *Bioresource Technology*, 2013, 128, 835-838].

NPARR 4(2), 2013-0169 **Bio-fuel agro-forestry industrial production system of mahula (*Madhuca latifolia* L.): Process development and future perspectives**

Mahula (*Madhuca latifolia* L.) is a deciduous tree commonly found in the tropical rain forests of Asian and Australian continent. The tree species, however, has been domesticated by tribal people in India for use as food (flowers), feed (leaves and flowers), wood (timber), oil (seeds) and beverage (flowers) locally called 'mahuli'. The flowers of this tree are a rich source (40-60% on dry weight basis) of fermentable sugars (glucose and fructose). The tribals in India

produce traditional country liquor called 'mahuli' by mixed culture of yeast fermentation of mahula flowers at home and semi-commercial levels for their own consumption. The flowers and seeds of mahula tree can be employed to produce bio-ethanol (from flowers) and bio-diesel (from seeds). Therefore, this review summarizes the progress made on agro-industrial technology for production of bio-fuels from mahula plants (flowers and seeds) and further its future perspectives [Behera, S., Ray, R.C. and Mohanty, R.C. (Department of Botany, Utkal University, Vanivihar, Bhubaneswar -751004, Orissa, India), *Journal of Scientific and Industrial Research*, 2013, **72**(1), 62-69].

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

NPARR 4(2), 2013-0170 Antifungal acetylinic thiophenes from *Tagetes minuta*: Potential biopesticide

Apart from thiophenes, which possess wide range of biocidal activity, aerial parts of *Tagetes* sp contain essential oil. Oil components were reported to have antifungal activity, thus making whole plant of *Tagetes* very useful for exploiting as natural fungistatic agent. In the present study, *Tagetes minuta* grown in north western Himalayan condition were evaluated [Saha, S.*, Walia, S., Kundu, A., Kumar, B. and Joshi, D. (Indian Agricultural Research Institute, New Delhi, India), *Journal of Applied Botany and Food Quality*, 2013, **85**(2), 207-211].

NPARR 4(2), 2013-0171 Efficacy of plant essential oils to control post-harvest decay of sweet cherry (*Prunus avium* L.) fruit

The development of natural crop protection products as alternatives to the use of synthetic fungicides is currently popular. The aim of this study was to evaluate the anti-fungal effects of several essential oils against the fungal pathogen, *Botrytis cinerea*, the causal agent of grey mould disease on sweet cherry (*Prunus avium* L.) under in vitro and in vivo conditions. Three essential oils (from fennel, black caraway, and peppermint) were each tested at five concentrations (0, 200, 400, 600, or 800 $\mu\text{l l}^{-1}$). In vitro results showed that the essential oil of black caraway had the highest fungicidal effect. The growth of grey mould was completely inhibited by the essential oil of black caraway at 400 $\mu\text{l l}^{-1}$. In vivo, the essential oils of black caraway, fennel and peppermint, at all concentrations, inhibited the growth of grey mould on sweet cherry fruit compared with the untreated controls. The application of each essential oil decreased the percentage loss in fresh weight significantly, and increased the storage-life of the fruit. Black

caraway oil, at 800 $\mu\text{l l}^{-1}$, maintained significantly higher soluble solids contents, titrable acidity values, and anthocyanin and carbohydrate contents than all other treatments. These results show that plant essential oils can have a strong effect on reducing post-harvest decay and improving the quality of sweet cherry fruit. These plant essential oils could provide an alternative to synthetic chemicals to control post-harvest phytopathogenic fungi on sweet cherry fruit [Aminifard, M.H. and Mohammadi, S. (Department of Horticultural Science, College of Agriculture, Birjand University, Amirabad Street, Birjand 9717533, Iran), *Journal of Horticultural Science and Biotechnology*, 2013, **88**(1), 79-84].

NPARR 4(2), 2013-0172 Pupicidal and repellent activities of *Pogostemon cablin* essential oil chemical compounds against medically important human vector mosquitoes

To determine the repellent and pupicidal activities of *Pogostemon cablin* (*P. cablin*) chemical compositions were assayed for their toxicity against selected important vector mosquitoes, viz., *Aedes aegypti* (*Ae. aegypti*), *Anopheles stephensi* (*An. stephensi*) and *Culex quinquefasciatus* (*Cx. quinquefasciatus*) (Diptera: Culicidae). The plants dry aerial parts were subjected to hydrodistillation using a modified Clevenger-type apparatus. The composition of the essential oil was analyzed by Gas Chromatography (GC) and GC mass spectrophotometry. Evaluation was carried out in a net cage (45 cm \times 30 cm \times 45 cm) containing 100 blood starved female mosquitoes and were assayed in the laboratory condition by using the protocol of WHO 2010. The repellent activity of *P. cablin* chemical compositions at concentration of 2 mg/cm² were applied on skin of fore arm in man and exposed against adult female mosquitoes. The pupicidal activity was determined against selected important vector mosquitoes to concentration of 100 mg/L and mortality of each pupa was recorded after 24 h of exposure to the compounds. Chemical

constituents of 15 compounds were identified in the oil of *P. cablin* compounds representing to 98.96%. The major components in essential oil were α -patchoulene, α -guaiene, β -patchoulene, α -bulnesene and patchouli alcohol. The repellent activity of patchouli alcohol compound was found to be most effective for repellent activity and 2 mg/cm² concentration provided 100% protection up to 280 min against *Ae. aegypti*, *An. stephensi* and *Cx. quinquefasciatus*, respectively. Similarly, pupae exposed to 100 mg/L concentrations of *P. cablin* chemical compositions. Among five compounds tested patchouli alcohol was found to be most effective for pupicidal activity provided 28.44, 26.28 and 25.36 against *Ae. aegypti*, *An. stephensi* and *Cx. quinquefasciatus*, respectively. The percent adult emergence was inversely proportional to the concentration of compounds and directly proportional to the pupal mortality. These results suggest that the *P. cablin* chemical compositions have the potential to be used as an ideal eco-friendly approach for the control of mosquitoes. This is the first report on the mosquito repellent and pupicidal activities of the reported *P. cablin* chemical compositions [Gokulakrishnan, J.*, Kuppusamy, E., Shanmugam, D., Appavu, A. and Kaliyamoorthi, K. (Center for Entomotoxicity Studies, Department of Zoology, Poompuhar College, Malaiyur-609 107 Tamilnadu, India), *Asian Pacific Journal of Tropical Disease*, 2013, 3(1), 26-31].

NPARR 4(2), 2013-0173 Insecticidal and genotoxic activity of *Psoralea corylifolia* Linn. (Fabaceae) against *Culex quinquefasciatus* Say, 1823

Indiscriminate use of synthetic insecticides to eradicate mosquitoes has caused physiological resistance. Plants provide a reservoir of biochemical compounds; among these compounds some have inhibitory effect on mosquitoes. In the present study the larvicidal, adulticidal and genotoxic activity of essential oil of *Psoralea corylifolia* Linn. against *Culex quinquefasciatus* Say was explored. Essential oil

was isolated from the seeds of *P. corylifolia* Linn. Larvicidal and adulticidal bioassay of *Cx. quinquefasciatus* was carried out by WHO method. Genotoxic activity of samples was determined by comet assay. Identification of different compounds was carried out by gas chromatography- mass spectrometry analysis. LC₅₀ and LC₉₀ values of essential oil were 63.38±6.30 and 99.02±16.63 ppm, respectively against *Cx. quinquefasciatus* larvae. The LD₅₀ and LD₉₀ values were 0.057±0.007 and 0.109±0.014 mg/cm² respectively against adult *Cx. quinquefasciatus*. Genotoxicity of adults was determined at 0.034 and 0.069 mg/cm². The mean comet tail length was 6.2548±0.754 μ m and 8.47±0.931 μ m and the respective DNA damage was significant i.e. 6.713% and 8.864% in comparison to controls. GCMS analysis of essential oil revealed 20 compounds. The major eight compounds were caryophyllene oxide (40.79%), phenol,4-(3,7-dimethyl-3-ethenyl-octa-1,6-dienyl) (20.78%), caryophyllene (17.84%), α -humulene (2.15%), (+)- aromadendrene (1.57%), naphthalene, 1,2,3,4-tetra hydro-1,6-dimethyl-4-(1-methyl)-, (1S-cis) (1.53%), trans- caryophyllene (0.75%), and methyl hexadecanoate (0.67%).

Essential oil obtained from the seeds of *P. corylifolia* showed potent toxicity against larvae and adult *Cx. quinquefasciatus*. The present work revealed that the essential oil of *P. corylifolia* could be used as environmentally sound larvicidal and adulticidal agent for mosquito control [Dua, V.K.*, Kumar, A., Pandey, A.C. and Kumar, S. (National Institute of Malaria Research, Health Centre, Field Unit BHEL, Ranipur, Hardwar, Uttarakhand-249403, India), *Parasites and Vectors*, 2013, 6(1)].

NPARR 4(2), 2013-0174 Larvicidal efficacy of plant oils against the dengue vector *Aedes aegypti* (L.) (Diptera: Culicidae)

The bioactivity of ten plant oils, Cedar wood (*Cedrus atlantica*), Citronella (*Cymbopogon nardus*), Clove (*Myrtus caryophyllum*), Eucalyptus (*Eucalyptus globulus*), Lemon grass (*Cymbopogon flexuosus*), Orange (*Citrus sinensis*), Nutmeg

(*Myristica fragrans*), Palmarosa (*Cymbopogon martinii*), Pine (*Pinus radiata*) and Tulsi (*Ocimum sanctum*) were tested at 125, 250, 500 and 1000 ppm concentrations against the third instar larvae of *Aedes aegypti*. Larval mortality was observed after 24 hours. Among the plant oils tested, orange oil exhibited highest larvicidal activity with LC₅₀ of 85.93, followed by palmarosa 50 with 88.78, tulsi with 92.48 and nutmeg oil with 93.62 ppm [Tennyson, S*., Samraj, D.A., Jeyasundar, D. and Chalieu, K (Department of Zoology, Madras Christian College, Chennai 600 059, Tamil Nadu, India), *Middle East Journal of Scientific Research*, 2013, **13**(1), 64-68].

NPARR 4(2), 2013-0175 Assessing essential oil components as plant-based preservatives against fungi that deteriorate herbal raw materials

This study assesses the antifungal efficacy of 14 essential oil (EO) components and some of their combinations as inhibitory to the growth of the aflatoxigenic fungus *Aspergillus flavus* LHPA₉ isolated from biodeteriorating *Asparagus racemosus* herbal raw materials. The aim was to determine whether they could be recommended as plant-based preservatives for enhancement of the shelf life of herbal raw materials. Thymol, eugenol, menthol, and their combinations were highly efficacious as their minimum inhibitory concentration (MIC) for inhibition of fungal growth as well as aflatoxin B₁ secretion was less than 1.0 µl ml⁻¹. Geranyl acetate, linalool, β-asarone, 1, 8-cineol, and E-citral were moderately antifungal as their MIC ranged between 1.0 and 5.0 µl ml⁻¹. During antioxidant activity 2, 2-diphenyl-1-picrylhydrazyl assay, thymol, eugenol, and β-caryophyllene showed strong radical scavenging activity, whereas β-asarone and p-cymene showed moderate activity. Some combinations of EO components showed synergism while others exhibited an additive or antagonism effect in their activity. The findings point to a recommendation that EO components are good alternatives to synthetic

preservatives to prevent deterioration of stored herbal raw materials by fungal and aflatoxin contamination and free-radical oxidation [Mishra, P.K*., Singh, P., Prakash, B., Kedia, A., Dubey, N.K., Chanotiya, C.S. (Laboratory of Herbal Pesticides, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi 221005, India), *International Biodeterioration and Biodegradation*, 2013, **80**, 16-21].

NPARR 4(2), 2013-0176 Screening of some essential oils against *Trichosporon* species

White Piedra is a superficial mycoses characterized by nodules on the hair shaft, caused by the basidiomycetous yeast *Trichosporon species*. In this study 25 essential oils were extracted and screened against two *Trichosporon* species i.e. *Trichosporon asahii* and *Trichosporon cutaneum*. Both these fungi procured from MTCC Chandigarh were maintained on yeast malt agar plates and tubes at 25°C. Two screening methods viz., agar well diffusion assay and minimum inhibitory concentration were adopted for the study. The results showed that the maximum anti-yeast activity against *T. asahii* and *T. cutaneum* was demonstrated by oil of *Mentha piperita* showing full inhibition of both the fungi, *Melaleuca alternifolia* with an inhibition zone of 45 and 40 mm, *Cymbopogon winterians* with inhibition zone of 45 and 45 mm and *Cymbopogon flexuosus* with 35 and 30 mm inhibition zones. The oil of *Trachyspermum ammi* exhibited 10 and 20 mm, *Abelmoschus moschatus* exhibited 30 and 20 mm, *Salvia sclarea* showed 20 and 18 mm and *Jasminum officinale* exhibited 25 and 15 mm inhibition zones showing moderate activity. The oil of *Cyperus scariosus*, *Pogostemon patchouli* and *Rosa damascene* showed no inhibition zone against both the fungi while *Vetiveria zizanioides* exhibited no inhibition in case of *T. asahii* and inhibition zone of 10 mm in case of *T. cutaneum* demonstrating comparatively low activity against both the fungi. These results support that the essential oils can be used to cure superficial

mycoses and these oils may have significant role as pharmaceuticals and preservatives [Uniyal, V*., Saxena, S. and Bhatt, R.P. (Department of Botany, SGRR(PG) College, Pathribagh, Dehradun- 248 001, India), *Journal of Environmental Biology*, 2013, **34**(1), 17-22]

NPARR 4(2), 2013-0177 Housefly (*Musca domestica* L.) control potential of *Cymbopogon citratus* Stapf. (Poales: Poaceae) essential oil and monoterpenes (citral and 1, 8-cineole)

In spite of being a major vector for several domestic, medical, and veterinary pests, the control aspect of the common housefly, *Musca domestica* L. (Diptera: Muscidae) is often neglected. In the present study, the essential oil of *Cymbopogon citratus* and its major components were evaluated for control of housefly. The chemical composition analysis of *C. citratus* oil by gas chromatographic mass spectrometry (GC-MS) revealed citral (47 %) and 1, 8-cineole (7.5 %) as principal components. The analysis of oil vapor by solid phase microextraction (SPME/GC-MS) showed increase in citral (74.9 %) and 1, 8-cineole (8.6 %) content. Assay of oil against housefly larvae and pupae through contact toxicity assay showed lethal concentration (LC)₅₀ value of 0.41 µl/cm² and of percentage inhibition rate (PIR) of 77.3 %, respectively. Fumigation assay was comparatively more effective with LC₅₀ of 48.6 µl/L against housefly larvae, and a PIR value of 100 % against housefly pupae. The monoterpenes, citral, and 1,8-cineole, when assessed for their insecticidal activity against housefly larvae, showed LC₅₀ of 0.002 and 0.01 µl/cm² (contact toxicity assay) and LC₅₀ of 3.3 and 2.4 µl/L (fumigation assay). For pupicidal assay, both citral and 1,8-cineole had a PIR value of 100 %. High efficacy of citral and 1,8-cineole against housefly, established them to be an active insecticidal agent of *C. citratus* oil. The study demonstrates potentiality of *C. citratus* oil as an excellent insecticide for housefly control, and the

results open up the opportunity of oil/monoterpenes being developed into an eco-friendly, economical, and acceptable product [Kumar, P.*, Mishra, S., Malik, A., Satya, S. (Applied Microbiology Laboratory, Centre for Rural Development and Technology, Indian Institute of Technology Delhi, New Delhi 110 016, India), *Parasitology Research*, 2013, **112**(1), 69-76].

NPARR 4(2), 2013-0178 Antifungal acetylinic thiophenes from *Tagetes minuta*: Potential biopesticide

Apart from thiophenes, which possess wide range of biocidal activity, aerial parts of *Tagetes* sp contain essential oil. Oil components were reported to have antifungal activity, thus making whole plant of *Tagetes* very useful for exploiting as natural fungistatic agent. In the present study, *Tagetes minuta* grown in north western Himalayan condition were evaluated for its potential for use as antifungal agent. Flower essential oil showed minimal antifungal activity. Whereas, leaf essential oil was found significant antifungal activity against three phytopathogenic fungi out of eight tested fungi. ED₅₀ values were 165, 175 and 110 µg mL⁻¹ against *Rhizoctonia solani*, *Sclerotinia sclerotiorum* and *Sclerotium rolfsii*, respectively. Thiophene rich extract of *Tagetes minuta* was found comparatively lesser active (ED₅₀: 233-484 µg mL⁻¹) than leaf essential oil against the same fungi. The present study shows that essential oil from leaves and thiophene rich extracts from marigold roots have significantly good antifungal activity against a number of soil borne and foliar plant pathogens. The easy availability of these plants makes it an attractive potential candidate for development of natural fungicide [Saha, S.*, Walia, S., Kundu, A., Kumar, B. and Joshi, D. (Indian Agricultural Research Institute, New Delhi, India), *Journal of Applied Botany and Food Quality*, 2013, **85**(2), 207-211].

MANURE/FERTILIZERS

NPARR 4(2), 2013-0179 A comparative assessment of organic manures and in -organic fertilizers on Okra (*Abelmoschus esculentus*)

A study conducted on a farmer's field at kardiga, shimoga district in Rainy season 2011-2012 with a view to study the effect of organic manures and in-organic fertilizers on the growth and yield of okra. Among the different combinations, application The maximum pod weight was recorded under organic manure in T5 (25kg) supplied with vermicompost + Farm yard manure (FYM) and the minimum pod weight was recorded in T1 (2.5 kg) and under inorganic sources in T5 (23kg) supplied with FYM + of RDF (Recommended Dose of Fertilizers) Nitrogen, phosphorus and potassium and the minimum pod weight was recorded in T1 (3kg) when supplied with only FYM [Anilkumar D. Talageri*, J.Narayana* and Y.P. Shilpshree *(Department of Environmental Science, Kuvempu University, Shankaraghatta -577451), *International Journal of Life Sciences*, 2013, **2**(1), 53-59

NPARR 4(2), 2013-0180 Growth and yield of tomato (*Lycopersicon esculentum* Mill.) as influenced by different organic fertilizers

A field experiment was carried out in Agricultural Research Station, Ferdowsi University of Mashhad, Iran during the season, 2011 to evaluate the vegetative growth yield quantity of tomatoes as affected by different organic fertilizers addition. The experiment was a randomized complete block design with three replications. The results showed that addition of organic fertilizers at rate of 20 tonne/ha significantly (at $P < 0.05$) increased tomato growth and yield compared to control (no fertilizer application). Also obtained results proved that tested treatments could be arranged in decreasing order as follows: municipal waste compost > poultry manure > cow manure > sheep manure > no fertilizer. Compost and poultry

manure had a synergistic effect on both fresh and dry weights of tomato shoots and roots and compared to other treatments. As a general result using of organic fertilizers especially in composted form had positive effect on soil health and fertility, which consequents increase yield in long term can be expected. [Mohammad Mehdizadeh*, Ebrahim Izadi Darbandi, Houshang Naseri –Rad and Ahmad Tobeh (Faculty members of Agriculture Department Payam noor University, Po. Box 19395-4697 Tehran ir. of Iran), *International Journal of Agronomy and Plant Production*, 2013, **4**(4), 734-738].

NPARR 4(2), 2013-0181 Effect of bat guano on the growth of *Vigna radiata* L

Bat guano is known to contain all the macro and micronutrients that plants require in a natural form and hence ably serve as plant fertilizer, soil builder, soil cleanser, fungicide, nematocide and compost activator. In ancient times it was used in agricultural practice as manure but with advent of chemical fertilizers its usage became less popular. Health menace created by chemical fertilizers is again popularizing organic farming but bat guano is still not popular among the farming community since no explicit work on its plant growth promoting activity has been done. Hence the present study was undertaken to study the effect on the growth of *Vigna radiata* seedlings using *Megaderma lyra* guano from two different geographical locations (Yennehole and Varanga) in different quantities (soil: guano; 20:1, 20:0.5, 20:0.1) and in two types of soil (Autoclaved and Nonautoclaved). NPK content of guano was also analysed using standard techniques. The results clearly indicated that the *M lyra* guano was rich in phosphorus content and comparing the guano from two locations the Varanga guano was found to be higher in its nitrogen content. Plant growth assay indicated that guano from Yennehole was found to be better as manure compared to that from Varanga. Likewise bat guano was required in a very small quantity to increase the efficiency of plant growth. Amendment of both types of soil with

bat guano from both locations showed good growth at soil: guano ratio of 20:0.5 [Shrinidhi Shetty*, K.S. Sreepada, Rama Bhat (Department of Biotechnology, Alva's College, Moodbidri-574227, D.K. Karnataka., India), *International Journal of Scientific and Research Publications*, 2013, **3**(3), 1-8].

NPARR 4(2), 2013-0182 Effect of integrated manuring on growth and yield of *Centella asiatica* (L.) Urb.

Centella asiatica is an important ethnomedicinal plant. Effect of integrated manuring on growth of *Centella asiatica* was investigated using vegetative clones from Kirtipur, Kathmandu. The plantlets were grown in earthen pots containing soil, with integrated manuring [Urea(%) : FYM(%), 75:25; 50:50; 25:75], individual manuring (100 % Urea, 100 % FYM) and control conditions (no manure). The experimental design was completely randomized and each treatment had forty plants. We examined number of leaves per ramet, petiole length, specific leaf area, number of primary branches, number of flowers per ramet and plant biomass. The number of leaves per ramet, leaf area and number of flowers per ramet were significantly higher in integrated manuring than other treatments. Biomass production in integrated manuring (50 % Urea and 50 % FYM) was seven times higher than in control; it was five times higher than in complete organic manuring (100 % FYM) and 1.5 times higher than in inorganic manuring (100 % Urea) [Anjana Devkota* and Pramod Kumar Jha (Central Department of Botany, Tribhuvan University, Kathmandu, Nepal), *Tropical Ecology*, 2013, **54** (1), 89-95].

NPARR 4(2), 2013-0183 Ecological effects of cow manure compost on soils contaminated by landfill leachate

Ecological effects of compost on soils contaminated by leachate were evaluated. *Tetrahymena pyriformis* was effective as the

toxicity indicator. Compost is effective to reduce biotoxicity risks of leachate-contaminated soils. Excessive compost has no benefit for decreasing leaching toxicity further. The experiment was conducted to evaluate the effect of cow manure compost (CMC) application on leaching toxicity of leachate polluted soils by using *Tetrahymena pyriformis* (TP). Soils treated with various levels of leachate (0, 12.5ml, 25ml, 37.5 ml, and 50 ml leachate per 300g soil) were amended with 0, 25g and 50g CMC, respectively. The results showed CMC application resulted in 7–18% lower leaching toxicity while excessive CMC has no significant benefit for decreasing leaching toxicity further. The alleviating effect of CMC on biotoxicity of soil extract was mainly attributed to either pH increase, high content of P and organic matter, or promotion on soil microbial metabolism and especially pH played an important role in alleviating effect. And the observations indicated that death rate (DR) of TP was more sensitive to leachate level respect to other biological parameters above and TP was effective as the test organism for leaching toxicity. Further studies are needed to unambiguously determine in-deep mechanism of toxicity impacts on TP posed by leachate pollutants [Lie Yang, Zhulei Chen*, Ting Liu, Juan Jiang, Beitao Li, Yongmin Cao, Yingjian Yu (School of Environmental Science & Engineering, Huazhong University of Science and Technology, Wuhan 430074, PR China), *Ecological Indicators*, 2013, **32**, 14–18].

NPARR 4(2), 2013-0184 The influence of multicomponent fertilizers on the concentration of potassium in perennial ryegrass (*Lolium perenne* L.)

A pot experiment on an acid brown soil was conducted in 1998-2001. Three multicomponent fertilizers were applied: Polifoska 8, Polifoska 15 and Polimag 306, Travit at the rates of 0.5; 1.0; and 1.5 g N per pot. The total forms of potassium were determined in

dry matter of perennial ryegrass with the use of ASA method. The contents of these elements were higher in the fertilized variants as compared to the control. No significant differences were found among the contents of investigated elements compared in plants treated with different multicomponent fertilizers. The chemical analyses indicated that increasing rates of the fertilizers applied enhanced the contents of potassium. In the content of potassium in dry matter of perennial ryegrass (*Lolium perenne* L.) the Polifoska 8 it ranged from 3.49 -4.92%. In the content of Potassium in dry matter of perennial ryegrass (*Lolium perenne* L.) the Polifoska 15 it

ranged from 4.29-4.86%. In the content of potassium in dry matter of perennial ryegrass (*Lolium perenne* L.) the Polimag 306 it ranged from 4.07-5.17%. In the content of potassium in dry matter of perennial ryegrass (*Lolium perenne* L.) the Travit it ranged from 3.84-4.73%. The content of potassium in perennial ryegrass (*Lolium perenne* L.) was mostly higher on objects may receive farm manures fertilisers compared to the control object. [Beata Draszawka–Bołzan (Faculty of Biology, University of Szczecin, 13 Waska Street, 71-415 Szczecin, Poland), *International Letters of Chemistry, Physics and Astronomy*, 2013, **8**(2), 188-194]

OILS/FATS (incl. Edible oils, Butter)**NPARR 4(2), 2013-0185 Using flaxseed oil to prepare therapeutical fat spreads**

The present study aims to evaluate the suitability of flaxseed oil (rich plant source of long chain omega-3 polyunsaturated fatty acid) as healthy oil in formulation of therapeutic fat spread. Eight fat spread samples containing 20%, 40%, 60%, 80% total blend fat were prepared. Total blend fat used in preparing different fat spread samples were prepared by blending flaxseed oil at various ratios with palm oil. However, other four fat spread samples were prepared as control sample using palm oil and soybean oil at different ratios. Each fat spread sample was analyzed for its moisture, fat, protein, ash and carbohydrate content as well as its sensory properties and microbiological characteristics. Total blend fat extracted from each fat spread sample was also analyzed for its physical and chemical properties, oxidative stability and fatty acid profile. The obtained results showed that all formulated fat spread samples were found to be in good microbiologically characteristics as they were free from contamination by different microorganism groups. The eight formulated fat spreads contained zero-trans fatty acids. The fatty acid C_{16:0} was the predominant saturated fatty acid, in all prepared formulated fat spread samples, while, C_{18:3} was the highest unsaturated one (the only omega-3 fatty acid in vegetable oils) followed by C_{18:1}, the highest C_{18:3} level of different fat spreads formulated from flaxseed oil is due to the highest percent of C_{18:3} in such oil. Incorporation of flaxseed oil into fat spread samples had marked effect on their contents of such fatty acid. Inversely, all fat spread samples prepared from flaxseed oil showed less oxidative stability compared to control samples, another decreasing effect on resistance against the oxidative rancidity occurred as flaxseed oil% increased in the formulation. No significant differences were observed for sensory properties resulted from using flaxseed oil in fat spread formulations [M.A. El-Waseif*, H.A. Hashem, H.H and Abd EL-Dayem (Department Food Science and Technology,

Faculty of Agriculture, Al-Azhar University, Nasr City, Cairo, Egypt), *Annals of Agricultural Sciences*, 2013, **58**(1), 5–11].

NPARR 4(2), 2013-0186 Chemical composition and functional characterisation of commercial pumpkin seed oil

Pumpkin (*Cucurbita pepo* L.) seed oil is a common product in Slovenia, Hungary and Austria and is considered a preventive agent for various pathologies, particularly prostate diseases. These properties are related to its high content of carotenoids and liposoluble vitamins. In this study the carotenoid (lutein and zeaxanthin), vitamin E (α - and γ -tocopherol) and fatty acid contents of 12 samples of commercial pumpkin seed oil were investigated together with the composition of the volatile fraction resulting from the roasting process. The aromatic profile obtained from the commercial samples was directly related to the intensity of the roasting process of the crushed pumpkin seeds. The roasting temperature played a crucial role in the concentrations of volatile substances originating from Strecker degradation, lipid peroxidation and Maillard reaction. The findings suggest that high-temperature roasting leads to the production of an oil with intense aromatic characteristics, while mild conditions, generally employed to obtain an oil with professed therapeutic characteristics, lead to a product with minor characteristic pumpkin seed oil aroma. The nutraceutical properties of the product are confirmed by the high content of α - and γ -tocopherol and carotenoids [Giuseppe Procida, Bruno Stancher, Francesca Cateni* and Marina Zacchigna (Department of Chemical and Pharmaceutical Sciences, University of Trieste, P.zle Europa 1, I-34127 Trieste, Italy), *Journal of the Science of Food and Agriculture*, 2013, **93**(5), 1035-1041].

NPARR 4(2), 2013-0187 Chemical composition and functional characterisation of commercial pumpkin seed oil

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NPARR 4(2), 2013-0188 Volatile constituents of roasted tigernut oil (*Cyperus esculentus* L.)

Volatile compounds play a key role in determining the sensory appreciation of vegetable oils. In this study a systematic evaluation of odorants responsible for the characteristic flavour of roasted tigernut oil was carried out. A total of 75 odour-active volatiles were identified. From these, 13 aroma compounds showing high flavour dilution factors in the range of 16 to 128 were quantified by their odour activity values (OAVs). On the basis of high OAVs in oil, the following aroma compounds [vanillin (chocolate, sweet

vanilla), 5-ethylfurfural (caramel, spicy), 2,3-dihydro-3,5-dihydroxy-6-methyl-4*H*-pyran-4-one (caramel), phenyl acetaldehyde (honey-like), ethanone, 1-(4-hydroxy-3-methoxyphenyl) (faint vanilla)] were elucidated as important contributors to the overall chocolate, sweet vanilla, butterscotch aroma of the oil. Odorants with high concentrations in the roasted tigernut oil such as 5-hydroxymethylfurfural, ethyl hexadecanoate, *n*-propyl-9,12-octadecadienoate gave relatively low OAVs, so their contributions to the overall orthonasal aroma impression of roasted tigernut oil can be assumed to be low [Ola Lasekan* (Department of Food Technology, Faculty of Food Science & Technology, University Putra Malaysia, UPM 43400, Serdang, Malaysia), *Journal of the Science of Food and Agriculture*, 2013, **93**(5), 1055-1061].

NPARR 4(2), 2013-0189 Amino acid profiles and quality from lotus seed proteins

Protein composition, amino acid profile and nutritional value of the lotus seed and its Osborne fractions were investigated. The seed was rich in protein with 19.85%, and showed well balanced amino acid composition compared with FAO/WHO pattern. Its nutritive properties were similar to those observed in the reference soybean protein. Phenylalanine, tyrosine, leucine and lysine were the limiting amino acids in the seed proteins. The albumin and globulin were the main protein fraction, the amino acid profile and nutritional value were close to the seed protein. Changes in transition temperature and thermal stability were observed through different solvent extractions. Albumin possessed the predominant thermal stability (81.4 °C) followed by globulin (74.49°C), prolamin (69 °C) and glutelin (65.6°C). So, solvent compositions influence the profile of AAs and their nutritive value, and aqueous solvent with 0.1 mol L⁻¹ NaCl was an efficient protein solubiliser. The results indicated that the extraction processes influenced the lotus seed protein quality and thermal stability. Overall, the study revealed that the lotus seed

protein was nutritionally well-balanced protein and might be of significant importance in the formulation of diets for humans [Hong-Yan Zeng*, Lian-Hui Cai, Xi-Ling Cai, Ya-Ju Wang and Yu-Qin Li (Hong-Yan Zeng, College of Chemical Engineering, Xiangtan University, Xiangtan 411105, Hunan, P.R. China), *Journal of the Science of Food and Agriculture*, 2013, **93**(5), 1070–1075].

NPARR 4(2), 2013-0190 Influence of some environmental factors on drupe maturation and olive oil composition

Understanding the relationships between olive cultivars and the cultivation environment as well as optimizing cultivation choices can lead to maximum expression of oil production in terms of both quantity and quality. For this purpose, samples of the Ortice olive cultivar grown in two different environments in southern Italy at altitudes of 500 and 50 m above sea level (a.s.l.) were harvested on various dates to monitor drupe maturation and determine the nutritional and chemical characteristics of the oils.

Fruits grown at 50 m a.s.l. ripened about 10-15 days earlier than those grown at 500 m a.s.l. The oil obtained at 500 m a.s.l. was characterized by a higher content of total polyphenols and a higher content of oleic and stearic acids. The different heat accumulation related to the environment affected drupe development as well as the colouring trend and oil content. Consequently, the growth environment changed the content of Ortice oil fatty acids and polyphenols, while the flavour profile remained fairly stable in both

environments, with the cultivar effect prevailing over the environment factor [Claudio Di Vaio, Sabrina Nocerino*, Antonello Paduano and Raffaele Sacchi (Sabrina Nocerino, Dipartimento di Arboricoltura, Botanica e Patologia Vegetale, Università di Napoli Federico II, Via Università 100, I-80055 Portici, Naples, Italy), *Journal of the Science of Food and Agriculture*, 2013, **93**(5), 1134-1139].

NPARR 4(2), 2013-0191 Sitosterol as an antioxidant in frying oils

The antioxidative effect of sitosterol at 1, 2 and 5% levels, in triolein, refined canola, high oleic sunflower and flaxseed oils, continuously heated for a period of up to 72 h at frying temperature of 180 C, was studied. High Pressure Size Exclusion Chromatography (HPSEC) was used to monitor changes in peak areas of triacylglycerol (TG) polymer, monomer and ester hydrolysis products. The presence of enhanced levels of sitosterol was found to significantly decrease TG polymer formation in triolein and the vegetable oil samples after heating at 180°C for a period of 72 h. A corresponding increase in the level of intact TG monomer and the extent of TG ester hydrolysis was observed in all samples with enhanced levels of sitosterol. Conversion of sterol to steradiene, by the 1, 2 elimination of water, may be responsible for the antioxidative effect of sitosterol at frying temperatures [Ashutosh Singh (Department of Agricultural, Food & Nutritional Science, University of Alberta, 410 Agriculture/Forestry Centre, Edmonton, AB, Canada T6G 2P5), *Food Chemistry*, 2013, **137**(1-4), 62-67].

PHYTOCHEMICALS

NPARR 4(2), 2013-0192 **Phytochemical investigation of the insulin plant *Costus pictus* D. Don**

Costus pictus D. Don (Spiral ginger) commonly known as 'Insulin plant' was introduced from Mexico to India (Kerala) very recently. The people in Kerala used to consume the fresh raw leaves for its anti-diabetic activity. The hypoglycaemic activity of *Costus pictus* is mainly because of secondary metabolites. Despite the preliminary studies the detailed phytochemical investigation has not been reported so far. Therefore, the leaves stem and rhizome extracts of *Costus pictus* in different solvents (hexane, ethyl acetate, methanol and water) were subjected to phytochemical studies. Even though there was negligible difference in the presence of chemical constituents in all 24 extracts of three samples; the methanol extract of leaves has shown maximum number and concentration of secondary metabolites based on phytochemical and TLC tests. Further analysis such as Column chromatography, HPLC and GC-MS of leaf methanol extract has revealed the presence of a glycoside compound similar to a reference compound, β -L-Arabinopyranose methyl glycoside and that might be the inducer molecule of its antidiabetic property [C. T. Shiny*, Anuj Saxena and Sharad Prakash Gupta, *Int J Pharm Biomed Res*, 2013, **4**(2), 97-104].

NPARR 4(2), 2013-0193 **Dimeric bisindole alkaloids from the stem bark of *Strychnos nux-vomica* L.**

Strychnos nux-vomica L. (Loganiaceae) is famous for its monomeric alkaloid content, such as strychnine, a convulsant poison. The stem bark of the tree is traditionally used to treat intermittent fever in South East Asia. In various studies, it appeared that dimeric indolo-monoterpenic alkaloids possess a promising activity on *Plasmodium falciparum*. Three

bisindolomonoterpenic alkaloids together with strychnochrysin, previously identified in the root bark of *S. nux-vomica*, were isolated from the stem bark. The structures of these compounds were established using NMR spectroscopy and mass spectrometry. Stereochemistry of the compounds was confirmed by molecular modelling. This then allowed the structural determination of strychnoflavine, a coloured bisindole alkaloid previously isolated from the root bark of the tree. Moreover, the conformational inversion in alkaloids possessing an ether bond in the strychnane moiety could be easily predicted by specific $\delta^{13}\text{C}$ NMR values. These longicaudatine-type alkaloids were found to display *in vitro* antiparasitic activity against a chloroquine resistant strain and a chloroquine sensitive strain. The most interesting was strychnochrysin showing an IC_{50} value at around 10 μM [Marie-Caroline Jonville*, Georges Dive, Luc Angenot, Joanne Bero, Monique Tits, Evelyne Ollivier and Michel Frédérick (Laboratoire de Pharmacognosie, Drug Research Center (CIRM), Université de Liège, B36, 1 Avenue de l'Hôpital, 4000 Liège, Belgium), *Phytochemistry*, 2013, **87**, 157-163].

NPARR 4(2), 2013-0194 **HPLC-UV-ESI-MS analysis of phenolic compounds and antioxidant properties of *Hypericum undulatum* shoot cultures and wild-growing plants**

LC-UV and LC-MS analysis were used to study the phenolic composition of water extracts of *Hypericum undulatum* (HU) shoot cultures and wild-growing (WG) plants. Total phenolic content (TPC), determined using the Folin-Ciocalteu assay, and the antioxidant activity measured by two complementary methods were also performed for each sample. Mass spectrometry revealed several phenolics acids with quinic acid moieties, flavonols, mostly quercetin, luteolin and apigenin glycosides, flavan-3-ols (catechin and epicatechin) and the xanthonoid mangiferin. Differences in phenolic composition profile and TPC were found between

the samples. The major phenolic in HU culture-growing (CG) samples is chlorogenic acid, followed by epicatechin, quercitrin and isoquercitrin. The WG plants presents hyperoside as the main phenolic, followed by isoquercitrin, chlorogenic acid and quercetin. The TPC and antioxidant activity were higher in samples from WG plants [Nuno Rainha, Kamila Koci, Ana Varela Coelho, Elisabete Lima, José Baptista, Manuel Fernandes-Ferreira*(Centre for the Research and Technology of Agro-Environmental and Biological Sciences, (CITAB), University of Trás-os-Montes e Alto Douro, 5001-801 Vila Real, Portugal), *Phytochemistry*, 2013, **86**, 83-91].

NPARR 4(2), 2013-0195 Steroidal saponins from the fruits of *Solanum torvum*

Seven steroidal glycosides have been isolated from the fruits of *Solanum torvum* Swartz. Their structures were established by 2D NMR spectroscopic techniques (^1H , ^1H -COSY, TOCSY, NOESY, HSQC, and HMBC) and mass spectrometry as (25*S*)-26-(β -d-glucopyranosyloxy)-3-oxo-5 α -furost-20(22)-en-6 α -yl-*O*- β -d-xylopyranoside (**1**), (25*S*)-26-(β -d-glucopyranosyloxy)-3-oxo-22 α -methoxy-5 α -furostan-6 α -yl-*O*- β -d-xylopyranoside (**2**), (25*S*)-26-(β -d-glucopyranosyloxy)-3 β -hydroxy-22 α -methoxy-5 α -furostan-6 α -yl-*O*- α -l-rhamnopyranosyl-(1 \rightarrow 3)- β -d-glucopyranoside (**3**), (25*S*)-3 β -hydroxy-5 α -spirostan-6 α -yl-*O*- β -d-xylopyranoside (**4**), (25*S*)-3-oxo-5 α -spirostan-6 α -yl-*O*- β -d-xylopyranoside (**5**), (25*S*)-3 β -hydroxy-5 α -spirostan-6 α -yl-*O*- β -d-glucopyranoside (**6**), (25*S*)-3 β ,27-dihydroxy-5 α -spirostan-6 α -yl-*O*- β -d-glucopyranoside (**7**) [Alida Pérez Colmenares, Luis B.

Rojas^b, Anne-Claire Mitaine-Offer^a, Laurent Pouységu^c, Stéphane Quideau^c, Tomofumi Miyamoto^d, Chiaki Tanaka^d, Thomas Paululat^e, Alfredo Usubillaga^b and Marie-Aleth Lacaille-Dubois*(Laboratoire de Pharmacognosie, EA 4267 FDE/UFC, Faculté de Pharmacie, Université de Bourgogne, BP 87900, 21079 Dijon Cedex, France), *Phytochemistry*, 2013, **86**, 137-143].

NPARR 4(2), 2013-0196 Tetracyclic triterpenoids and terpenylated coumarins from the bark of *Ailanthus altissima* (“Tree of Heaven”)

Tetracyclic triterpenoids (named as altissimanins A–E, **1–5**) and a terpenylated coumarin (denominated as altissimacoumarin G, **6**), along with fifteen known compounds (**7–21**) were isolated from the bark of *Ailanthus altissima*. Structures of compounds **1–6** were established by spectroscopic methods and chemical transformations. Altissimanin A (**1**) is a tirucallane-type triterpenoid bearing an uncommon oxetane ring in the side-chain, while altissimanins D (**4**) and E (**5**) are two unprecedented dimers each consisting of one tirucallane-type and one dammarane-type triterpenoid moiety. All the isolates were evaluated for their cytotoxic effects against a small panel of human cancer cell lines [Zhi-Lai Hong, Juan Xiong*, Shi-Biao Wu, Jing-Jing Zhu, Jun-Lin Hong, Yun Zhao, Gang Xia and Jin-Feng Hu* (Department of Natural Products Chemistry, School of Pharmacy, Fudan University, No. 826 Zhangheng Road, Shanghai 201203, PR China), *Phytochemistry*, 2013, **86**, 159-167].

PULP/PAPER

NPARR 4(2), 2013-0197 **Timber bamboo pulp**

Fast-growing biomass, such as bamboo, has the potential to serve an important future role in the pulp and paper industry with potential to both lower resource costs and improve a product's sustainability. Moso bamboo is particularly interesting due to its fast growth and size, which allows it to be handled and chipped similarly to wood resources. In this study, we will share results of the chip preparation, kraft cooking, and ECF bleaching of this bamboo species and compare its pulpability, bleachability, and physical properties to a fast growing hybrid poplar tree. Results indicate that the bamboo chips cooked and bleached similarly to the poplar hardwood, allowing for co-cooking. The resulting pulps had superior tensile properties at low refining, but did have higher fines that lowered drainability as measured by Canadian Standard Freeness. The bamboo fiber morphology was also measured, indicating the fiber to have length weighted average fiber lengths and coarseness values to be greater than the poplar wood studied, which should allow this material to be used in many paper grades. Application: The results of this study would be best used by industry professionals interested in the potential of Moso bamboo as a papermaking fiber. Cooking and bleaching conditions are provided along with handsheet properties and fiber morphologies [Runge T.*, Houtman, C., Negri, A. and Heinricher, J. (Biological System Engineering, University of Wisconsin-Madison, Madison, WI, United States), *Tappi Journal*, 2013, **12**(2), 9-15].

NPARR 4(2), 2013-0198 **A new biobleaching sequence for kenaf pulp: Influence of the chemical nature of the mediator and thermogravimetric analysis of the pulp**

This paper evaluates five phenolic compounds as mediators for kenaf pulp biobleaching by laccase. The results have been

compared with the treatment using a non-phenolic mediator, 1-hydroxybenzotriole and laccase alone. The influence of the nature of the chemical mediators used on various pulp properties is discussed. In addition to oxidizing lignin, the phenolic radicals formed in the process take part in condensation and grafting reactions in enzymatic stage. After biobleaching sequence (LP), syringaldehyde was shown to be the best phenolic mediator, allowing a delignification of 43% and 72% ISO brightness. These results were similar to the use of laccase alone due to the role as mediators of syringyl units resulting from oxidative lignin degradation. As a novelty, the study was supplemented with thermogravimetric analysis, with emphasis on the crystallinity degree of the cellulose surface and the aim of elucidating the action mechanisms of laccase-mediator systems on fiber [Andreu, G, Barneto, A.G and Vidal, T.* (Textile and Paper Engineering Department, ETSEIAT, Universitat Politècnica de Catalunya, Colom 11, E-08222 Terrassa, Spain), *Bioresource Technology*, 2013, **130**, 431-438].

NPARR 4(2), 2013-0199 ***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*. Authors 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* [Pandey, V.C. and Kumar, A*. (Department of Environmental Science, Babasaheb Bhimrao Ambedkar (Central) University, Raibareilly Road, Lucknow, 226025 Uttar Pradesh, India), *Genetic Resources and Crop Evolution*, 2013, **60**(3), 1165-1171].

NPARR 4(2), 2013-0200 Evaluation of the paper making potential of *Ailanthus altissima*

In this work, *Ailanthus altissima* (tree-of-heaven) wood was analyzed for its chemical, morphological and papermaking properties. The *A. altissima* wood was cooked under kraft conditions using different active alkali charges and then handsheets were produced with the pulps having a kappa number of 16. Based on structural, strength and optical data it was found that the kraft pulp of *A. altissima* is not suitable to be used alone for the production of printing and writing papers. Notwithstanding, the handsheets exhibit a favorable value of brightness in comparison to those produced from *Eucalyptus globulus* pulp (with similar kappa number). Therefore, the wood of *A. altissima* seems to have a good potential to be used as a partial substitute of the main raw material of the Portuguese pulp industry. In fact, the results showed that when beaten *E. globulus* and *A. altissima* pulps were mixed (50:50, w/w), the paper making properties were comparable to those of beaten eucalyptus kraft pulps. Therefore, the use of *A. altissima* wood seems promising for the production of uncoated wood-free papers,

which has advantages both from an economical and environmental perspective [Ferreira, P. J.T.*, Gamelas, J.A.F., Carvalho, M.G.V.S., Duarte, G.V., Canhoto, J.M.P.L. and Passas, R. (Chemical Process Engineering and Forest Products Research Center, Chemical Engineering Department, University of Coimbra, Pólo II, R. Sílvio Lima, 3030-790 Coimbra, Portugal), *Industrial Crops and Products*, 2013, **42**(1), 538-542].

NPARR 4(2), 2013-0201 Use of sugar cane straw as a source of cellulose for textile fiber production

This paper reports the development of textile fibers from cellulose of sugar cane straw and commercial cellulose. Sugar cane straw pulps were obtained after alkaline pulping, using soda/anthraquinone (AQ). For the removal of residual lignin, pulps were submitted to chemical bleaching with hydrogen peroxide. Bleached pulps were used to obtain fibers with N-methylmorpholine-N-oxide (NMMO). Straw and pulps were characterized for their chemical composition (cellulose, polyoses and lignin). Fibers were analyzed to evaluate maximum water uptake or swelling, weight loss and mechanical properties. Microstructure was analyzed by a scanning electron microscope (SEM). Pulping yield was 30%, and fibers showed water uptake capacity around 60-73%. The mass loss profile was about 25-26% in 30 days. Fibers obtained from commercial cellulose and straw presented tenacity values in the range of 4.1-4.3. cN/tex, which are compatible with commercial lyocell produced from wood pulp cellulose [Costa, S.M.*, Mazzola, P.G., Silva, J.C.A.R., Pahl, R., Pessoa, A. and Costa, S.A. (School of Arts, Sciences and Humanities, Textile and Fashion Course, University of São Paulo, Av. Arlindo Betio, 1000, Parque Ecologico do Tiete, Ermelino Matarazzo, CEP: 03828-080 São Paulo, SP, Brazil), *Industrial Crops and Products*, 2013, **42**(1), 189-194].

***NPARR* 4(2), 2013-0202 Hemicellulose in pulp affects paper properties and printability (Review)**

Hemicellulose is an important component in plant fibre and it contributes to paper properties. During pulping and fibrerecycling, it could be removed by either its degradation or release. The objective of this work was to explore the effects of hemicellulose loss on paper structure and printability. Herein, parts of hemicellulose were selectively extracted from bleached eucalyptus kraft pulp with sodium hydroxide solution. The bulk, surface roughness, and air permeability of paper were found to have

increased as a result of hemicellulose loss, particularly as the hemicellulose content in pulp was decreased below 13%. Both the brightness and opacity of the paper were slightly improved due to the removal of hemicellulose. Meanwhile, strength indices decreased as expected. Both ink transfer and print through were reduced with hemicellulose loss. When the print density was lower than 1.6, the dependence of print through on hemicellulose loss at a certain degree of print density was not obvious [Hu, G*., Fu, S. and Liu, H. (State Key Laboratory of Pulp and Paper Engineering, South China University of Technology, Guangzhou 510640, China), *Appita Journal*, 2013, **66**(2), 139-144].

RUBBER/GUM

NPARR 4(2), 2013-0203 Protective effect of cashew gum nanoparticles on natural larvicide from *Moringa oleifera* seeds

Nanoparticles (NPs) have been used as carriers and as protective coatings of labile substances with applications in pharmacy, medicine, and agriculture. This work focused on the development of an entrapment process for the protection of a natural larvicide extracted from *Moringa oleifera* (MO) seeds with cashew gum (CG) NPs as a wall material. CG-MO NPs were characterized with regard to their size, morphology, kinetic release, thermal properties, and *Stegomyia aegypti* larvae mortality. The result showed that the CG-MO NPs presented average particle sizes ranging from 288 to 357 nm, with unimodal distribution. MO larvicide active principle loading varied from 2.6 to 4.4%, and the entrapment efficiencies were in the range 39.1-60.8%. In vitro release kinetics showed a Fickian diffusional behavior. The thermal stability of the CG-MO NPs was related to the MO content, where their decomposition temperatures decreased with increasing MO active principle loading. Bioassays with third instar larvae showed that the mortality rate was related to larvicide loading and reached values up to $98 \pm 3\%$ mortality. The CG-MO NPs showed effective extract entrapment, with satisfactory larvicide effects even after 55 days of sample preparation and were effective as an improved and controlled release larvicide system [Paula, H.C.B.*, Rodrigues, M.L.L., Ribeiro, W.L.C., Stadler, A.S., Paula, R.C.M. and Abreu, F.O.M.S. (Department of Analytical and Physical Chemistry, Federal University of Ceará, Fortaleza, CE, Brazil), *Journal of Applied Polymer Science*, 2012, 124(3), 1778-1784]

NPARR 4(2), 2013-0204 Gum Cordia: A novel edible coating to increase the shelf life of Chilgoza (*Pinus gerardiana*)

Cordia myxa is a deciduous tree, which grows nearly all over the Indo-Pak subcontinent.

The ripe fruits contain an anionic polysaccharide having good adhering property. Chilgoza (*Pinus gerardiana*), specie of genus Pinus (pine nuts) grows in Pakistan, Afghanistan and India. It is a rich source of unsaturated fatty acids but the unshelled nuts are highly susceptible to rancidity. An effort was made to investigate the efficacy of gum Cordia in comparison with carboxy methyl cellulose (CMC) as edible coating to retard this oxidation. Gum Cordia and CMC with and without natural antioxidants were used in this study. Methanolic extract of *C. myxa* and alpha tocopherol were selected as antioxidants. Chemical and sensory analyses were performed on coated and uncoated pine nuts stored at 35°C for 112 days. Significant differences ($p < 0.05$) between coated and uncoated samples were observed. Samples coated with gum Cordia containing the extract of *C. myxa* exhibited highest (ca. 95%) increase in shelf life followed by CMC and the *C. myxa* extract (ca. 60%), gum Cordia (ca. 25%), and CMC (ca. 15%); based on peroxide value ($20 \text{ meq.O}_2 \text{ kg}^{-1}$). However, samples treated with alpha tocopherol did not improve the oxidative stability [Haq, M.A.*, Alam, M.J. and Hasnain, A. (Department of Food Science and Technology, University of Karachi, University Road, Karachi 75270, Pakistan), *LWT-Food Science and Technology*, 2013, **50**(1), 306-311].

NPARR 4(2), 2013-0205 Characterization and in vitro drug release studies of a natural polysaccharide Terminalia catappa gum (Badam gum)

The main objective of the present study is the physicochemical characterization of naturally available *Terminalia catappa* gum (Badam gum [BG]) as a novel pharmaceutical excipient and its suitability in the development of gastroretentive floating drug delivery systems (GRFDDS) to retard the drug for 12 h when the dosage form is exposed to gastrointestinal fluids in the gastric environment. As BG was being explored for the first time for its pharmaceutical application, physicochemical, microbiological, rheological,

and stability studies were carried out on this gum. In the present investigation, the physicochemical properties, such as micromeritic, rheological, melting point, moisture content, pH, swelling index, water absorption, and volatile acidity, were evaluated. The gum was characterized by scanning electron microscopy, differential scanning calorimetry (DSC), powder X-ray diffraction studies (PXRD), and Fourier transform infrared spectroscopy (FTIR). Gastroretentive floating tablets of BG were prepared with the model drug propranolol HCl by direct compression methods. The prepared tablets were evaluated for all their physicochemical properties, in vitro buoyancy, in vitro drug release, and rate order kinetics. PBG 04 was selected as an optimized formulation based on its 12-h drug release and good buoyancy characteristics. The optimized formulation was characterized with FTIR, DSC, and PXRD studies, and no interaction between the drug and BG was found. Thus, the study confirmed that BG might be used in the gastroretentive drug delivery system as a release-retarding polymer [Meka, V.S.*, Nali, S.R., Songa, A.S. and Kolapalli, V.R.M. (School of Pharmacy, International Medical University, Kuala Lumpur, 57000, Malaysia), *AAPS PharmSciTech*, 2013, **13**(4), 1451-1464].

NPARR 4(2), 2013-0206 Assessment of production efficiency, physicochemical properties and storage stability of spray-dried propolis, a natural food additive, using gum Arabic and OSA starch-based carrier systems

The aim of this work was to obtain propolis in a powder, alcohol-free, water-dispersed and shelf-stable form. Propolis extract was spray-dried using gum Arabic and octenyl succinic anhydride (OSA) starch as carriers in two different weight ratios (1:4 and 1:6). Spray-dried propolis samples were evaluated for morphology, moisture, water activity, water dispersibility, hygroscopicity, particle size, particle distribution, entrapping efficiency,

stability, isotherms and antioxidant properties. The spray-drying process produced round particles with sizes ranging from 15 to 24 μm . This process preserved the antioxidant activity of propolis and also allowed propolis to be obtained in a powder form, which was stable during storage at room temperature, had low hygroscopicity and was highly dispersible in cold water. The application of this technology could increase the use of propolis in various industrial applications, such as an antimicrobial and as an antioxidant in food [Da Silva, F.C.*, Da Fonseca, C.R., De Alencar, S.M., Thomazini, M., Balieiro, J.C.D.C., Pittia, P. and Favaro-Trindade, C.S. (Universidade de São Paulo, Faculdade de Zootecnia e Engenharia de Alimentos, Av. Duque de Caxias Norte 225, CP 23, CEP: 13535 900, Pirassununga, SP, Brazil), *Food and Bioprocess Processing*, 2013, **91**(1), 28-36].

NPARR 4(2), 2013-0207 Formulation and texture characterization of environment friendly chewing gum

Zein is a natural product, obtained from corn gluten. Rheological property of zein suggests its application as chewing gum base. Synthetic chewing gum base is very difficult to clean off surfaces because of its adhesive texture, and gum long lasting nature. Millions of dollars worldwide are spent for chewing gum waste disposal. Many researchers have investigated possibility of developing gum products that are biodegradable or less sticky in an attempt to remove these problems. In current study model corn zein chewing gum is developed and effect of formulation components on textural properties was investigated. Various plasticizers are used for formulation of corn zein chewing gum and Zein/N-oleoylsarcosine solution in various ratios was used as coating solution and effect of coating solution on textural properties was investigated [Mehta, F.*, Rajagopalan, R. and Trivedi, P. (Department of Pharmaceutics, School Of Pharmaceutical Sciences, Rajiv Gandhi Prodhogiki Vishwavidyalaya, Bhopal, (M.P.),

India), *International Journal of PharmTech Research*, 2013, **5**(1), 222-232].

NPARR 4(2), 2013-208 **Pharmaceutical applications of Ispaghula Husk: Mucilage (Review)**

Natural carbohydrates have been popularly used as a material for centuries in all kinds of pharmaceutical applications. It is the world's most abundant renewable and biodegradable polymer. Isabgol has been popularly used as therapeutic agent for the treatment of constipation, diarrhea, irritable syndrome, inflammatory bowel disease, ulcerative colitis, colon cancer, diabetes, and hypercholesterolemia. The uniqueness of the chemical structures and macromolecular configurations of mucilage obtain from the Isabgol (*Plantago ovata* forskal) has attracted Carbohydrate chemists in last decade, as the hydrogel produced by it is rigid, difficult to break, to dissolve. Ironically solubility, flexibility is very important criteria for materials to be used in pharmacy. To meet these criteria chemical modifications of isabgol husk mucilage is indispensable so that it can be transformed into carrier for new drug delivery system, as a low cost non-conventional source for the using pharmaceutical formulations as an "Excipient",

which can improve its processability and performance for specific application in the broad field of pharmacy. Exploitation of Isabgol husk mucilage as an "Excipient" and its innovative, non-conventional applications, chemical derivatization, use of its derivative in modern fashion of drug designing has become a room for inventions for research scholar. Gums and Mucilage are naturally occurring biopolymers, finding increasing applications in pharmaceutical and biotechnology industry. It has been used successfully for many years in the food and pharmaceutical industry as a thickening agent, as a gelling agent, and as a colloidal stabilizer. Mucilage also has several unique properties that have enabled it to be used as a matrix for entrapment and/or delivery of variety of drugs, proteins, and cells. Being a naturally occurring polysaccharide, in recent year it has gained increased importance in industrial applications. The benefits of natural carbohydrates are also more and more appreciated by the scientists and consumers from various industries due to its inertness, biocompatibility, and biodegradability [Majmudar, H.*, Mourya, V., Devdhe, S. and Chandak, R.(Department of Pharmaceutics, Government college of Pharmacy, Amarawati, India), *International Journal of Pharmaceutical Sciences Review and Research*, 2013, **18**(1), 49-55].

SPICES/CONDIMENTS

NPARR 4(2), 2013-0209 An integrated approach for the reduction of aflatoxin contamination in chilli (*Capsicum annuum* L.)

An integrated approach for management of aflatoxin contamination in chilli was undertaken by evaluating the fungicides, bioagents and plant extracts against *Aspergillus flavus* under both *in vitro* and field condition. Maximum inhibition of radial growth (91.1%) was observed with 0.3% mancozeb followed by captan (85.2%). Carbendazim (73%) was effective and superior over other systemic fungicides. A complete inhibition (100%) of *A. flavus* was observed in neem seed kernel extract (NSKE), nimbicidin and pongamia oil at 5%. An indigenous *Pseudomonas fluorescens* bioagent isolate inhibited (74.9%) the growth of *A. flavus* over *Trichoderma harzianum* (70.4%). The superior performing fungicides, plant extracts and bioagents identified under *in vitro* were used for challenge inoculation on chilli fruits and so also for field evaluation. The captan treated fruits recorded the least infection of *A. flavus* (1.6%) followed by *P. fluorescens* (2.0%), NSKE (2.2%) and nimbicidin treated fruits (7.8%) as against control (38.3%). As regards to field evaluation, the least incidence was recorded in NSKE sprayed chilli plot (1.6%) and was on par with captan (2.2%), *P. fluorescens* (2.4%) and *T. harzianum* (2.6%) compared to control (7.4%). Hence, a pre-harvest spray of NSKE (5%) or mancozeb (0.3%) or *P. fluorescens* (1×10^8

cfu/ml) 10 days before harvest of chilli is recommended for field level management of aflatoxin [Sudha, S., Naik, M.K. and Ajithkumar, K. (Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Raichur 584 102 Karnataka, India), *Journal of Food Science and Technology*, 2013, **50**(1), 159-164].

NPARR 4(2), 2013-0210 Influence of vacuum packaging on seed quality and mineral contents in chilli (*Capsicum annuum* L.)

Studies were carried out to find out the influence of vacuum packaging on physical parameters of whole chilli and biochemical constituents in chilli seeds. Chilli fruits were stored in vacuum packed and jute bags stored at room temperature ($25 \pm 2^\circ\text{C}$), cold storage ($4 \pm 1^\circ\text{C}$) under both light and dark conditions for a period of 24 months. At the end of the storage period, seeds were separated from fruits and various parameters, viz. moisture content, capsaicin content, ascorbic acid, carbohydrates, protein and mineral elements like Fe, P, Na and K were analyzed. It was observed that the samples stored in vacuum packed bags maintained the quality with least deterioration in all the quality parameters compared to samples stored in jute bags [Deepa, G.T.*, Chetti, M.B., Khetagoudar, M.C and Adavirao G.M. (University of Agricultural Sciences, Dharwad 580 005 Karnataka, India), *Journal of Food Science and Technology*, 2013, **50**(1), 153-158].

SUGARS

NPARR 4(2), 2013-0211 Development of a sweet sorghum juice clarification method in the manufacture of industrial feedstocks for value-added fermentation products

In recent years, there has been a dramatic increase in interest of sweet sorghum (*Sorghum bicolor* L.) for small to large-scale manufacture of renewable, biobased fuels and chemicals. New fermentation organisms hold tremendous potential for the production of biobased fuels, chemicals, and materials from industrial sugar feedstocks, in particular syrups. Clarification of sweet sorghum juice will be critical to the production of stable, intermediate syrup feedstocks for efficient transport, storage, and year-round supply. Juices extracted from mature sweet sorghum hybrids and immature cultivar Topper 76-6 (Topper), were clarified using heat, heat-milk of lime, and heat-milk of lime-polyanionic flocculant at various temperatures and target limed pHs, and compared to the clarification of sugarcane (*Saccharum* spp. hybrids) juice. There was no significant loss of fermentable sugars (sucrose + glucose + fructose) across clarification by temperature and only a slight decrease in fermentable sugars when clarified by pH. Preheating the sweet sorghum juice from 85 to 100°C not only produced clarified juices of low turbidity, but also with excellent turbidity control. For the cultivars studied, a minimum limed juice pH of ~6.3–6.5 was optimum for the clarification of sweet sorghum juice preheated to ~80–85°C with 5 ppm polyanionic flocculant addition with respect to clarified juice turbidity, protein, calcium, starch, and to a lesser extent phosphate levels. There was a strong effect of cultivar on juice quality, clarification performance, and clarified juice quality, which warrants further research (Brett Andrzejewski*, Gillian Eggleston, Sarah Lingle and Randall Powell (USDA-ARS Southern Regional Research Center, 1100 Robert

E. Lee Blvd., New Orleans, LA 70124, USA), *Industrial Crops and Products*, 2013, **44**, 77-87].

NPARR 4(2), 2013-0212 LC-MS/MS analysis of sugarcane extracts and differentiation of monosaccharides moieties of flavone c-glycosides

LC-MS/MS data of the flavones from extracts of nonmodified and transgenic sugarcane (“Bowman-Birk” and “Kunitz”) led to the proposition of characteristic fragmentations that can be applied to identify the monosaccharides glucose, arabinose, and rhamnose in C-glycosylflavones. Collision-induced dissociation (CID) MS/MS generated diagnostic ions for different linked sugars in C-glycosylflavone–O-glycoside and C-glycosylflavone–O-acid derivatives, and the combination of MS data with postcolumn derivatization using UV shift reagents (which provide complementary information to determine the substitution patterns in the flavone skeleton) allowed for the identification of seven flavones not previously reported in sugarcane: 6-methoxyluteolin-8-C-arabinosyl-7-O-glucoside; diosmetin-8-C-arabinosyl-7-O-arabinoside; vitexin-7-O-rhamnoside; diosmetin-8-C-rhamnosyl-7-O-glucoside; tricetin-8-C-(6"-O-sinapoylglucoside); 7,4' di-O-methylapigenin-8-C-arabinosyl-rhamnoside; and luteolin-8-C-rhamnosyl-7-O-rhamnoside [Renata Colombo*, Janete Harumi Yariwake, Emerson Ferreira Queiroz, Karine Ndjoko and Kurt Hostettmann (Instituto de Química de São Carlos, Universidade de São Paulo, São Carlos, São Paulo, Brazil), *Journal of Liquid Chromatography & Related Technologies*, 2013, **36**(2), 239-248].

NPARR 4(2), 2013-0213 Energy losses in traditional jaggery processing

Jaggery is a traditional Indian sweetener prepared using sugarcane. Farmers make jaggery

in their own farms using juice obtained after crushing sugarcane with a crusher. The settled juice is boiled in open pans with continuous stirring and, simultaneously clarificants are added in required quantity. The consistency of the juice becomes thick on concentration by boiling and then it is poured into moulds to make jaggery blocks on cooling. The efficiency of crushing and concentration process is 60% and 14.75%, respectively. The low efficiency is due to the use of open pans for concentration and using moulds for cooling. Adopting alternative technologies like a steam jacketed vessel which will get preheated water from the cooling and moulding section. Hot water can also be used in improving the crushing efficiency thereby making the jaggery processing energy efficient [M Esther Magdalene Sharon*, CV Kavitha Abirami and K Alagusundaram (Indian Institute of Crop Processing Technology, Thanjavur-613 005, India), *Indian Food Industry Mag*, 2013, **32**(3), 22-25].

NPARR 4(2), 2013-0214 Comparative economics of organic and inorganic jaggery preparation in Mandya district

The study was undertaken in Mandya district of Karnataka during the year 2010-2011. Based on the primary data obtained from 30 processors and 64 consumers each of organic and inorganic jaggery was elicited through survey method. The result revealed that average investment of Rs. 933255 and Rs. 988081 were required to set up organic and inorganic jaggery processing unit with a capacity of nine quintals per day. The average per quintal cost of inorganic jaggery preparation was more (Rs. 2392.24) when compared to organic jaggery units (Rs. 2187.00). Per quintal income from organic jaggery was found to be higher (Rs. 3450.84) than that of

inorganic jaggery (Rs. 2990.47). Net return in organic jaggery was higher than inorganic jaggery at Rs. 1411.40 and Rs. 725.50 per quintal, with B:C ratio of 1.41 and 1.11, respectively [Swamy, P. S. D.; Honnaiah, *Mysore Journal of Agricultural Sciences*, 2013, **47** (2), 374-378].

NPARR 4(2), 2013-0215 Operational efficiency and profitability measurement of Indian gur (jaggery) manufacturers

Gur (jaggery) is a natural, traditional product of sugarcane. Kushinagar1 district of Uttar Pradesh has a large number of gur manufacturing units, mostly located in the rural areas and manufacturers are following conventional methods for producing this, although, there is no R&D assistance or marketing institutions for support. It is found that the manufacturers are producing mainly for distilleries and local liquor producers, not for the foodplate or common man's consumption. The paper examines the cost–return analysis, profitability and operational efficiency of gur manufacturing units in the study area. The study revealed that units of medium and large sizes were able to cover their operating expenses with a significant level of profit but small size units were earning a marginal profit. The profit earned by this category was very low as compared to the other two sizes. This research will urged the policy–makers to streamline strategies that promote stabilisation of sugarcane economy [Amit Kumar Dwivedi*, Nivedita T. Dwivedi, Bittu Sah, G.S. Dangayach (Entrepreneurship Development Institute of India, P.O. Bhat–382428, Gandhinagar, Gujarat, India), *International Journal of Procurement Management*, 2013, **6**(4), 466-480].

THERAPEUTICS

NPARR 4(2), 2013-0216 *Nyctanthes arbor-tristis* Linn. - A critical ethnopharmacological review (Review)

Nyctanthes arbor-tristis (Oleaceae) is a mythological plant; has high medicinal values in Ayurveda. The popular medicinal use of this plant are anti-helminthic and anti-pyretic besides its use as a laxative, in rheumatism, skin ailments and as a sedative. Vitrally, the natives plant it in their home gardens to pass on its medicinal usage to oncoming generations. The present review encompasses an ethnopharmacological evaluation focusing on information on the chemical constituents, pharmacological actions and toxicology in order to reveal the therapeutic potential and gaps requiring research involvement. The present review is based on searches in Scifinder[®], Pubmed (National Library of Medicine) and books published on the subject during the period 1933 to 2012. Results: *Nyctanthes arbor-tristis* is most important in local and traditional medicines especially in India for treating intermittent fevers, arthritis and obstinate sciatica. Crude extracts and isolated compounds from the plant were shown to be pharmacologically active against inflammation, malaria, viral infection, leishmaniasis and as an immunostimulant. The major class of biologically active compounds are the iridoid glucosides incl., Arbostriside A, B and C from the seeds active as anticancer, anti-leishmania, anti-inflammatory, anti-allergic, immunomodulatory and antiviral. Other molecules; calceolarioside A, 4-hydroxyhexahydrobenzofuran-7one and β -sitosterol from leaves have been reported to be active as anti-leishmanial, anticancer and anti-inflammatory, respectively. The crude extracts have been found to be safe with an LD₅₀ of 16 gm/kg, while the LD₅₀ of arbostriside-A isolated from the seeds was found to be 0.5 g/kg. Mostly *in-vitro* or in some cases *in-vivo* models provide some evidence especially in the treatment of inflammatory conditions like arthritis, fevers related to malaria and protozoan diseases especially

leishmaniasis. The only clinical study found, is for treating malaria, but with crude extract only. Further, more detailed safety data pertaining to the acute and sub-acute toxicity, cardio and immunotoxicity also needs to be generated for crude extracts or pure compounds [Agrawal, J., and Pal, A*. (Molecular Bio-prospection Department, Central Institute of Medicinal and Aromatic Plants, Council of Scientific and Industrial Research, Lucknow 226015, India), *Journal of Ethnopharmacology*, 2013, **146** (3), 645-658].

NPARR 4(2), 2013-0217 **Hepatoprotective activity of *Borreria hispida* on paracetamol induced liver damage**

Hepatocytes are the functional cells of the liver and perform a wide range of metabolic, secretory and endocrine functions. Hepatotoxicity implies chemical-driven liver damage. The liver plays a major role in transforming and clearing chemicals and is susceptible to the toxicity from these agents. Certain medicinal agents, when taken in overdoses and sometimes even when introduced within therapeutic ranges, may injure the organ. Other chemical agents, those used in laboratories and industries, natural chemicals and herbal remedies can also cause hepatotoxicity. *Borreria hispida* seed flavonoid-rich fraction possesses free radical scavenging and antioxidant activity both *in vitro* and *in vivo*. *Borreria hispida* Linn has been in use in the Indian system of medicine. Various part of the plant are useful in the treatment of antifertility, appetite, Bleeding in child birth, body ache, Gum trouble, scabies and skin disease, Stomach compliance, Ulcers, hepatitis, Wounds, head ache and tooth ache. The hepatotoxicity is induced by the paracetamol overdose, and the methanolic extract of *Borreria hispida* shows a good reduction of hepatotoxicity [Johnson, D.B*. , Senthil Kumar, C., Rajesh, R., Venkatnarayanan, R. and Mohammed Ansar, V.K. (Department of Pharmacology, R.V.S. College of Pharmaceutical Sciences, Sullur,

Coimbatore, Tamil Nadu, India), *Research Journal of Pharmacy and Technology*, 2013, **6**(1), 61-65].

NPARR 4(2), 2013-0218 Phytochemical investigation of various extracts of leaves and stems of *Achyranthes aspera* Linn.

Plants and plant based medications are the basis of many of the modern pharmaceuticals we use today for various ailments. The main objective of this study was to appraise antioxidant activity of different sequential extracts of leaves and stems of *Achyranthes aspera* by phytochemical analysis. The plant material was dried in shade, crushed and subjected to prepare different sequential and non-sequential extracts using soxhlet apparatus. Our findings revealed that both stems and leaves possess the phytochemicals like alkaloids, cardiac-glycosides, terpenoids, flavonoids, saponins, steroids, proteins and reducing sugars in different amounts. The results exhibited the presence of different phytochemicals. All these phytochemicals have potential therapeutic or physiological actions on human system, for that the leaves and stems of *A. aspera* can stand as a potential source of some vital drugs [Sharma V.*, Agarwal, A., Chaudhary, U. and Singh, M. (Department of Biosciences and Biotechnology, Banasthali University, Banasthali, 304022, Rajasthan, India), *International Journal of Pharmacy and Pharmaceutical Sciences*, 2013, **5**(SUPPL.1), 317-320].

NPARR 4(2), 2013-0219 The Anxiolytic Potential and Psychotropic Side Effects of an *Echinacea* Preparation in Laboratory Animals and Healthy Volunteers

The toxicity, psychotropic side effects and anxiolytic potential of an *Echinacea angustifolia* extract that produced promising effects in laboratory tests performed earlier was investigated. Rats were studied in the elevated plus-maze, conditioned fear, open-field, object

recognition and conditioned place preference tests. Toxicity was studied in rats after intragastric administration. The preparation decreased anxiety in the elevated plus-maze and ameliorated contextual conditioned fear. No lethality or behavioural signs of discomfort were noticed in rats treated with 1000 and 3000 mg/kg *Echinacea angustifolia*. The extract was without effect in tests of locomotion (open-field), memory (object recognition) and rewarding potential (conditioned place preference) within a wide dose range. A pharmacological formulation based on the same *E. angustifolia* extract was tested in human subjects. One or two tablets per day were administered for 1 week to healthy volunteers scoring high on the State-Trait Anxiety Inventory (STAI). The tablets contained 20 mg of the plant extract. Data were collected using a structured self-assessment diary technique. The high dose (2 tablets per day) decreased STAI scores within 3 days in human subjects, an effect that remained stable for the duration of the treatment (7 days) and for the 2 weeks that followed treatment. The lower dose (1 tablet per day) did not affect anxiety significantly [József Haller*, Tamás F. Freund, Katalin Gyimesi Pelczer, János Füredi, Laszlo Krecsak and János Zámboi (J. Haller, Institute of Experimental Medicine, P.O. Box 67, 1450 Budapest, Hungary), *Phytotherapy Research*, 2013, **27**(1), 54-61].

NPARR 4(2), 2013-0220 Effects of *Bixa orellana* L. seeds on hyperlipidemia

Bixa orellana L., *urucum*, or *urucu*, a native tropical tree of Central and South American rain forests is used to treat various diseases in popular medicine. In Ceará, Northeast of Brazil, the seeds of *urucum* have been used for the treatment of high lipid blood levels. The present study investigated the effects of the aqueous extract from *Bixa orellana* seeds (AEBO) in mice with hyperlipidemia induced by tyloxapol, fructose and ethanol. In hyperlipidemia induced by Triton WR1339, 400

and 800 mg/kg AEBO reduced triglycerides (TG) serum levels at 24 h and 48 h. In the study of hypertriglyceridemia induced by fructose, AEBO in doses of 400 mg/kg and 800 mg/kg reduced TG levels by 48.2% and 48.7%, respectively. Finally, the ethanol experimental model with 400 mg/kg AEBO promoted a reduction of 33.6% of TG levels, while the 800 mg/kg concentration reduced hypertriglyceridemia in 62.2%. In conclusion, the aqueous extract of the seeds of *Bixa orellana* was capable of reversing the hypertriglyceridemia induced by Triton, fructose and ethanol, demonstrating a hypolipidemic effect. However, further studies are necessary to discover the precise mechanism of action [Jamile M. Ferreira, Daniel F. Sousa, Mariana B. Dantas, Said G. C. Fonseca, Dalgimar B. Menezes, Alice M. C. Martins*, Maria Goretti R. de Queiroz¹ (Department of Clinical and Toxicological Analyses, Federal University of Ceara, Ceara, Fortaleza, Brazil), *Phytotherapy Research*, 2013, **27**(1), 144-147].

NPARR 4(2), 2013-0221 Towards the use of non-psychoactive cannabinoids for prostate cancer

The palliative effects of *Cannabis sativa* (marijuana), and its putative main active ingredient, Δ^9 -tetrahydrocannabinol (THC), which include appetite stimulation, attenuation of nausea and emesis associated with chemo- or radiotherapy, pain relief, mood elevation, and relief from insomnia in cancer patients, are well-known. Because of the adverse psychoactive effects of THC, numerous recent preclinical studies have been focused on investigating other non-psychoactive constituents of *C. sativa*, such as cannabidiol, for potential therapeutic use. In this issue of the *British Journal of Pharmacology*, De Petrocellis and colleagues present comprehensive evidence that plant-derived cannabinoids, especially cannabidiol, are potent inhibitors of prostate carcinoma viability *in vitro*. They also showed that the extract was active *in vivo*, either alone or when administered with

drugs commonly used to treat prostate cancer (the anti-mitotic chemotherapeutic drug docetaxel (Taxotere) or the anti-androgen bicalutamide (Casodex)) and explored the potential mechanisms behind these antineoplastic effects [Pal Pacher (Section on Oxidative Stress and Tissue Injury, Laboratory of Physiologic Studies, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, 5625 Fishers Lane, MSC-9413, room 2N-17, Rockville, MD 20852, USA), *British Journal of Pharmacology*, 2013, **168** (1), 76-78].

NPARR 4(2), 2013-0222 Naphthoquinone components from *Alkanna tinctoria* (L.) Tausch show significant antiproliferative effects on human colorectal cancer cells

Our research to seek active compounds against human colorectal cancer from the root of *Alkanna tinctoria* (L.) Tausch led to the isolation of two naphthoquinones, alkannin (1) and angelylalkannin (2). The antiproliferative effects of the two compounds on human colon cancer cells HCT-116 and SW-480 were determined by the 3, 4-(5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium salt (MTS) method. Cell cycle profile and cell apoptosis were determined using flow cytometry. Both of the two compounds showed significant inhibitory effects on the cancer cells. For alkannin (1) and angelylalkannin (2), the median inhibitory concentration (IC₅₀) values were 2.38 and 4.76 μ m for HCT-116 cells, while for SW-480 cells they were 4.53 and 7.03 μ m, respectively. The potential antiproliferative mechanisms were also explored. At concentrations between 1–10 μ m, both compounds arrested the cell cycle at the G1 phase and induced cell apoptosis [Nguyen Huu Tung*, Guang-Jian Du, Chong-Zhi Wang, Chun-Su Yuan² and Yukihiro Shoyama^{1,*} (Yukihiro Shoyama, Faculty of Pharmaceutical Sciences, Nagasaki International University, 2825-7 Huis Ten Bosch, Sasebo, Nagasaki 859-3298, Japan), *Phytotherapy Research*, 2013, **27**(1), 66-70].

VEGETABLES

NPARR 4(2), 2013-0223 **Beneficial phytochemicals in potato - a review**

Potato contains several phytochemicals such as phenolics, flavonoids, polyamines, and carotenoids, which are highly desirable in diet because of their beneficial effects on human health. The concentration and stability of these constituents are affected by several factors such as genotype, agronomic factors, postharvest storage, cooking and processing conditions. The advances in analytical techniques have made possible the identification and understanding the functions of phytochemicals, particularly their antioxidant properties. The potatoes are stored and processed into a variety of products before consumption. In the present review, phytochemicals present in potatoes, factors affecting their content, stability and health benefits are discussed. Processing the potatoes rich in phytochemicals can play an important role in promoting the health of a large segment of population in the countries where potatoes form a substantial part of daily diet [Ezekiel, R.*, Singh, N., Sharma, S. and Kaur, A (Division of Crop Physiology and Postharvest Technology, Central Potato Research Institute, Shimla, India), *Food Research International*, 2013, **50**(2), 487-496].

NPARR 4(2), 2013-0224 **Total phenolic, total anthocyanin and phenolic acid concentrations and antioxidant activity of purple-fleshed potatoes as affected by boiling**

The effect of boiling on concentrations of total phenolics (TP), total anthocyanins (TA) and phenolic acids (PA) and on antioxidant activity (AA) of purple-fleshed potatoes belonging to (*Solanum andigenum*) was determined in four native Andean accessions. Extraction methods for each parameter were optimized for raw and boiled freeze dried samples. The concentration of methanol strongly influenced the extraction of TP

and antioxidants to be evaluated for AA, with 80% and 60% methanol, being more efficient for raw and for boiled potato samples, respectively. The predominant PA in raw and boiled potato tubers was chlorogenic acid (CA). Caffeic acid was also present in raw tubers but drastically decrease in boiled tubers. For all accessions, the concentrations of TP and AA determined in boiled tubers were higher than in raw tubers. However, with the exception of Guincho, the TA and CA concentrations determined in raw and boiled tubers of the accessions were not significantly different. The deep purple-fleshed accession Guincho showed the highest TA concentration (418 mg/100 g, FW) and AA (17,305 µg Trolox equivalent/g, FW). Boiled purple-fleshed potatoes are a good source of TA and show high AA, and can probably contributes significantly to the intake of health-promoting phenolic compounds [Gabriela Burgos*, Walter Amoros, Lupita Muñoa, Paola Sosa, Edith Cayhualla, Cinthia Sanchez, Carlos Díaz and Merideth Bonierbale (International Potato Center, Av. La Molina 1895, PO Box 1558, Lima, Peru), *Journal of Food Composition and Analysis*, 2013, **30**(1), 6-12].

NPARR 4(2), 2013-0225 **Sensory evaluation of pigmented flesh potatoes (*Solanum tuberosum* L.)**

Pigmented potato cultivars were ranked by a consumer panel for overall acceptance, and acceptance of aroma, appearance, and flavor. Potatoes were analyzed for total phenolics, anthocyanins and carotenoids. Concentrations of total phenolics in yellow and purple potato cultivars were 2-fold greater ($P < 0.001$) than in the white cultivar. Anthocyanins were low to non-detectable in white and yellow potatoes. Purple potatoes anthocyanin concentration was 20-fold greater ($P < 0.001$) than in yellow potatoes. Carotenoid concentrations in white and purple potatoes were similar, while yellow potatoes had a 45-fold greater carotenoids concentration compared to white and purple

potatoes. Consumers ranked the aroma and appearance of white and yellow potatoes higher than purple ($P < 0.05$). However, no significant differences were observed in overall acceptance between the potato cultivars. These results suggest that consumers may be willing to consume pigmented potatoes, which are beneficial to health due to their higher antioxidant content [Kerrie L. Kaspar, Jean Soon Park, Charles R. Brown, Karen Weller, Carolyn F. Ross, Bridget D. Mathison, Boon P. Chew*(School of Food Science, Washington State University, Pullman, USA), *Food and Nutrition Sciences*, 2013, 4(1), Article ID: 26766, 5 pages DOI:10.4236/fns.2013.41011].

NPARR 4(2), 2013-0226 Quality of fresh-cut purple-fleshed sweet potatoes after X-ray irradiation treatment and refrigerated storage

The effect of X-ray irradiation on the quality of fresh-cut, refrigerated purple-fleshed sweet potato (PFSP) cubes was investigated. Packaged sweet potato cubes were treated with 0, 250, 500, 750 or 1000 Gy X-ray irradiation and stored at $4 \pm 1^\circ\text{C}$ for 14 days. After 14 days, total aerobic bacteria counts were 4.1 and 3.2 \log_{10} CFU g^{-1} , and mould-yeast counts were 3.3 and 3.0 \log_{10} CFU g^{-1} in 750 and 1000 Gy treated samples, respectively. Doses up to 1000 Gy did not affect the firmness, moisture content and anthocyanin content of PFSP cubes throughout storage. PFSP cubes' flesh colour did not change during the first week of storage, but lightness (L^*) increased after 14 days. Also, irradiation doses at 750 and 1000Gy decreased saturation (C^*) significantly, producing duller flesh colour than controls. Results indicate that X-ray irradiation treatment at doses up to 1000 Gy can reduce microbial populations while maintaining the physical quality and anthocyanin content of

PFSP cubes up to 14 days of storage [Manolya E. Oner* and Marisa M. Wall (U.S. Department of Agriculture, Agricultural Research Service, U.S. Pacific Basin Agricultural Research Centre, Hilo, HI, USA), *International Journal of Food Science & Technology*, 2013, **48**(10), 2064-2070].

NPARR 4(2), 2013-0227 The quality of protein of coloured fleshed potatoes

Potatoes of purple varieties and red flesh colour were estimated as the important food product containing valuable protein. Amino acids concentration and protein nutritive value of coloured potatoes were analysed and compared with traditional yellow-fleshed varieties. Studies comprised potatoes of 13 varieties: 7 of purple-fleshed, four of red-fleshed and two of yellow-fleshed. There were observed differences between studied potatoes with respect to dry matter, starch and protein content as well as to amino acids concentration and protein quality independently on flesh colour. Potatoes of low as well of high content of total protein, independently on flesh colour, characterised similar protein quality, like for example varieties of Blaue Anneliese and Highland B. Red or Blue Congo and Salad Blue. Leucine limited the quality of majority of coloured fleshed potato varieties used for the experiment. The best amino acid profiles and protein quality confirmed by chemical scores and EAA index values characterised purple fleshed Vitelotte and Blaue Anneliese, yellow fleshed Verdi as well as red fleshed Herbie 26, Highland B. Red and Rosemarie [A. Pęksa*, A. Kita, K. Kułakowska, M. Aniołowska, K. Hamouz and A. Nemś (Department of Food Storage and Technology, Faculty of Food Science, Wrocław University of Environmental and Life Sciences, Poland), *Food Chemistry*, 2013, **141**(3), 2960-2966].

WOOD

NPARR 4(2), 2013-0228 Merchantable timber production in *Dalbergia sissoo* plantations across Bangladesh: regional patterns, management practices and edaphic factors.

Dalbergia sissoo (sissoo) is an extensively planted tree species in Bangladesh, primarily because of its fast growth rate and multiple economic benefits. However, only a few studies have quantified baseline timber volumes attainable under sissoo cultivation in Bangladesh, and even fewer since large-scale sissoo dieback occurred in the mid- and late 1990s. Using data from 72 plantations across five Bangladeshi regions, we derived region-specific rotation-age volume estimates for sissoo. We also examined how sissoo volumes were correlated with plantation characteristics (plantation age, per cent mortality, per cent sissoo and tree density) and soil characteristics (texture, soil pH and organic matter). Sissoo volume estimates differed significantly across regions, ranging from 52.0-80.0 m³ ha⁻¹ in the Khulna and Chuadanga regions respectively. Our highest estimates were considerably lower than virtually all reported sissoo volume estimates due to high tree mortality in the plantations we surveyed (46.4±11.3% of stems). Sissoo volume was negatively associated with soil clay content whereby the lowest region-specific rotation-age volumes associated with the highest average clay content. Results of this study suggest sissoo plantations in Bangladesh are likely to yield less revenue earnings than they have historically or compared with other commercial plantation species [Hossain S. M. Y. and Martin A. R., *Journal of Tropical Forest Science*, 2013, **25**(3), 299-309]

NPARR 4(2), 2013-0229 Correlations among the heart/sapwood ratio of eucalyptus wood, yield and charcoal properties

Quantification of heartwood and sapwood in wood is necessary because the percentage of

variation is important for the different uses of wood. The objectives of this study were to determine the heartwood/sapwood ratio in Eucalyptus clones, as well as verifying its correlations with wood density, charcoal yield and its properties. The experiment was carried out according to a randomized design with six treatments (clones) with three replications (trees), totaling eighteen sampling units. Pearson correlation coefficient was used to determine the correlations among heartwood/sapwood ratio and the other properties. Smaller heartwood/sapwood ratios are related to higher wood specific gravity and higher charcoal yield. Lowest heart/sapwood ratios provide higher bulk density of charcoal and higher fixed carbon contents, and lower ash and volatile matter contents. Average values of heart/sapwood ratio ranged from 0.49 to 1.01. One of the clones tested was statistically superior to the others for charcoal production [Pereira, B. L. C., Oliveira, A. C., Carvalho, A. M. M. L., Carneiro, A. de C. O., Vital, B. R. and Santos, L. C. *Scientia Forestalis*, 2013, **41** (98), 217-225].

NPARR 4(2), 2013-0230 The effects of heat treatment on some mechanical properties of juvenile wood and mature wood of *Eucalyptus grandis*

Heat treatment is a well-known method for modifying wood that is applied in different ways, and treatment schedules change from tree to tree. This treatment improves the physical properties of wood but, in general, it reduces the mechanical properties of wood. The effects of heat treatment on the mechanical properties of juvenile and mature wood of the same tree species have not been well-defined. Therefore, we focused our study on the differences in the mechanical properties of juvenile wood and mature wood of *Eucalyptus grandis* after both were subjected to heat treatment. Wood samples were treated at temperatures of 120, 150, and 180°C for 4, 6, and 8 h. The test results showed that decreases in the mechanical properties of juvenile wood (e.g., modulus of elasticity (MOE),

modulus of rupture (MOR), compression strength (CS), and impact bending (IB)) were greater than the decreases that occurred in mature wood that was heat treated at the same conditions [Bekir Cihad Bal and İbrahim Bektaş *Drying Technology: An International Journal*, 2013, **31**(4), 479-485].

NPARR 4(2), 2013-0231 Hormonal effect on the behaviour of semi hardwood cuttings of *Jatropha curcas*

Jatropha curcas, commercially important tree species used to produce biofuels, is known for its multipurpose benefits and its role in agro forestry. Present study examines the amenability of different *J. curcas* strains viz. DARL-1, DARL-2, CJC-18 and CJC-19 through semi

hardwood cuttings treated with hormones [Indole 3 acetic acid, α -Naphthalene acetic acid and Indole 3 butyric Acid (200 ppm)]. The exogenous plant hormones significantly affected the cuttings of different cultivars in early emergence of shoots, shoots number, shoot length (cm) and leaves per cutting as recorded in the study. The effectiveness was in the order IBA > NAA > IAA when applied to the cuttings. Among the different strains DARL-2 followed by DARL-1 showed better response to hormones as compared to CJC-18 and CJC-19. Over all, it was concluded that semi hardwood cuttings of DARL-2 and DARL-1 treated with IBA 200 ppm can be used for the mass propagation of *J. curcas* under Central Western Himalayas of Uttarakhand [Anuja Kumari; Arya, M. C.; Joshi, P. K. and Ahmed, Z., *Indian Forester*, 2013, **139**(2), 150-154].

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

CULTIVATION

NPARR 4(2), 2013-0232 Regeneration and assessment of genetic fidelity of the endangered tree *Moringa peregrina* (Forsk.) Fiori using Inter Simple Sequence Repeat (ISSR)

Moringa peregrina is an endangered species of Moringaceae. *M. peregrina* is a multipurpose tree with a wide variety of potential uses including its medicinal activity. In this study, a rapid and efficient micropropagation protocol for *M. peregrina* has been established. *In vitro* germinated seedlings were cultured on Murashige and Skoog (MS) medium supplemented with different levels of either 6-benzyladenine (BA) or kinetin (Kin). The maximum shoot proliferation of 6.5 shoots per explant with 100% shoot proliferation rate was observed on MS medium supplemented with 1.0 mg/l BA. On the other hand, MS medium supplemented with 1 mg/l indole-3-butyric acid (IBA) resulted in the maximum number of roots. Micropropagated plants were successfully acclimatized. Genetic stability of micropropagated plants was assessed using Inter-Simple Sequence Repeat (ISSR). The amplification products were monomorphic in all *in vitro* grown plants. No polymorphism was detected indicating the genetic integrity of *in vitro* propagated plants. This micropropagation protocol could be useful for raising genetically uniform plants for plant propagation and commercial cultivation [Al Khateeb, W., Bahar, E., Lahham, J., Schroeder, D. and Hussein, E.* (Department of Biological Sciences, Yarmouk University, Irbid, Jordan), *Physiology and Molecular Biology of Plants*, 2013, **19**(1), 157-164].

NPARR 4(2), 2013-00233 Propagation and production of Gac (*Momordica cochinchinensis* Spreng.), A greenhouse case study

Greater cultivation of the underutilised Gac fruit, *Momordica cochinchinensis*, by poorly resourced householders and farmers would potentially improve livelihoods, and, on a larger scale, meet the increasing demand for Gac as a health product. Cultivation methods need to be developed to suit small- and large-scale production and must consider the unpredictable ratio of male to female plants grown from seed, and slow growth induced by cool temperatures. In this study, we examined the responses of Gac to propagation and protected cropping techniques to identify potential methods for increasing production. Plants germinated from seed in seed-raising mix under warm and humid conditions were grown hydroponically to maturity in a climate-controlled greenhouse during a temperate winter, producing fruits that were harvested ripe, from 44 weeks after sowing. Cuttings taken from female plants were dipped in indole-3-butyric rooting hormone powder or gel, or were left untreated, and then placed in rock wool, potting mix, water or closed media sachet. All treatment combinations, with the exception of the untreated potting mix, permitted the development of healthy plants in a second greenhouse crop. Growing plants from seed, then vegetatively increasing the number of productive female plants by cuttings is a means to increase Gac production with limited resources. Gac production using greenhouse technology, as described here for the first time, is relevant to other temperate regions. The finding that larger fruits have a higher percentage of edible aril than smaller fruits provides a new area of investigation towards enhancing production [Parks, S.E., Murray, C.T., Gale, D.L., Al-Khawaldeh, B. and Spohr, L.J.* (Central Coast Primary Industries Centre, Locked Bag 26, Gosford, NSW 2250, Australia), *Experimental Agriculture*, 2013, **49**(2), 234-243].

POSTHARVEST TECHNOLOGIES

NPARR 4(2), 2013-0234 Effects and possible mechanisms of tea tree oil vapor treatment on the main disease in postharvest strawberry fruit

The purpose of this study was to investigate the effect of tea tree oil (TTO) against the main fungal disease in strawberries and a possible mechanism for the effects. TTO vapor exhibited a higher activity against spore germination and mycelial growth of *Botrytis cinerea* and *Rhizopus stolonifer* under *in vitro* conditions. TTO vapors at 0.9 g/L significantly reduced artificially inoculated gray mold and soft rot *in vivo*, and treated strawberries maintained a fresher quality than untreated strawberries during storage. In addition, this treatment also enhanced the resistance of strawberries against *B. cinerea*, which caused a higher hydrogen peroxide (H₂O₂) level and activities of superoxide dismutase (SOD), phenylalanine ammonia-lyase (PAL), peroxidase (POD) and β-1, 3-glucanase during the first period of incubation. These results indicate that TTO can reduce fruit decay, possibly by inhibiting pathogen growth directly and inducing disease resistance indirectly, and TTO vapor may provide an alternative means of controlling disease in strawberries [Xingfeng Shao, Hongfei Wang, Feng Xu and Sai Cheng (Department of Food Science and Engineering, Ningbo University, Ningbo 315211, Zhejiang, PR China), *Postharvest Biology and Technology*, 2013, **77**, 94-101].

NPARR 4(2), 2013-0235 Effect of post-harvest treatment and storage conditions on quality of plum cv. Santa Rosa

Freshly harvested fruits were subjected to post-harvest treatments of 4% calcium chloride, 0.1% carbendazim, wax coating, High Density Poly-Ethylene (HDPE) packaging with ethylene absorbants and HDPE packaging with 1.5% ventilation. The treated fruits were kept under

two storage conditions viz ambient and Zero Energy Cool Chamber and were evaluated at periodical intervals for various physico-chemical and sensory attributes. Among the post harvest treatments fruits treated with 4% calcium chloride and kept in Zero Energy Cool Chamber maintained higher values of firmness, TSS, acidity, sugars, minimum values of physiological loss in weight, spoilage and scored higher acceptability scores [Hayat Shazia, Mir M.A., Singh D.B., Hayat N., and Khan F.U. (Department of Horticulture, Allahabad Agricultural Institute Deemed University, Allahabad -211 007), *Progressive Horticulture*, 2013, **45**(1), 89- 94].

NPARR 4(2), 2013-01236 Water management and its effect on the postharvest quality of fresh-cut vegetables

This review discusses water management for the production of leafy vegetables and its impact on the quality and safety of the fresh-cut product. The influence of different irrigation water doses on the quality and safety characteristics of fresh-cut lettuce, more specifically Romaine and Iceberg lettuce, is presented. The results of studies show that using 25% less irrigation water prolongs the storage period (shelf life), decreases browning on the cut edge of lettuce pieces and preserves microbiological quality. The opposite and therefore negative effects have been found when 25% and 50% more irrigation water were used. Therefore, lettuce growers can reduce by 25% the irrigation water used mostly based on the benefits in the shelf life of fresh-cut lettuce, but also because it reduces farming costs, improves sustainability and above all, it alleviates the increasing water scarcity due to climate change. Efforts should be made to optimize water management for each type of crop, as irrigation has a significant influence on the post-cutting quality of the product. Agricultural practices that reduce the amount of water for irrigation should be adopted, while maintaining yield and quality

[Gil MI, Tudela, JA Luna and MC Allende A, *Stewart Postharvest Review*, 2013, **9**(3), 1-8]

NPARR 4(2), 2013-0237 Effects of auxin, gibberellin, and cytokinin on petal blackening and flower opening in cut lotus flowers (*Nelumbo nucifera*)

Cut lotus flowers (*Nelumbo nucifera* Gaertn. cv. Saddabutra), which are sold as closed buds, fail to open and show rapid petal blackening when placed in vase water. We investigated the effect on bud opening and petal blackening of treatments with an auxin, a gibberellic acid, and two cytokinins. Continuous treatment of cut flowers placed in an aqueous solution containing ≥ 0.1 mM naphthylacetic acid (NAA) hastened petal blackening and resulted in stem curvature, but lower concentrations (0.01-10 μ M) had no effect. Depending on the experiment, continuous treatment with 0.03-0.45 mM of the gibberellin GA₃ delayed petal blackening by 0.5-1.5 d (controls lasted 4 d), but in experiments during the hot/rainy season (May-September) GA₃ had no effect. At 25-100 μ M the cytokinin benzyladenine (6-benzylaminopurine; BA) delayed petal blackening by about 1.0 d. Similarly, the cytokinin thidiazuron (TDZ) delayed petal blackening by about 1.0 d, at 1.25-2.5 μ M. Pulse treatments had similar or better effects. A 3-12 h pulse treatment with 0.45 mM GA₃ or with 10 μ M TDZ delayed the time to petal blackening by 1.1-2.3 d. However, none of these treatments promoted bud opening. It is concluded, nonetheless, that a pulse treatment with GA₃ or TDZ seems promising for practice [Wachiraya Imsabai and Wouter G. van Doorn (Department of Horticulture, Faculty of Agriculture at Kamphaeng Saen, Kasetsart

University, Kamphaeng Saen Campus, Nakhon Pathom 73140, Thailand), *Postharvest Biology and Technology*, 2013, **75**, 54-57].

NPARR 4(2), 2013-0238 Carrageenan as an alternative coating for papaya (*Carica papaya* L. cv. Eksotika)

Edible coatings are gaining popularity compared to other types of packaging due to their more environmental friendly nature and ability to carry active ingredients. In this study, a two-factor central composite design (CCD) was used to optimize a carrageenan-based edible coating formulation for coating of 'Eksotika' papayas. The effect of a carrageenan-based [carrageenan (0.2–0.8%, w/v) and glycerol (0–1%, w/v)] coating on firmness and colour components (*L*, *a* and *b* values) of papaya was evaluated. From the optimization study, no significant ($p > 0.05$) lack of fit was found for the reduced model for all response variables (firmness, *L*, *a* and *b* values) tested. Coefficients of determination (R^2) ranging from 0.767 to 0.952 were obtained for these responses. From the multiple response optimization analysis, a combination of 0.78% (w/v) carrageenan with 0.85% (w/v) glycerol for a carrageenan-based coating was predicted to give desirable effects for the response variables tested, with no significant ($p > 0.05$) differences between the experimental and predicted values [Hanisah Mustaffa Hamzah, Azizah Osman*, Chin Ping Tan and Farinazleen Mohamad Ghazali (Department of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia), *Postharvest Biology and Technology*, 2013, **75**, 142-146]

Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. **National conference on emerging trends in medicinal plants and herbal products**, December 13th 2013, Department of Botany; Virudhunagar, Tamil Nadu; E-mail: mehalingamp@yahoo.co.in; Website: <http://www.vhnsnc.edu.in>.
2. **2nd Asian Congress on Biotechnology (ACB 2013)**, Dec 19th 2013, Department of Biochemical Engineering and Biotechnology, Asian Federation of Biotechnology, New Delhi; Website: <http://web.iitd.ac.in/~sundar/acb2013.htm>
3. **Harnessing Natural Resources for Sustainable Development Conference**, 29th to 31st January 2014, Guwahati, Assam, India; Website: <http://hnrsc.cottoncollege.org.in>
4. **National Conference on Evolutionary Trends in Biological and Pharmaceutical Chemistry**, 30th to 31st January 2014, Tiruchirappalli, TamilNadu, India; Website: <http://www.ncetbp.in>.
5. **National Conference on Environment: Pollution & Protection**, 30th January to 1st February 2014, Durgapur, West Bengal, India; Website: http://www.nitdgp.ac.in/all_pdf/ees/-NIT_Brochure_Geology.pdf
6. **Future Prospects of Advancements in Biological Sciences, Health Issues & Environmental Protection**, Feb 08th 2014, Society of Biosciences, Health Issues and Environmental Protection, Lucknow , U.P., India; Website; <http://www.fabhep.in>
7. **5th Global Summit on Medicinal and Aromatic Plants Conference** 8th to 12th December 2013 Miri, Sarawak, India Website: <http://www.gosmap2013.com>
8. **6th International Congress of Environmental Research (ICER-13)**, 19th to 21st December 2013, Aurangabad, Maharashtra, India, Website: <http://www.icer13.jerad.org>

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: