From the Director’s Desk

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

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Gangan Prathap
(Former Director)
CSIR-NISCAIR
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NATURAL PRODUCTS AND RESOURCES REPOSITORY (NPARR)
(A Quarterly Electronic Repository of Current Information on Natural Products and Resources)

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NPARR 5(1), 2014-01 Effective clarification of pomegranate juice: A comparative study of pretreatment methods and their influence on ultrafiltration flux

The aim of this study was to introduce an effective pre-clarification step in order to improve performance of subsequent ultrafiltration (UF) and to obtain a high quality pomegranate juice (PJ) with improved clarity. The effects of various pre-clarification treatments utilizing gelatin, bentonite and polyvinyl polypyrrolidone (PVPP) on UF performance were evaluated comparatively through analysis of flux behavior and membrane fouling. Quality attributes of the PJs (pH, total acidity, total phenolic content, total monomeric anthocyanins, individual phenolic acids, organic acids, total antioxidant activity and color characteristics) following various pre-clarification treatments were also investigated. On the whole, pre-clarification treatments that included PVPP exhibited a higher overall adsorption capacity, especially of low molecular weight phenolics. The best results with regard to both the fouling behavior of the UF membrane and the juice clarity were achieved by sequential application of PVPP and bentonite. Since lesser amounts of fining agents were used in the pre-clarification treatments, quality attributes of PJ were well preserved comparing conventional clarification applications [Pelin Onsekizoglu Bagci* (Trakya University, Department of Food Engineering, 22180 Edirne, Turkey), Journal of Food Engineering, 2014, 141, 58–64].

NPARR 5(1), 2014-02 Impact of sugar-sweetened beverages on blood pressure

The impact of sugar-sweetened beverages (SSBs) on blood pressure (BP) has been debated, with some evidence suggesting that their increased intake is related to higher risk of developing hypertension. We conducted a systematic review exploring the relation between consumption of SSB and BP. A comprehensive search in 5 electronic databases along with a bibliography search was performed. The keywords “sugar sweetened beverages,” “sugary drinks,” “added sugars,” “blood pressure,” and “hypertension” were indexed in all combinations. Studies were included that reported the effects of intake of SSBs on BP. We excluded studies with <100 subjects and those involving subjects aged <12 years. Of 605 potentially relevant studies, a total of 12 studies (409,707 participants) met our inclusion criteria; 6 were cross sectional studies, whereas the rest were prospective cohort studies. All 12 studies showed positive relation between increased SSB intake and hypertension; however, statistical significance was reported in 10 of these studies. Of the 12 studies, 5 reported an increase in mean BP whereas 7 reported an increase in the incidence of high BP. In conclusion, our systematic review shows that the consumption of SSBs is associated with higher BP, leading to increased incidence of hypertension. Restriction on SSB consumption should be incorporated in the recommendations of lifestyle modifications for the treatment of hypertension. Interventions to reduce intake of SSBs should be an integral part of public health strategy to reduce the incidence of hypertension [Aaqib Habib Malik* (Yale University, United States), Yasir Akram, Suchith Shetty, Senada Senda Malik and Valentine Yanchou Njike), American Journal of Cardiology, 2014, 113 (9), 1574-1580].

NPARR 5(1), 2014-03 Shelf-life evaluation of natural antimicrobials for Concord and Niagara grape juices

This study was conducted to evaluate the effectiveness of natural antimicrobials for shelf-life extension of cold-filled still and carbonated Concord and Niagara grape juices, which have
traditionally been preserved with chemical preservatives. Commercial juices were inoculated with a spoilage yeast cocktail of *Dekkera, Kluveromycetes, Brettanomyces*, and *Zygosaccharomyces* at $10^2$ and $10^3$ CFU/ml. The following agents were added to still juices: no preservative (negative control), 0.05% potassium sorbate plus 0.05% sodium benzoate (positive control), 0.1 or 0.2% cultured dextrose, 250 ppm of dimethylidicarbonate (DMDC), 10 or 20 ppm of natamycin, and 250 ppm of DMDC plus 5 or 10 ppm of natamycin. Carbonated juice was treated with the negative control, positive control, and 250 ppm of DMDC plus 10 ppm of natamycin. Microbial stability of samples was assessed every 2 weeks during 6 months of storage at 21°C by yeast enumeration and measurement of turbidity, pH, and Brix. Juices were deemed spoiled when yeast counts exceeded $10^6$ CFU/ml. Cultured dextrose was not effective at levels tested in both types of juice. The most promising results were obtained with DMDC and natamycin combination treatments in still Niagara juice and in carbonated Concord and Niagara juices. In these treatments, shelf-life extension similar to that of the positive control (153 to 161 days) was achieved while maintaining similar turbidity, pH, and °Brix. Spoiled juices had lower pH and °Brix values and higher turbidity due to microbial activity and increased in microbial levels [Siricururatana, P.*, Iyer, M. M.; Manns, D. C., Churey, J. J., Worobo, R. W. and Padilla-Zakour, O. (Department of Food Science, Cornell University, New York State Agricultural Experiment Station, Geneva, New York 14456, USA), *Journal of Food Protection*, 2013, No. 1(January), 72-78].

**NPARR 5(1), 2014-04 Amounts of artificial food colors in commonly consumed beverages and potential behavioral implications for consumption in children**

Artificial food colors (AFCs) are widely used to color foods and beverages. The amount of AFCs the Food and Drug Administration has certified over the years has increased more than 5-fold since 1950 (12 mg/capita/day) to 2012 (68 mg/capita/day). In the past 38 years, there have been studies of adverse behavioral reactions such as hyperactivity in children to double-blind challenges with AFCs. Studies that used 50 mg or more of AFCs as the challenge showed a greater negative effect on more children than those which used less. The study reported here is the first to quantify the amounts of AFCs in foods (specifically in beverages) commonly consumed by children in the United States. Consumption data for all foods would be helpful in the design of more challenge studies. The data summarized here should help clinicians advise parents about AFCs and beverage consumption [Laura J. Stevens*, John R. Burgess, Mateusz A. Stochelski and Thomas Kuczek (Laura J. Stevens, Nutrition Science Department, Purdue University, 700 W. State Street (G-46), West Lafayette, IN 47907, USA), *Clin Pediatr* April 24, 2014].
Effects of the strawberry (*Fragaria ananassa*) purée elaboration process on non-anthocyanin phenolic composition and antioxidant activity

Strawberries are harvested in a short period of time frequently involving fruit surplus. This paper studies the impact of the strawberry purée elaboration process on the chemical composition of the final products. Thirty-two phenolic compounds were studied by Liquid Chromatography with Diode Array Detector (LC-DAD) and Mass Spectrometry (LC-MS). An LC-DAD method was set up and validated and the non-anthocyanin phenolic profile was quantified at the different steps of production, for three elaboration processes and two harvests (2011 and 2012). We have tentatively identified apigenin-7-O-glucoside, luteolin-3-O-glucuronide, malonyl caffeoylquinic acid, *trans*-resveratrol glucoside and caffeoylglucaric isomer. (+)-Catechin and HHDP-galloylglucose were the most abundant phenolic compounds. The most abundant flavonol was kaempferol-3-glucoside.

The purée maintains the fruit’s non-anthocyanin phenolic composition and *in vitro* antioxidant activity as determined by ORAC and DPPH methods. This fact suggests that strawberry purée could be considered a valuable ingredient for producing food derivatives [M. Antonia Álvarez-Fernández, Ruth Hornedo-Ortega, Ana B. Cerezo, Ana M. Troncoso and M. Carmen García-Parrilla*(Area of Nutrition and Food Science, School of Pharmacy, University of Seville, C/P. García González No 2., Sevilla 41012, Spain), *Food Chemistry*, 2014, 164(1), 104-112].

Antioxidant activity, total phenolic and flavonoids contents of three herbs used as condiments and additives in pickles products

Heracleum lasiopetalum Boiss, *Kelussia odoratissima* Mozaff., and Echinophora platyloba DC. belong the Apiaceae family. They are Iranian endemic plants. These three herbs have been used as food additives in traditional preparations such as pickles. Antioxidant activity (AA) of methanol extracts (ME) of the plants was evaluated by three assays, including DPPH, FRAP, and TEAC. From all three assays, comparing all the MEs for their IC50 and EC1 values, *E. platyloba* had the highest AA. Total phenolic content (TPC) of the extracts ranged from 74 to 120 mg TAE/g. The extract of *H. lasiopetalum* exhibited the highest TPC. The flavonoids content (FC) of the extracts ranged from 7.63 to 14.52 mg RE/g, from which the extract of *E. platyloba* had the highest flavonoids concentration. A positive correlation between the FC and AA in DPPH assay was found. A significant correlation was also found between the TPC and AA in FRAP assay. These results suggested that the level of AA in these plants varied in a great extent. The results indicated that extract of *E. platyloba* could be an important dietary source of flavonoids compounds with high antioxidant capacity. In addition, *E. platyloba* can be used as an alternative preservative and natural flavor instead of synthetic ones in food industry (especially pickles) [Abdollah Ghasemi Pirbalouti (Shahrekord Branch Islamic Azad University Research Centre of Medicinal Plants & Ethnoveterinary P.O. Box: 166 Shahrekord, Iran / Medicinal Plants ProgramStockbridge School of Agriculture College of Natural Science University of Massachusetts Amherst, MA 01003, USA), *Herba Polonica*, 2013, 59(3), 51-62].
COSMETICS/COSMECEUTICALS

NPARR 5(1), 2014-07 An ethnobotanical survey of medicinal plants used in Rwanda for voluntary depigmentation

Voluntary depigmentation, a very common practice in sub-Saharan Africa, often performed with pharmaceutical products diverted from their pharmacological use, may cause severe dermatological and systemic side effects. The present work aims at investigating whether and which herbs were used in Rwanda for similar purposes before the advent of the current depigmentation craze; this may give clues at herbal treatments possibly advantageous compared to current products.

Compared to other pathophysiological conditions, there is currently a very limited use of herbal preparations for depigmentation. Five herbs had a citation percentage equal or above to 50%, *Brillantaisia cicatricosa* Lindau (Acanthaceae), *Chenopodium ugandae* (Aellen) Aellen (Chenopodiaceae), *Dolichopentas longiflora* Oliv. (Rubiaceae), *Protea madiensis* Oliv. (Proteaceae) and *Sesamum angolense* Welw. (Pedaliaceae); *in vitro* experiments indicated a modulation of melanogenesis by these plant extracts, confirming the information obtained from traditional healers.


NPARR 5(1), 2014-09 Medicinal plants as anti-ageing materials: A Review

Natural plant compounds show a wide range of activities like anti-cancer, anti-inflammatory, and anti-ageing. Ageing is due to complicated biochemical processes. This review focuses on some natural compounds serve as anti-ageing materials. Some materials such as phenolics, carotenoids, terpenoids or alkaloids may have an important role as antioxidant compounds and as free radical scavengers. These constituents find at seeds, leaves, roots or fruits. Most of these materials can protect skin against wrinkle and other skin disease. Some of important anti-ageing plants are *Aloe vera*, *Vitis vinifera*, *Triticum sativum*, *Dioscorea villosa*, *Camelia sinensis* [Shahram Sharafzadeh (Department of Agriculture, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran), Global Journal of Medicinal Plant Research, 2013, 1(2), 234-236].

NPARR 5(1), 2014-10 Antioxidant, antimelanogenic, and skin-protective effect of sesamol

Sesame contains high nutritional value and important bioactive lignans which are good for the fruits of Nutmeg (*Myristica fragrans*). The plants have been reported in the literature having good anti-microbial, anti-oxidant and anti-inflammatory activity. Various formulation batches i.e., F1 to F15 were prepared and evaluated for various parameters like colour, appearance, consistency, washability, pH, spreadability and antimicrobial activity. Optimized formulation was compared with the marketed preparation. Amongst all the formulation studied batch F4 was found optimum for all the parameters. It is a very good attempt to establish the herbal gel containing hydro-alcoholic extract of neem leaves (*Azadirachta indica*) and fruits of nutmeg (*Myristica fragrans*) [K. Yamini* and T. Onesimus (Department of Pharmacology, DCRM Pharmacy College, Inkkollu, India), Int J Pharm Bio Sci, 2013, 4(2), 956 - 960].
health-promoting effects including sesamol. Sesamol is found in trace amounts in sesame. The biological action from the trace amounts of sesamol found might indicate its efficacy. This paper presents a systematic study of the antimelanogenic and skin-protective effects (antioxidant) of sesamol and positive compounds. The results showed that sesamol had the most scavenging 2,2-Diphenyl-1-picrylhydrazyl hydrate (DPPH) radical with an IC50 value < 14.48 µM. The antioxidant power (Ferric reducing antioxidant power value) of sesamol at a concentration of 0.1129 µM was 189.88 ± 17.56 µM FeSO4. Sesamol inhibited lipid peroxidation with an IC50 value of 6.15 ± 0.2 µM. Moreover, sesamol possessed a whitening effect by inhibition of mushroom tyrosinase at an IC50 value of 1.6 µM and an inhibition of cellular tyrosinase with 23.55 ± 8.25% inhibition at a concentration of 217.2 µM. Sesamol exhibited high antioxidant and anti-tyrosinase activity compared to the positive control, kojic acid and β-arbutin. Sesamol from edible sesame seed could therefore, have an alternative cosmeceutical purpose [Srisayam M*, Weerapreeyakul N, Barusrux S and Kanokmedhakul K (Graduate School, Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen, 40002, Thailand (M.S.). Journal of Cosmetic Science, 2014, 65(2):69-79].

NPARR 5(1), 2014-011 Rosmarinus officinalis extract suppresses propionibacterium acnes–induced inflammatory responses

Propionibacterium acnes is a key pathogen involved in the progression of acneinflammation. The development of a new agent possessing antimicrobial and anti-inflammatory activity against P. acnes is therefore of interest. In this study, we investigated the inhibitory effect of rosemary (Rosmarinus officinalis) extract on P. acnes–induced inflammation in vitro and in vivo. The results showed that ethanolic rosemary extract (ERE) significantly suppressed the secretion and mRNA expression of proinflammatory cytokines, including interleukin (IL)-8, IL-1β, and tumor necrosis factor-α in P. acnes–stimulated monocytic THP-1 cells. In an in vivo mouse model, concomitant intradermal injection of ERE attenuated the P. acnes–induced ear swelling and granulomatous inflammation. Since ERE suppressed the P. acnes–induced nuclear factor kappa-B (NF-κB) activation and mRNA expression of Toll-like receptor (TLR) 2, the suppressive effect of ERE might be due, at least partially, to diminished NF-κB activation and TLR2-mediated signaling pathways. Furthermore, three major constituents of ERE, carnosol, carnosic acid, and rosmarinic acid, exerted different immumodulatory activities in vitro. In brief, rosmarinic acid significantly suppressed IL-8 production, while the other two compounds inhibited IL-1β production. Further study is needed to explore the role of bioactive compounds of rosemary in mitigation of P. acnes–induced inflammation [Tsung-Hsien Tsai,1 Lu-Te Chuang,2 Tsung-Jung Lien,3 Yau-Rong Liing,3 Wei-Yu Chen,4 and Po-Jung Tsai* (Department of Human Development and Family Studies, National Taiwan Normal University, 162 Hoping E. Rd., Sec. 1, Taipei 10610, Taiwan), Journal of Medicinal Food, 2013, 16(4), 324-333].
DYES (incl. Food colorants)

NPARR 5(1), 2014-012 Marine natural pigments: Chemistry, distribution and analysis

Natural pigments are a group of chemically heterogeneous molecules that occur across several taxonomical groups. Due to the remarkable chemistry of marine organisms, many species exhibit a wide-range of colours, many of which display several biological properties and constitute an evolutionary adaptation.

In this work we review the state of the art regarding pigments from marine invertebrates, with special attention being given to the chemistry and distribution of these molecules, as well as relevant instrumental techniques for their analysis, such as LC–MS and HPLC–DAD. Some of the classes covered include tetrapyrroles, carotenoids, azulenes, indigo and quinines [David M. Pereira*, Patrícia Valentão and Paula B. Andrade (3B’s Research Group – Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, AvePark, 4806-909 Taipas, Guimarães, Portugal), Dyes and Pigments, 2014, 111, 124-134].

NPARR 5(1), 2014-013 Mechanical extraction of natural dye extracts from Bixa orellana seeds in spouted bed

Since the recent prohibition on use of the synthetic dye in several countries there is an increasing international interest for natural pigment. The use of annatto (Bixa orellana) seeds as a source of natural dye has been increased due to its lack of toxicity. In this paper, the mechanical extraction of the bixin from Bixa orellana seeds in a spouted bed has been studied. The results show that it is possible to efficiently extract this natural dye from Bixa orellana seeds in spouted bed. The effect of the insertion of a draft tube on the mechanical extraction of bixin was analyzed. The fluid dynamic aspects, the extracted mass, the yield and bixin content were quantified [M A S Barrozo, KG Santos and F G Cunha (Federal University of Uberlândia, School of Chemical Engineering, Brazil), Industrial Crops and Products, 2013, 45, 279-282].

NPARR 5(1), 2014-014 Studies on the application of natural dye extract from Bixa orellana seeds for dyeing and finishing of leather

The types of dyestuff that are used by tanneries generally vary depending on the product range needed along with the dictates of the fashion world. It is a fact that each tannery uses between 50 and 100 different types of dyestuffs. Leather industry primarily uses dyestuffs such as acid, basic, metal complex, reactive and sulfur dyes. Many of the synthetic dyes used for leather dyeing are difficult to degrade due to their complex structure and xenobiotic properties. Hence, there is a need for development of more degradable or natural materials for use as a coloring agent for leathers, which would eco benign. Thus, the present study aims at extraction of color from Bixa orellana seeds and employing the same in dyeing and finishing of leather. The leathers dyed and finished using the natural dye extract showed better coloring properties. It is the first time, where this material is reported for their use in leather processing [A. Tamil Selvi, R. Aravindhan, B. Madhan, J. Raghava Rao*(Chemical Laboratory, Central Leather Research Institute, Council of Scientific and Industrial Research, Adyar, Chennai 600 020, India), Industrial Crops and Products, 2013, 43, 84-86].

NPARR 5(1), 2014-015 Bacterial pigments and their applications

Natural pigments sourced from ores, insects, plants and animals were the colorants used since prehistoric period. Synthetic dyes which took the place of natural pigments in the
middle of 19th century still rule the field to the maximum extent in spite of its hazardous effect to humans, animals and environment. As an alternative to synthetic pigments, bacterial pigments due to their better biodegradability and higher compatibility with the environment, offer promising avenues for various applications. The industry is now able to produce some bacterial pigments for applications in food, pharmaceuticals, cosmetics and textiles. Extraction of bacterial pigments in relatively pure and concentrated forms is the main technological challenge. Optimization of fermentation process and the medium components are reported as key strategies for economic recovery of pigments. Research work needs to be carried out to formulate the fermentation media for each bacterial pigment on large scale by using economical and easily available sources for commercial process. Recent advances in synthetic biology, metabolic engineering efforts of bacteria will greatly expand the pigments that could be produced economically in sufficient amounts for industrial application. This review summarizes the current technology status and challenges, economics, novel strategies for production of bacterial pigments and metabolic engineering of bacteria with a focus on applications of bacterial pigments in food industry, pharmaceutical industry, dyeing as well as on other applications [Chidambaram Kullandaisamy Venil, Zainul Akmar Zakaria, Wan Azlina Ahmad* (Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia). Process Biochemistry, 2013, 48(7), 1065-1079].

There is an increasing interest in adding value to textiles by the use of natural products. Many of the plant materials, from which natural dyes are obtained, found to have some medicinal values. In the current study, dyeing materials were prepared from pomegranate (Punica granatum), wild mangosteen (Diospyros peregrine), myrabalan (Terminalia chebula), arjun (Terminalia arjuna), betel nut (Areca catech), onion (Allium cepa), tea (Camellia sinensis), neem (Camellia sinensis), eucalyptus (Eucalyptus cinerea) and dye flower (Coreopsis basalis). Cotton fabrics were dyed with the extracted colouring materials and were tested for their wash fastness to ensure the durability of the colour on the fabrics. Finally, the antimicrobial property of ten different natural dyed fabrics was tested against Bacillus subtilis (Gram positive) and Escherichia coli (Gram negative). The cotton fabrics dyed with extracts of arjun, betel nut, pomegranate, tea and onion were found to have antimicrobial activity against both the test bacteria at varying efficiency. The dyed fabrics also showed reasonably good wash fastness; hence have practical potential for adding antibacterial properties along with vibrant colours to textiles of medical and other delicate uses [S Datta*, MA Uddin, KS Afreen, S Akter, A Bandyopadhyay (Dept. of Microbiology, Primeasia University, HBR Tower, 9 Banani, Dhaka-1213, Bangladesh). Bangladesh J Sci Ind Res, 2013, 48(3), 179-184].
ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 5(1), 2014-017 Chemical composition and anti-inflammatory activity of the essential oils of Psidium guajava fruits and leaves

Psidium guajava L. (Myrtaceae) has been used traditionally against gastrointestinal disturbances and respiratory ailments. The chemical composition of the essential oil of both leaves and fruits were elucidated by gas–liquid chromatography/mass spectrometry (GLC/MS). Forty-five and forty-two compounds, accounting for 93.7% and 89.7% of the fruit and leaf oil, were identified, respectively. The dominant compounds were β-caryophyllene (17.6%) and limonene (11.0%) for the fruit oil and β-caryophyllene (16.9%) and selin-7(11)-en-4α-ol (8.3%) for the leaf oil. The radical scavenging activities of both essential oils were assessed by the diphenyl picrylhydrazyl (DPPH•) and deoxyribose degradation assays. Guava leaf oil reduced DPPH• radicals and prevented the degradation of the deoxyribose with IC50 values of 3.59 and 12.64 µg/mL. The in vitro cytotoxicity of the oils in HepG2 and MCF-7 carcinoma cells was examined using the SRB assay (IC50 32.53 and 49.76 µg/mL for the leaves and fruit oils against HepG2 cells). Inhibition of 5-lipoxygenase (5-LOX) was used to evaluate the anti-inflammatory activity of both oils (IC50 130.69 and 196.45 µg/mL for the leaves and fruit oils). The anti-inflammatory activity was explained via virtual docking of the major identified compounds to the main sites in the 5-LOX crystal structure [Sherweit H. El-Ahmady, Mohamed L. Ashour and Michael Wink* (Institute of Pharmacy and Molecular Biotechnology, Heidelberg University, Heidelberg, Germany), Journal of Essential Oil Research, 2013, 25(6), 475-481]

NPARR 5(1), 2014-018 Antimicrobial and antioxidant activities of the essential oil from onion (Allium cepa L.)

The aims of this study were to test the efficacy of essential oil of Allium cepa against food spoilage and food-borne pathogenic microorganisms and its antioxidant activity. The essential oil revealed an interesting antimicrobial effect against the tested microorganisms with the MIC and MBC values in the ranges of 0.18–1.80 mg/mL and 0.54–3.6 mg/mL, respectively. The antioxidant activities of the essential oil were investigated and the oil showed moderate antioxidant activities in ABTS assay (0.67 mg/mL as IC50 value), DPPH test (IC50 value = 0.63 mg/mL) and metal chelating assay (IC50 value of 0.51 mg/mL). Furthermore, the reducing power of the oil was dose dependent, and the reducing capacity of the oil was inferior to butylated hydroxytoluene, which is known to be a strong reducing agent. It was suggested that the essential oil from A. cepa may be a new potential source as natural antimicrobial and antioxidant agents applied in food system [Chun-Lin Ye*, De-Hui Dai and Wei-Lian Hu (School of Biological and Chemical Engineering, Zhejiang University of Science and Technology, Hangzhou 310023, PR China), Food Control, 2013, 30 (1), 48-53]

NPARR 5(1), 2014-019 Preservation of sensory and chemical properties in flavoured cheese prepared with cream cheese base using oregano and rosemary essential oils

The purpose of this study was to evaluate the effect of oregano and rosemary essential oils on the oxidative and fermentative stabilities of flavoured cheese prepared with cream cheese base. The studied samples were cream cheese (CC) and cream cheese with the addition of oregano (CO) and rosemary (CR) essential oils which were evaluated for peroxide (PV) and anisidine (AV) values, descriptive analysis and fermentation parameters as stability indicators during storage. The samples CO and CR showed higher stability during storage. On day 35, CO and CR exhibited lower PV (11.70 and 12.32 meq O2/kg, respectively) than CC. Also,
rancid flavour intensities were much higher in CC during storage showing ratings of 26.27 with respect to the ratings of 20.22 in CO and 20.67 in CR detected on storage day 35. Furthermore, the samples with essential oils treatments showed lower acidity and total viable counts (TVCs) and higher pH than CC. On storage day 35, CO samples had the highest pH (4.68), and the lowest acidity (1.24 mg lactic acid/100 g) and TVC (2.35 CFU/g). Oregano and rosemary essential oils demonstrated a protective effect against lipid oxidation and fermentation in flavoured cheese prepared with cream cheese base [Rubén H. Olmedo, Valeria Nepote and Nelson R. Grosso*(Química Biológica, Facultad de Ciencias Agropecuarias (UNC), IMBIV-CONICET, CC 509, 5000 Cordoba, Argentina), LWT - Food Science and Technology, 2013, 53(2), 409-417].

NPARR 5(1), 2014-020 Screening of fruit and leaf essential oils of Litsea cubeba Pers. from North-East India – Chemical composition and antimicrobial activity

Essential oils from the leaves and fruits of Litsea cubeba Pers. collected in the Assam and Arunachal Pradesh states in north-east India, were analyzed by gas chromatography (GC) and GC–mass spectrometry (GC–MS). On the whole, 117 components have been characterized. The two leaf oils (LC1, LC2) show sabinene as the main component; the other significant compounds for LC1 oil are α-pinene, terpine-4-ol, α-terpineol and myrcene, whereas for LC2 1,8-cineole and α-pinene are the other most important compounds. The three fruit oils (LC3, LC4 and LC5) were characterized by different profiles, indeed LC3 and LC4 showed a similar composition with citronellol and citronellal the main components, accounting for 70% and 10% of total oils, respectively. LC5, instead, presents geranial (c. 44%) and neral (c. 40%) as the main components, whereas citronellal reaches only c. 3%. Essential oils were evaluated for their antimicrobial activity against Staphylococcus aureus, Listeria monocytogenes, Escherichia coli, Pseudomonas aeruginosa, Candida albicans and Aspergillus niger. All microbial strains appeared sensitive to the cytotoxic activity of the essential oils under investigation. Leaf and fruit oils showed different levels of inhibition depending on their particular chemical composition; however, the LC5 sample was broadly the most effective [Anil Kumar Saikia, Dipak Chetia, Manuela DArrigo, Antonella Smeriglio, Tonia Strano and Giuseppe Ruberto *(Istituto del C.N.R. di Chimica Biomolecolare, Catania, Italy), Journal of Essential Oil Research, 2013, 25(4), 330-338].
FEED/FODDER

NPARR 5(1), 2014-021 Improving the fatty acid profile of winter milk from housed cows with contrasting feeding regimes by oilseed supplementation

Many studies show concentrations of nutritionally desirable fatty acids in bovine milk are lower when cows have no access to grazing, leading to seasonal fluctuations in milk quality if cows are housed for part of the year. This study investigated the potential to improve the fatty acid profiles of bovine milk by oilseed supplementation (rolled linseed and rapeseed) during a period of indoor feeding in both organic and conventional production systems. Both linseed and rapeseed increased the concentrations of total monounsaturated fatty acids, vaccenic acid, oleic acid and rumenic acid in milk, but decreased the concentration of the total and certain individual saturated fatty acids. Linseed resulted in greater changes than rapeseed, and also significantly increased the concentrations of \( \alpha \)-linolenic acid, total polyunsaturated fatty acids and total omega-3 fatty acids. The response to oilseed supplementation, with respect to increasing concentrations of vaccenic acid and omega-3 fatty acids, appeared more efficient for organic compared with conventional diets [S. Stergiadis, C. Leifert, C.J. Seal, M.D. Eyre, H. Steinshamn and G. Butler* (Nafferton Ecological Farming Group, School of Agriculture Food and Rural Development, Newcastle University, Nafferton Farm, Stocksfield, Northumberland NE43 7XD, UK), Food Chemistry, 2014, 164, 293-300].

NPARR 5(1), 2014-022 Utility of nettle (Urtica dioica) in layer diets as a natural yellow colorant for egg yolk

Yolk color is an important quality trait of eggs. Natural pigment sources are preferred by consumers. Synthetic pigments are banned in some production systems. As nettle (Urtica dioica) addition was found to substantially increase broiler skin yellowness, it was hypothesized to be a potent natural yolk coloring feed component. Therefore, the pigmentation by nettle and possible side-effects on performance, egg quality and antioxidant properties were tested in a 4-week experiment with 40 individually caged H&N Nick Brown layers (70 weeks of age). A basal feed mixture low in pigments and tocopherol was designed. Two weeks prior to the experiment, all animals received this basal mixture plus synthetic pigments (25 mg/kg Carophyll® Yellow, 15 mg/kg Carophyll® Red). Thereafter, eight animals each received diets either with 0, 6.25, 12.5 or 25 g nettle per kg put into the basal mixture or a control diet containing synthetic pigments like the pre-experimental diet and extra 40 mg/kg of \( \alpha \)-tocopherylacetate. In detail, nettle was supplied by two independent batches to four animals per dosage each. Performance was assessed during 4 weeks and feed and egg samples were collected in the last week of the experiment and analyzed for various variables with a focus on color and antioxidant traits. By applying different statistical models, a comparison with the control animals, batch differences and nettle dosage effects were evaluated. Yolk yellowness \( (b^*) \) increased with nettle addition depending on dosage and batch, yet was equally effective as synthetic pigmentation (29.4) in all investigated cases (avg. 30.3). The score according to the DSM-Yolk Color Fan increased from 1.7 in the non-supplemented group to 4.2 (6.25 g nettle A/kg) and up to 6.5 (25 g nettle B/kg). This increase depended on dose and batch. Due to the lack of red pigments in nettle, scores were still lower than with the control treatment (9.5). The development of thiobarbituric acid reactive substances, monitored over 12 weeks in lyophilized yolk powder, was not affected by batch or nettle concentration. However, yolk from nettle fed hens, especially from one batch, was richer in tocopherols with increasing dosage though being far from that found in the tocopherol supplemented hens. There was no substantial influence of nettle supplement or batch on laying performance and general egg quality. Nettle supplementation of layer diets is
therefore considered as an effective means to naturally achieve the desired yolk yellowness, and this without risking unfavorable side-effects [Y. Loetscher, M. Kreuzer* and R.E. Messikommer (ETH Zurich, Institute of Agricultural Sciences, Universitaetstrasse 2, 8092 Zurich, Switzerland), *Animal Feed Science and Technology, 2013, 186(3-4), 158-168]

**NPARR 5(1), 2014-023 Evaluation of potential and effective rumen digestion of mistletoe species and woody species browsed by goats in a semi-arid savanna, southwest Zimbabwe**

The potential and effective rumen digestion of three mistletoe species (*Erianthemum ngamicum, Plicosepalus kalachariensis* and *Viscum verrucosum*) and four acacia species (*Acacia gerrardii, Acacia karroo, Acacia nilotica* and *Acacia robusta*) browsed by goats in the semi-arid savanna in Zimbabwe was determined *in vitro* with or without including polyethylene glycol (PEG). The *in vitro* gas production (IVGP) (74.6 vs. 63.1 mL), gas production rate (0.05/h vs. 0.035/h) and effective degradability (46.7 vs. 35.3 ml) were higher in mistletoe than acacia (P<0.01). For mistletoe species, *P. kalachariensis* had the highest IVGP, potential gas production (*b*), gas production rate (*c*) and effective degradability (ED) than *E. ngamicum* and *V. verrucosum* (P<0.01). In acacia species, IVGP and potential gas production (*b*) were higher in *A. karroo* whilst *A. gerrardii* had the greatest gas production rate (*c*) than the other acacia species. In all browse species, addition of PEG, which minimised the inhibitory effects of tannin on microbial fermentation, resulted in an increase in gas production parameters except in *P. kalachariensis* (P<0.01). The effect of PEG on fermentation and degradability was greater in acacia foliage than in mistletoe foliage (IVGP, 19 vs. 41%; potential gas production, 11 vs. 16%; effective degradability, 13 vs. 42%), which suggested that the tannin in acacia was more biologically active than that in mistletoe. In both mistletoe and acacia species, there was an interaction between species and PEG for IVGP and effective degradability. This result suggested that the effects of PEG on fermentation parameters were species-specific as species responded differently to the addition of PEG. The increase in fermentation parameters due to the addition of PEG varied widely amongst the acacia species (range: 10-114%) and mistletoe species (range: 7-49%). Thus, the inclusion of PEG to neutralise or reduce the effects of tannins should consider the species were its use would be more beneficial, such as in *A. gerrardii, A. robusta, and E. ngamicum* in this study. In conclusion, mistletoe species show a high nutritive value with large potential for feeding goats in the semi-arid savanna due to the higher values of IVGP, gas production rate, potential gas production, and effective degradability than those for acacia species. In addition, our results support the use of PEG to neutralise tannins in tannin-rich forages [H.G.T. Ndagurwa* and J.S. Dube (Forest Ecology Laboratory, Faculty of Applied Science, National University of Science & Technology, P.O. Box AC 939 Ascot, Bulawayo, Zimbabwe), *Animal Feed Science and Technology, 2013, 186 (1-2), 106-111].
FIBRES (incl. Textile and other utility fibres)

NPARR 5(1), 2014-024 Characterization and analysis of ligno-cellulosic seed fiber from Pergularia daemia plant for textile applications

A hitherto uninvestigated ligno-cellulosic seed fiber from the plant Pergularia daemia has been chosen for the current study to unravel its physical properties, and potentialities in textile applications. The raw, NaOH treated, and wax removed fibers were tested for their morphological and structural features by X-ray diffraction, SEM, FT-IR spectra, and thermal analysis by thermogravimetry and differential scanning calorimetry. The raw fibers have low cellulose content and less crystalline compared to cotton and are having hollow, smooth surface, and less density. The brittle nature and low elongation at break of virgin fiber makes it difficult for the spinning. It becomes spinnable after NaOH treatment due to the increased elongation at break by partial removal of lignin [T. Karthik and R. Murugan (Department of Textile Technology, PSG College of Technology, Coimbatore, 641004, Tamil Nadu, India), Fibers and Polymers, 2013, 14(3), 465-472].

NPARR 5(1), 2014-025 Effects of fibre-surface morphology on the mechanical properties of Porifera-inspired rubber-matrix composites

In this paper, mineralised organic fibre morphologies, inspired by the structures of Porifera (sponges) are correlated to the mechanical performance of fibre reinforced rubbers. The mineralised structures are rich in calcium carbonate and silica. These compounds nucleate and precipitate on the fibre surfaces yielding different morphologies as a function of mineral ion concentrations. Smaller mineralised precipitates manifestly improve the mechanical performance of composites while thicker precipitates enveloping the fibres give rise to inferior properties. Mechanisms and evidenced reasoning for these differences are reported herein [Parvez Alam*, Daniela Graf Stillfried, Jessika Celli and Martti Toivakka (Centre for Functional Materials, Abo Akademi University, Porthaninkatu 3, 20500, Turku, Finland), Applied Physics A, 2013, 111 (4), 1031-1036].

NPARR 5(1), 2014-026 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 [Sirlene M. Costa*, Priscila G. Mazzola, Juliana C.A.R. Silva, Richard Pahl and Adalberto Pessoa Jr., (School of Arts, Sciences and Humanities, Textile and Fashion Course, University of São Paulo, Av. Arlindo Bélio, 1000, Parque Ecológico do Tieté, Ermelino Matarazzo, CEP: 03828-080 São Paulo, SP, Brazil), Industrial Crops and Products, 2013, 42, 189-194]

NPARR 5(1), 2014-027 Effect of jute and kapok fibers on properties of thermoplastic cassava starch composites
Since mechanical properties and water uptake of biodegradable thermoplastic cassava starch (TPCS) was still the main disadvantages for many applications. The TPCS matrix was, therefore, reinforced by two types of cellulosic fibers, i.e. jute or kapok fibers; classified as the low and high oil absorbency characteristics, respectively. The TPCS, plasticized by glycerol, was compounded by internal mixer and shaped by compression molding machine. It was found that water absorption of the TPCS/jute fiber and TPCS/kapok fiber composites was clearly reduced by the addition of the cellulosic fibers. Moreover, stress at maximum load and Young’s modulus of the composites increased significantly by the incorporation of both jute and kapok fibers. Thermal degradation temperature, determined from thermogravimetric analysis (TGA), of the TPCS matrix increased by the addition of jute fibers; however, thermal degradation temperature decreased by the addition of kapok fibers. Functional group analysis and morphology of the TPCS/jute fiber and TPCS/kapok fiber composites were also examined using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) techniques [Jutarat Prachayawarakorn*, Sudarat Chaiwatyothin, Suwat Mueangta and Areeya Hanchana, (Department of Chemistry, Faculty of Science, King Mongkut’s Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand), Materials & Design, 2013, 47, 309-315].
The consumption of more vegetables and less meat is associated with higher levels of acculturation among Mongolians in South Korea

Although Mongolian immigrants are a rapidly growing population in South Korea, the 2 countries have distinct diets because of climatic and geographical differences. The Mongolian diet is mostly animal-based with few vegetables and fruits, whereas the Korean diet is largely plant based. The purpose of this study was to examine the association between acculturation and dietary intakes among Mongolians living in South Korea. We hypothesized that higher levels of acculturation would be associated with higher vegetable, fruit, and plant-based food intakes among Mongolian immigrants. A total of 500 Mongolian immigrants participated in this study conducted between December 2010 and May 2011. To measure the acculturation level, we developed an acculturation scale based on the Suinn-Lew Asian self-identity acculturation scale. Dietary intakes were assessed using the 24-hour dietary recall method. Associations between acculturation and dietary intakes were investigated using a general linear model adjusted for demographic characteristics. The participants were grouped into either a low-acculturation group or a high-acculturation group. The high-acculturation group reported significantly higher consumption of vegetables and rice and significantly lower consumption of meat, potatoes, and flour products compared with their low-acculturation counterparts. However, a higher level of acculturation was also significantly related to a higher intake of sodium. These findings could be used to tailor nutrition programs to different acculturation levels.

Increased acid output, accompanied with a defective defense system, is considered a fundamental pathogenesis of duodenal ulcer (DU). However, relapse of DU occurs despite proton pump inhibitors and H₂ receptor antagonists, hence imposing the enforcement of the defense system. Dried powder of the yam tuber (Dioscorea spp) has been used in traditional folk medicine as a nutritional fortification. We hypothesized that dried-yam powder would prevent DU through improvement of anti-inflammatory actions and carbonic anhydrase (CA) activity. Therefore, we investigated the preventive effects of dried-yam powder against the cysteamine-induced DU and elucidated the underlying mechanisms. Duodenal ulcers were induced in Sprague-Dawley rats by intragastric administration of 500 mg/kg cysteamine-HCl. The dried-yam powder was used as a pretreatment before the cysteamine-HCl. The number and size of DU were measured. The expressions of inflammation mediators were checked in duodenal tissues, and the expressions of CAs and malondialdehyde levels were also examined. Cysteamine provoked perforated DU, whereas dried-yam powder significantly prevented DU as much as pantoprazole and significantly reduced the incidence of perforation. The messenger RNA expressions of cyclooxygenase-2 and inducible nitric oxide synthase were remarkably decreased in the yam group compared with the cysteamine group, and the serum levels of proinflammatory cytokines including interleukin-1β, interleukin-6, and tumor necrosis factor were significantly attenuated in the yam group. Cysteamine significantly decreased the expression of CAs, whereas yam...
treatment significantly preserved the expressions of CA IX, XII, and XIV. In conclusion, dried-yam powder exerts a significant protective effect against cysteamine-induced DU by lowering the activity of inflammatory cytokines and free radicals and restoring the activity of CAs, except in CA IV [Jong-Min Park, Yoon-Jae Kim, Ju-Seung Kim, Young-Min Han, Napapan Kangwan, Ki Baik Hahm, Tae-Sok Kim, Oran Kwon and Eun-Hee Kim* (CHA Cancer Prevention Research Center, CHA Cancer Institute, CHA University, Seoul, Korea), Nutrition Research, 2013, 33(8), 677-685].

NPARR 5(1), 2014-030 Baking properties and biochemical composition of wheat flour with bran and shorts

Bran, being a by-product of grain grinding, is characterised by a high biological value and is thus widely used in food production. In this study, different streams of bran and shorts from the wheat graded milling process were incorporated into wheat flour at levels of 5, 11, 17 and 23% (w/w) to investigate their influence on the nutritional and baking properties of flour.

Bran and shorts streams improved the baking properties of flour blends. The best result in the case of graded flour blends with different bran products was obtained at the 95:5 ratio. The products containing peripheral parts of grain had higher proteolytic enzyme and superoxide dismutase activities and lower trypsin inhibitor content and β-amylase activity compared with graded flour.

Streams of wheat milled fractions including peripheral parts of grain increase the content of bioactive substances and dietary fibre in blends with wheat graded flour [Leonid Kaprelyants, Sergey Fedosov* and Dmytro Zhygunov (Department of Physics, Odessa National Academy of Food Technologies, Odessa, Ukraine), Journal of the Science of Food and Agriculture, 2013, 93(14), 3611-3616].
FRUITS

NPARR 5(1), 2014-031 Nutritional composition of minor indigenous fruits: Cheapest nutritional source for the rural people of Bangladesh

In line of the development of a food composition database for Bangladesh, 10 minor indigenous fruits were analysed for their nutrient composition comprising ascorbic acid, carotenoids and mineral values. Nutrient data obtained have been compared with published data reported in different literatures, book and United States Department of Agriculture-National Nutrient Database for Standard Reference. Ascorbic acid was highest in Wood apple and lowest in Roselle. Monkey jack contained the highest amount of carotenoids, zinc and copper. Content of calcium, magnesium and phosphorous were found highest in Antidesma velutinum. Potassium was the highest in Wood apple followed by in Moneky jack. It was noted that most of the minor fruits have much higher amount of ascorbic acid than the national fruit – Jack fruit ripe, the king fruit – Mango ripe of Bangladesh and exotic fruits – Apple and Grapes. The nutrient values of these minor fruits would make awareness among the people for their mass consumption for healthy life and to grow more minor fruit trees from extinction in order to maintain biodiversity [Md. Tariqul Islam Shajib*, Mahbuba Kawser, Md. Nuruddin Miah, Parveen Begum, Lalita Bhattacharjee, A. Hossain, Inge S. Fomsgaard, Sheikh Nazrul Islam (Department of Biochemistry, Sher-E-Bangla Agricultural University, Dhaka 1207, Bangladesh), Food Chemistry, 2013, 140(3), 466-470].

NPARR 5(1), 2014-032 Nutrients and bioactive compounds of Thai indigenous fruits

This study determined the nutritional potential of Thai indigenous fruits in terms of nutrients, bioactive compounds, and antioxidant activities. Three indigenous fruits were collected at two conservation areas in Kanchanaburi province, Thailand. The results showed that Phyllanthus emblica L. exhibited the highest levels of vitamin C (575±452mg/100g), total phenolics (TP) (3703 ± 1244 mGAE/100 g), and antioxidant activities, as measured by DPPH, FRAP and ORAC assays. Compared to the other two fruits, Antidesma velutinosum Blume contained higher levels of most nutrients and dietary fibre (15.6±5.9g/100g), as well as carotenoids (335±98µg/100g) and phytosterols (22.1±3.9mg/100g). Spondias pinnata (L.f.) Kurz was high in total phenolics (3178 ± 887 mGAE/100 g) and antioxidant activity. Moreover, high correlations were found between TP and antioxidant activities (r>0.9). These Thai indigenous fruits are potentially good sources of nutrients, bioactive compounds, and antioxidant activities. Conservation and utilisation should be promoted for food security and consumption as part of a healthy diet [Kunchit Judprasong, Somsri Charoenkiatkul*, Parunya Thiyajai and Monruedee Sukprasansap (Institute of Nutrition, Mahidol University, Putthamonthon 4 Rd., Salaya, Phutthamonthon, Nakhon Pathom, Thailand), Food Chemistry, 2013, 140(3), 507–512].

NPARR 5(1), 2014-033 Antidiarrheal activity of ethanolic fruit extract of Psidium guajava (Guava) in castor oil induced diarrhea in albino rats

Diarrhoea is one of the common health conditions affecting people in less developed countries. The World Health Organization (WHO) has estimated that 1.5 billion episodes of diarrhea occur every year in developing countries, resulting in 3 million deaths. This study was done to evaluate anti-diarrheal potency of the ethanolic fruit extract of Psidium guajava using Wistar albino rats to scientifically validate its continued use by the local people. It was also
aimed at determining the acute toxicity in mice and phytochemical composition of the extract. The fruits were collected in July, 2012 from the College of Veterinary Medicine farm, Makerere University, dried for 1 week, ground and macerated in 70% ethanol. The dry extract was reconstituted using normal saline and orally administered to different groups of rats at doses of 200, 400 and 600 mg/Kg. Anti-diarrheal activity was determined using the percentage reduction in the frequency of defecation in rats with castor oil-induced diarrhea. Loperamide (1 mg/Kg) was used as positive control. Phytochemical composition was qualitatively determined as described by Harborne (1998). Acute toxicity was evaluated by determination of LD50 and observations of toxic signs. The ethanolic crude fruit extract of *Psidium guajava* showed significant (p<0.05, Dunnet test) antidiarrhoea activity evidenced by the reduction in rate of defecation by up to 78.33% at 600mg/kg body weight comparable to loperamide (100%). This activity could be attributed to the phytochemicals such as flavonoids and tannins in *Psidium guajava* that were present in high levels and have been reported to exhibit antidiarrheal activity through denaturing protein hence forming protein tannates which minimize the intestinal mucosa permeability. The LD50 of the crude ethanolic fruit extract was 10,715 mg/Kg. The findings of this study show that the fruit of *Psidium guajava* have a very significant antidiarrhoea activity and are safe to use as indicated by the high LD50 value. This supports the traditional use of the ethanolic fruit extract of *Psidium guajava* as herbal remedy for treatment of diarrhea [James Ndukui Gakunga, Bernard Mirianga, Haruna Muwonge, Lawrence Fred Sembajwe and John Kateregga. (Department of pharmacy, Clinics and Comparative Medicine, College of Veterinary Medicine, Animal Resources and Biosecurity, Kampala, Uganda). *Natl J Physiol Pharm Pharmacol*. 2013; 3(2): 191-197].
**FUEL (incl. Biogas, Biodiesel, Biomass energy, Ethanol, etc.)**

*NPARR* 5(1), 2014-034 **Opportunities for the use of chufa sedge in biodiesel production**

As the production volume of biodiesel grows, conventional raw materials used in the production of biodiesel, such as rapeseed oil, are lacking, and other potentially oleaginous plants, the oil of which could be used for production of biodiesel, must be investigated. This article addresses opportunities for chufa sedge cultivation and presents the quality indicators for chufa sedge oil and the biodiesel derived from it. The results show that chufa sedge oil may be used directly in biodiesel production, and the biodiesel produced from chufa sedge oil complies with the requirements of the standards in almost all properties except for oxidation stability and cold filter plugging point. These indicators can be improved by adding the synthetic antioxidant butylated hydroxytoluene and the synthetic depressant Wintron XC-30. This article presents the properties determined from the study of chufa sedge oil mixtures combined with mineral diesel fuel and conventional biodiesel fuel, with variation in the concentrations of the components. These mixtures comply with the requirements set for fuels. [Violeta Makareviciene*, Milda Gumbyte, Anatolii Yunik, Svitlana Kalenska,Viktor Kalenskii, Dzhamal Rachmetov and Egle Sendzikiene(Aleksandras Stulginskis University, Studentu str. 11, Akademija, LT-53361 Kaunas r., Lithuania) *Industrial Crops and Products*, 2013, 50, 633–637]

*NPARR* 5(1), 2014-035 **Burning without slashing. Cultural and environmental implications of a traditional charcoal making technology in the central Sahara**

In this paper a traditional charcoal making technology occasionally adopted by Tuareg people in the hyper-arid central Sahara (SW Libya) has been described by authors. This methodology (called *esed*) has been identified thanks to ethnobotanic and ethnographic interviews with people living in the Tadrart Acacus massif (the kel Tadrart Tuareg) and confirmed by macroscopic and micromorphological analyses of residual field evidence. *Esed* consisted of burning *in situ* trunks of dead *Acacia tortilis* (Forssk.) Hayne; subsequently, small portions of collapsed and still-burning wood were buried with sand in an attempt to ensure combustion under anoxic conditions. Our interviews elucidated that the *esed* technology is well known by people living in the region and has possibly been practiced for a long time. Surprisingly, local informants highlighted that *esed* was employed to made charcoal only during years marked by abrupt reduction of precipitation and consequently of natural resources. The last employment of *esed* dates to the dry phase of the mid-1970s, when charcoal was used as an exchangeable good. The discovery of this charcoal making technology shed new light on the capability of Tuareg to manage the few natural resources available in marginal environments and to cope with rapid climate changes [Andrea Zerboni*, Isabella Massamba N'Siala, Stefano Biagetti and Savino di Lernia (Dipartimento di Scienze della Terra “A. Desio”, Università degli Studi di Milano, Via Mangiagalli 34, I-20133 Milano, Italy), *Journal of Arid Environments*, 2013, 98, 126-131].

*NPARR* 5(1), 2014-036 **Comparison of quality and production cost of briquettes made from agricultural and forest origin biomass**

This paper presents the quality and cost of small-scale production of briquettes, made from agricultural and forest biomass in north-eastern Poland. The experiment involved production of eight types of briquettes. The highest net calorific value was determined for briquettes made from pine sawdust (18,144 MJt⁻¹). The value measured for briquettes made from perennial energy plants
was over 1500 MJ t\(^{-1}\) lower, and for those made from straw 2000 MJ t\(^{-1}\) lower than for sawdust briquettes. The sawdust briquettes left significantly the lowest amount of ash (0.40% of dry mass). The significantly highest content of hydrogen, sulphur and nitrogen was found in briquettes containing the highest portion of rapeseed oilcake. The quality of briquettes varied and only some of them met the requirements of DIN 51731. Briquettes made from pine sawdust were of the highest quality. The briquette production cost ranged from 66.55 € t\(^{-1}\) to 137.87 € t\(^{-1}\) for rape straw briquettes and for those made from a mixture of rape straw and rapeseed oilcake (50:50), respectively. In general, briquette production was profitable, except for the briquettes made from a straw and rapeseed oilcake mixture [Mariusz J. Stolarski, Stefan Szczukowski, Józef Tworkowski, Michał Krzyżaniak, Paweł Gulczyński, Mirosław Mleczek*(Department of Chemistry, University of Life Sciences in Poznan, Wojska Polskiego 75, 60-625 Poznan, Poland), Renewable Energy, 2013, 57, 20-26].

Effect of wastewater irrigation on biodiesel quality and productivity from castor and sunflower oil seeds

Since biofuels are capturing a significant share in the energy consumption pattern, serious concerns have been declared regarding the impacts of biofuel production on environmental quality. One environmental aspect that has gained attention is the significant water consumption for cultivations of biofuel crops and it is strictly related to the water scarcity encountered in many regions as a result of climate change, so alternative water sources such as wastewater can be exploited. The purpose of this paper is to study the use of wastewater as irrigation feedstock for cultivations of sunflower and castor crops and to track the effect of critical parameters on oil and biodiesel quality. Parameters such as oil yield, acid value, density and viscosity were measured and it was observed that wastewater irrigation can have a positive impact on oil's quality for biodiesel production [Theocharis Tsoutsos*, Michael Chatzakis, Ioannis Sarantopoulos, Athanasios Nikologiannis and Nikos Pasadakis (Renewable and Sustainable Energy Systems Laboratory, Environmental Engineering Dept, Technical University of Crete, Greece), Renewable Energy, 2013, 57, 211-215].

Ethanol production from agroindustrial biomass using a crude enzyme complex produced by Aspergillus niger

This study investigates ethanol production from simultaneous fermentation and saccharification (SFS) and separated hydrolysis and fermentation (SHS) using enzyme complexes produced by Aspergillus niger strains (ATCC 16404, ATCC 1057, ATCC 9029). The enzyme complexes were produced by solid-state fermentation (SSF) on inexpensive and readily available agroindustrial products: rice byproduct (composed of AFEX-treated rice rust and rice bran), whey and sugarcane bagasse. The ethanol was produced by Saccharomyces cerevisiae Y904 using whey and rice byproduct as the substrate and the enzyme complex produced by A. niger. The best result for solid-state fermentation (40 U/g of dry substrate, A. niger ATCC 16404) was obtained in a 0.5 L rotating drum bioreactor at 40°C filled half filled with solid biomass composed of rice byproduct (86% wt/wt), whey (12% wt/wt) and CaCl\(_2\) (2.0% wt/wt). The best result for ethanol fermentation (11.7 g/L of ethanol) was obtained after 12 h of SFS at pH 4.5 and 35°C. A comparative study of ethanol production by Trichoderma reesei CCT 2768 and A. niger ATCC 16404 complexes under the same optimised SFS and SSF conditions was also performed, revealing that ethanol production by the A. niger enzyme complex was 2.25 times higher than that by T. reesei. These findings suggest that the ethanol production using crude enzymatic complexes produced by A. niger and agroindustrial biomass described in this paper is
very promising in terms of disposal of the whey produced by cheese-making and other dairy food processing [Nattácia Rodrigues de Araujo Felipe Rocha, Maria Aparecida Barros, Janaína Fischer, Ubirajara Coutinho Filho and Vicelma Luiz Cardoso* (Federal University of Uberlandia, Faculty of Chemical Engineering, P.O. Box 593, Av. João Naves de Ávila, 2121, Campus Santa Mônica, Bloco 1K, 38400-902 Uberlândia, MG, Brazil), Renewable Energy, 2013, 57, 432-435].
INSECTICIDES (incl. Fungicides, Herbicides, Nematicides, Larvicides, etc.)

NPARR 5(1), 2014-039 Disinfestation of stored dates using microwave energy

This study was conducted to determine the mortality of two common insect species in stored dates using a microwave oven operating at 2450 MHz. Adults of Tribolium castaneum (Herbst) and Oryzaephilus surinamensis (L.), and larvae of T. castaneum (15 days) were used to internally infest stored un-pitted dates and then subjected to microwave treatment at 180, 300, 600 or 800 W power for 20, 30 or 40s. Complete mortality was achieved for adults of both insects and larvae of T. castaneum when the power was 800 W and the exposure time was 30 or 40s. Mortality of T. castaneum larvae was also 100% when the power and exposure time were 600 W and 40s, respectively. The quality attributes of the microwave-treated dates (in which 100% mortality was achieved) were compared with untreated dates. Instrumental evaluation of texture profiles revealed that microwave disinfestation did not affect hardness, adhesiveness, springiness, cohesiveness and chewiness. Microwave disinfestation did not affect the sensory attributes or the surface color of date fruits. The moisture loss during microwave treatment was between 1.0 and 1.5 percentage points. Further investigations are required to determine the capability of microwave disinfestation for packed dates and other stored product insects and life stages [A. Manickavasagan, P.M.K. Alakahoon, T.K. Al-Busaidi, S. Al-Adawi, A.K. Al-Wahaibi, A.A. Al-Raes, R. Al-Yahyai and D.S. Jayas*(Department of Biosystems Engineering, University of Manitoba, MB R3T 2N2, Canada), Journal of Stored Products Research, 2013, 55, 1-5].

NPARR 5(1), 2014-040 Mycoflora of high-moisture maize treated with ozone

This study evaluated the effectiveness of ozone to reduce the presence of fungi in stored high-moisture maize. Maize at moisture contents of 18, 22 and 26% (wet basis) were treated with air having ozone concentrations of 0, 50, 500, 1000 and 15,000 ppm for 1 h at a flow rate of 0.5 L min⁻¹. After treatment, maize samples were surface disinfected and fungal species – Aspergillus, Cladosporium, Curvularia, Fusarium, Mucor, Penicillium, and Rhizopus – enumerated in the samples. The response to grain moisture content varied with fungal species. The average fungal infections per 100 kernels of maize for the non-ozone treated samples was 14.0 for Aspergillus, 0.6 for Cladosporium, 56.9 for Penicillium, and 3.2 for Rhizopus. Ozone at the median concentrations – 500 and 1000 ppm – was most effective in reducing the presence of Aspergillus (p<0.0001), Fusarium (p<0.0001) and Mucor (p<0.0001). Penicillium infections decreased with ozone concentrations of 1000 and 15,000 ppm (p<0.0001). An ozone concentration of 15,000 ppm was necessary to reduce Rhizopus infection (p<0.001). Ozone is capable of penetrating the surface of maize kernels to reduce fungal infections during storage. Ozonation of high-moisture maize is likely most effective in controlling the activity of Aspergillus and Fusarium due to their relatively high occurrence of infection on non-ozone treated maize and the observed reduction in their presence at lower ozone treatment concentrations [S.D. White, P.T. Murphy*, L.F. Leandro, C.J. Bern, S.E. Beattie and J. (Hans) van Leeuwen (Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, IA 50011, USA), Journal of Stored Products Research, 2013, 55, 84-89].

NPARR 5(1), 2014-041 Fumigation toxicity of allicin against three stored product pests

The fumigant toxicity of allicin against the adults, larvae and pupae of Tribolium castaneum (Herbst) (Coleoptera: Tenebrionidae), Oryzaephilus surinamensis (L.) (Coleoptera: Silvanidae) and Cryptolestes ferrugineus
(Stephens) (Coleoptera: Cucujidae) was investigated under laboratory conditions. Results showed that for 6 d exposure of adults of these three species to allicin, the LC$_{50}$ was 0.38, 0.51 and 0.51 µL/L of air, respectively, and the corresponding LC$_{99}$ values were 1.11, 8.40 and 2.18 µL/L of air, respectively. The LC$_{50}$ for larvae was 0.11, 0.12 and 0.36 µL/L of air after only 3 d exposure, respectively, indicating that the larvae were much more sensitive to allicin than adults. The pupal emergence of *T. castaneum*, *O. surinamensis* and *C. ferrugineus* was reduced to 85.6, 94.4 and 100%, respectively, after allicin treatment with a concentration of 5 µL/L of air. Trials using allicin in containers filled to 50% of capacity with wheat to imitate commercial conditions resulted in LC$_{99}$ values for 6 day exposure of 19.7, 32.1 and 26.9 µL/L of air for adults of the three species, respectively. Head space solid phase microextraction (HS-SPME) combined with gas chromatograph (GC) analysis indicated that the concentration of allicin (615 µL/L) in the sealed fumigation vessels decreased to 6.21 µL/L of air after 1 d fumigation and 1.54 µL/L of air after 6 d of fumigation in sealed bottles, respectively. The concentration of allicin decreased quickly as aeration times increased, with less than 0.05 µL/L of air after 16 d aeration regardless of the fumigation time. These results suggest that allicin may be suitable as an active ingredient in a botanical fumigant [Yujie Lu*, Jianfeng Zhong, Zhengyan Wang, Fengjie Liu and Zhenghuang Wan (College of Food Science and Technology, Henan University of Technology, Lianhua Street, Zhengzhou 450051, Henan Province, China), *Journal of Stored Products Research*, 2013, 55, 48–54].
MANURE/FERTILIZERS


The investigation was carried out at Horticulture Research Centre, Patharchatta, Pantnagar with ten treatments at different doses of vermicompost, Poultry manure and FYM. Among different treatments, FYM @ 150 kg/tree resulted in maximum tree height, tree spread, tree volume and panicle length. Application of vermicompost @ 75 kg/tree resulted in maximum NPK content of leaves. While, treatment FYM @ 150 kg/tree recorded highest amount of soil nitrogen, phosphorus and zinc. Maximum fruit set, fruit retention, fruit yield and minimum fruit drop was observed with application of 150 kg FYM per tree while fruit cracking was minimum in treatment vermicompost @ 75kg/tree. [Rani Anubha, Lal R. L., Uniyal Shweta and Chand Satish (Department of Horticulture, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand), *Progressive Horticulture*, 2013, 45(1), 126-131].

NPARR 5(1), 2014-043 Effect of irrigation and fertigation levels on cabbage (*Brassica oleracea* var. *capitata* L.)

The experiment was conducted in rabi season during the year 2007–08 at Horticultral Research Farm, IGKV, Raipur (C.G.). There were 25 treatment combinations involving 5 irrigation levels (Furrow irrigation at 1.2 Iw/CPE, drip irrigation at 100, 80, 60 & 40 per cent PE) and 5 nitrogen levels (50, 75, 100, 125 & 150 per cent of recommended dose of nitrogen) through fertigation. Results indicate that all the growth parameters were significantly influenced by irrigation and fertigation with nitrogen levels. Higher plant height and more number of leaves plant$^{-1}$ were observed with drip irrigation at 100 per cent PE and fertigation applied @ 150 per cent of recommended dose of nitrogen. Increasing the irrigation and nitrogen levels increased the yield significantly and highest yield (30.60 ton ha$^{-1}$) was obtained with drip irrigation at 100 per cent PE and fertigation with 150 per cent of recommended dose of nitrogen (29.71 ton ha$^{-1}$). Total uptake of nitrogen (287.93 kg ha$^{-1}$), phosphorus (25.30 kg ha$^{-1}$) and potassium (297.11 kg ha$^{-1}$) were maximum at drip irrigation at 100 per cent PE. Similarly the maximum uptake of nitrogen (296.22 kg ha$^{-1}$), Phosphorus (26.90 kg ha$^{-1}$) and potassium (309.74 kg ha$^{-1}$) were observed at fertigation with 150 per cent of recommended dose of nitrogen. water use efficiency (WUE) was found higher under drip irrigation at 40 per cent PE (9.80 q ha$^{-1}$ cm$^{-1}$) over furrow irrigation at 1.2 Iw/CPE (8.08 q ha$^{-1}$ cm$^{-1}$). [Kumar P.* and Sahu R.L. (Department of Soil science and Agricultural Chemistry, Indira Gandhi Krishi Vishwavidyalaya, Raipur- 492006 (C.G.) India), *Progressive Horticulture*, 2013, 45(2), 366-372]

The experiment was carried out on mango (*Mangifera indica* L.) cv. Dashehari to investigate the effect of foliar spray of micronutrients and sorbitol on fruit set, yield and fruit quality parameter. Seven treatments comprising of calcium nitrate (0.06%), boric acid (0.02%), sorbitol (2.0%) alone & in combinations (Le. calcium nitrate @ 0.06% + boric acid @ 0.02%, calcium nitrate @ 0.06% + sorbitol @ 2.0% and boric acid @ 0.02% + sorbitol @ 2.0%) and control (water spray) were used as foliar spray solutions at the time of start of flowering. The experiment was laid out in a Randomized Block Design (RBD) with four replications and two trees under each replication. Data were recorded on percent fruit set, yield and quality parameters of fruits. The data were statistically evaluated by using standard procedures. The pooled data for the year 2009 and 2010 indicated that the foliar treatments with micronutrients and sorbitol were found very effective for increased fruit set, yield and fruit quality. The boric acid (0.02%) with sorbitol (2.0%) proved to be most effective for enhancing fruit set (1.58%), yield (48.51 kg tree⁻¹), fruit weight (165.6 g), TSS content (18.59°B), total sugar (14.92%), ascorbic acid (20.32 mg 100 g⁻¹) and pcarotene (3.01 mg 100g⁻¹). 

OILS/FATS (incl. Edible oils, Butter)

NPARR 5(1), 2014-046 Synthesis of maleated-castor oil glycerides from biodiesel-derived crude glycerol

Castor oil glycerides were obtained from the glycerolysis of castor oil or its methyl esters with alkaline-crude glycerol. High monoglyceride yields were obtained between 20–30 min and 180–200°C with both substrates. The glycerolysis of castor oil afforded highest yield of products at 180°C and 30 min (50.4% of monoglycerides and 35% of diglycerides). However, the glycerolysis of methyl esters was more selective toward the formation of monoglycerides. Castor oil glycerides were further esterified with maleic anhydride without catalyst. Reaction was followed by acid value and \(^1\)H NMR. ca. 87% conversion of hydroxyl groups was obtained at 90°C. The final product contained 2.6 maleate groups per glyceride molecule [David A. Echeverri, William A. Perez and Luis A. Rios* (Grupo Procesos Fisicoquímicos Aplicados, Universidad de Antioquia, Sede de Investigación Universitaria, Cra. 53 # 61 - 30 Medellín, Colombia), Industrial Crops and Products, 2013, 49, 299–303]

NPARR 5(1), 2014-047 Assessing the potential of non-edible oils and residual fat to be used as a feedstock source in the enzymatic ethanalysis reaction

The focus of this work was to evaluate the potential of non-edible feedstocks to yield biodiesel by an enzymatic route. The ethanalysis of native oils from tropical crops, such as andiroba (Carapa guianensis), babassu (Orbignya sp.), jatropha (Jatropha curcas), macaw palm (Acrocomia aculeata), palm tree (Elaeis guineensis) and industrial waste (beef tallow) in solvent-free system was studied. All reactions were carried out with the microbial lipase from Burkholderia cepacia immobilized on a silica-polyvinyl alcohol matrix in a solvent-free system at 50°C for a maximum period of 24 h. Under the conditions tested the biocatalyst was efficient in converting all fatty acids in the lipid feedstocks into the corresponding ethyl esters. Viscosity values for biodiesel samples obtained in each reaction (4.3 and 6.0 mm/s) showed consistent reduction in relation to their original feedstock material, which also confirms the high conversion of triglycerides to ethyl esters (>94.5%). This comparative study shows that the formation of ethyl esters from different non-edible feedstocks was feasible and can provide a considerable increase in the prospect of attaining an environmental sustainability of the process as a whole [Ana K.F. Carvalho, Patricia C.M. Da Rós, Larissa F. Teixeira, Grazielle S.S. Andrade, Gisella M. Zanin and Heizir F. de Castro* (Engineering School of Lorena, University of São Paulo, PO Box 116, 12602-810, Lorena, SP, Brazil), Industrial Crops and Products, 2013, 50, 485–493]

NPARR 5(1), 2014-048 Development of botanical and fish oil standard reference materials for fatty acids

As part of collaboration with the National Institutes of Health’s Office of Dietary Supplements and the Food and Drug Administration’s Center for Drug Evaluation and Research, the National Institute of Standards and Technology has developed Standard Reference Material (SRM) 3274 Botanical Oils Containing Omega-3 and Omega-6 Fatty Acids and SRM 3275 Omega-3 and Omega-6 Fatty Acids in Fish Oil. SRM 3274 consists of one ampoule of each of four seed oils (3274-1 Borage (Borago officinalis), 3274-2 Evening Primrose (Oenothera biennis), 3274-3 Flax (Linum usitatissimum), and 3274-4 Perilla (Perilla frutescens), and SRM 3275 consists of two ampoules of each of three fish oils (3275-1 a concentrate high in docosahexaenoic acid, 3275-2 an anchovy oil high in docosahexaenoic acid and eicosapentaenoic
acid, and 3275-3 a concentrate containing 60% long-chain omega-3 fatty acids). Each oil has certified and reference mass fraction values for up to 20 fatty acids. The fatty acid mass fraction values are based on results from analyses using gas chromatography with flame ionization detection (GC-FID) and mass spectrometry (GC/MS). These SRMs will complement other reference materials currently available with mass fractions for similar analytes and are part of a series of SRMs being developed for dietary supplements [Michele M. Schantz *, Lane C. Sander, Katherine E. Sharpless, Stephen A. Wise, James H. Yen, Agnes NguyenPho and Joseph M. Betz (Analytical Chemistry Division, National Institute of Standards and Technology, Gaithersburg, MD, 20899 USA), Analytical and Bioanalytical Chemistry, 2013, 405(13), 4531-4538].
Metabolite profiling of phenolic acids, anthocyanidins and flavonoids in cabbage (*Brassica oleracea* var. *capitata*)

Metabolite profiling of phenolic acids, anthocyanidins and flavonoids in *Brassica oleracea* var. *capitata* cultivated in the spring and fall seasons were evaluated. Phenolic acids (caffeic, *p*-coumaric, ferulic and sinapic acid), anthocyanidins (cyanidin and peonidin), and flavonols (quercetin and kaempferol) were identified and quantified by LC–MS and HPLC analyses. The total phenolic acid contents (10,633 μg/g DW) were increased 6.3-fold in red cabbages; in contrast, phenolic acids were present in significantly higher levels in the outer parts of the green cabbages in the spring sowing than in those of the fall sowing. In the case of red cabbages, the phenolic acid levels in the outer parts were higher (3147.5 μg/g DW), but the seasonal factor was not significant. Statistical analysis exhibited a significantly negative correlation between anthocyanidins and quercetin but exhibited a positive correlation between flavonols and phenolic acids in both cultivars. The most dramatic differences in the effect of the tissue position were analyzed by two-way MANOVA. The levels of anthocyanidins were 25–28% higher in the spring than those in the fall cabbages, whereas the contents were similar in the various tissue positions. [Suhyoung Park, Mariadhas Valan Arasu, Nan Jiang, Seung-Hyun Choi, Yong Pyo Lim, Jong-Tae Park, Naif Abdullah Al-Dhabi and Sun-Ju Kim* (Department of Bio-Environmental Chemistry, Chungnam National University, 99 Dae-hak-ro, Yuseong-gu, Daejeon 305-764, Republic of Korea), *Industrial Crops and Products*, 2014, 60, 8–14].

Simmondsia chinensis afforded ten flavonoids (1-10) and four lignans (11-14). The structures of the isolated compounds were elucidated on the basis of spectroscopic evidences and correlated with known compounds. Among isolated compounds, flavonoid aglycones (1-4) showed stronger antioxidant activity than their glycosides (5-10) whilst lignan glycosides (11-14) showed moderate to weak antioxidant activity using DPPH and β-carotene methods in relation to BHT (positive control). The inhibitory potential against enzyme lipoxygenase was also evaluated for isolated compounds exhibiting variable potency. For flavonoids, glycosides are less potent inhibitors than free aglycones. Quercetin is the most potent inhibitor with an IC₅₀ of 5.6 μM. Lignoid glycosides exhibited moderate to weak inhibitory effect against lipoxygenase enzyme. Luteolin was used as a positive control in lipoxygenase inhibiting assay. [Wael M. Abdel-Mageed*, Soad A.H. Bayoumi, Awwad A. Radwan, Mounir M. Salem-Bekhit, Sherif H. Abd-Alrahman, Omer A. Basudan and Hanaa M. Sayed (Pharmacognosy Department, College of Pharmacy, King Saud University, Riyadh 11451, P.O. Box 2457, Saudi Arabia) *Industrial Crops and Products*, 2014, 60, 99–103].

Changes in bioactive phytochemical content and *in vitro* antioxidant activity of carob (*Ceratonia siliqua* L.) as influenced by fruit ripening

In the present study, three varieties (Wild, Fleshy and Sisam) of carob (*Ceratonia siliqua* L.) pods were analyzed for their bioactive phytochemical content and antioxidant activities (AA) at three ripening stages. The results showed that the samples have the highest total phenolic (TPC), total flavonoid (TFC) and ascorbic acid content (AAC) in the unripe stage. The antioxidant activity examined using free radical scavenging effect against 2-2-diphenyl-1-picrylhydrazyl (DPPH), ferric reducing power (FRP) and ferrous iron chelating (FIC) assays decreased significantly throughout the ripening.

**Simmondsia chinensis:** A rich source of bioactive flavonoids and lignans

A radical scavenging guided phytochemical study on the leaf of *Simmondsia chinensis*
Extremely significant correlations (p < 0.001) were found between phytochemical compound contents (TPC, TFC and AAC) and assessed antioxidant activities, except between AAC and FIC where just a very significant correlation (p < 0.01) was recorded. Our data revealed that extracts of unripe C. siliqua L. are an excellent source of natural antioxidants that might be more widely used in cosmetic, pharmaceutical and food industries. [Yassine Benchikh, Hayette Louaileche*, Béatrice George and André Merlin (Laboratoire de Biochimie Appliquée, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, 06000 Bejaia, Algérie), Industrial Crops and Products, 2014, 60, 298–303].

NPARR 5(1), 2014-052 Comparative chemical and biochemical analysis of extracts of Hibiscus sabdariffa

Hibiscus sabdariffa extracts have attracted attention because of potentially useful bioactivity. However, there have been no systematic studies of extraction efficiencies of H. sabdariffa. The nature of extracts used in different studies has varied considerably, making comparisons difficult. Therefore, a systematic study of extracts of H. sabdariffa made with different solvents was carried out using water, methanol, ethyl acetate and hexane in the presence/absence of formic acid, using different extraction times and temperatures. The extracts were analysed for total polyphenol content, antioxidant capacity using DPPH, FRAP and TEAC assays, and specific anthocyanins were determined using HPLC and LC–MS. The results showed that chufa peels can be regarded as an excellent source of natural antioxidants (mainly flavonoids) and a good additive in the beverage and canning. [Yanghe Luo, Xingren Li, Juan He, Jia Su, Liyan Peng, Xingde Wu, Runan Du and Qinshi Zhao* (State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, People’s Republic of China), Food Chemistry, 2014, 164, 30-35].

NPARR 5(1), 2014-053 Isolation, characterisation, and antioxidant activities of flavonoids from chufa (Eleocharis tuberosa) peels

In this paper, chufa peels (Eleocharis tuberosa) were researched for the flavonoid profile for the first time. Twenty flavonoids were isolated and identified, including six new ones, named eleocharins A–F (1–6). Their structures were characterised by spectroscopic methods and compared with published data. The antioxidant activity of the acetone extract, EtOAc fraction, and nBuOH fraction of chufa peels as well as the isolated flavonoids were assessed by 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical bioassay. The results showed that chufa peels can be regarded as an excellent source of natural antioxidants (mainly flavonoids) and a good additive in the beverage and canning. [Heba A. Sindi, Lisa J. Marshall* and Michael R.A. Morgan (School of Food Science and Nutrition, University of Leeds, Leeds LS2 9JT, United Kingdom), Food Chemistry, 2014, 164, 23–29].

NPARR 5(1), 2014-054 Effect of domestic processing on the polyphenol content and bioaccessibility in finger millet (Eleusine coracana) and pearl millet (Pennisetum glaucum)

Finger millet (Eleusine coracana) and pearl millet (Pennisetum glaucum) were evaluated for polyphenolic content and their bioaccessibility. Total polyphenols of native finger millet was 10.2 mg/g which reduced by 50% after sprouting or pressure-cooking, while 12–19% reduction was seen after open-pan
boiling. Total flavonoids of the grain reduced drastically on sprouting, pressure-cooking or open-pan boiling. Concentration of phenolic acids generally increased during sprouting and roasting of finger millet. Pressure cooking, open-pan boiling and microwave-heating reduced the bioaccessible polyphenols by 30–35%, while the same was increased by 67% by sprouting. Significant reduction of total polyphenols was observed in pressure-cooked, open-pan boiled and microwave-heated pearl millet. Concentration of sinapic and salicylic acids were highest phenolic acids of pearl millet. Total polyphenols reduced during sprouting and pressure-cooking. There was a 20% increase in the bioaccessible polyphenols after sprouting of pearl millet. Thus, sprouting and roasting provided more bioaccessible phenolics from these two common millets studied. [Gavirangappa Hithamani and Krishnapura Srinivasan* (Department of Biochemistry and Nutrition, CSIR–Central Food Technological Research Institute, Mysore 570 020, India), Food Chemistry, 2014, 164, 55-62].
PULP/PAPER

NPARR 5(1), 2014-055 A model-based approach for simultaneous water and energy reduction in a pulp and paper mill

Pulp and paper mills receive much attention from environmentalist and authority due to their impact on natural resources, particularly in water and energy consumption. Many research works have been reported for water and energy savings for the pulp and paper mill. However, none of them were targeted at the brown stock washing system (BSWS), where significant water and energy are consumed to perform pulp cleaning and black liquor concentration. This paper presents an optimization model aiming for simultaneous water and energy saving for BSWS in the pulp and paper mills. A mixed integer non-linear programming (MINLP) model has been developed to optimize the water network design. The synthesized water network results in significant reduction in energy and water consumption. Sensitivity analysis is performed to analyse the relationship between washing efficiency and utilities (water and energy) consumption. [Irene Mei Leng Chew*, Dominic Chwan Yee Foo, Jean-Christophe Bonhivers, Paul Stuart, Alberto Alva-Aranga and Luciana Elena Savulescu (School of Engineering, Monash University Sunway Campus, Jalan Lagoon Selatan, 46150 Bandar Sunway, Selangor, Malaysia), Applied Thermal Engineering, 2013, 51 (1-2), 393–400]

NPARR 5(1), 2014-056 Enhanced methane production from rice straw co-digested with anaerobic sludge from pulp and paper mill treatment process

Rice straw is a widely available lignocellulosic waste with potential for energy recovery through anaerobic digestion. Lignin slows the hydrolysis phase, resulting in low methane recovery and long digestion periods. Although pretreatment is effective, it often requires high energy inputs or chemicals that are not feasible for farm-scale systems. This study investigates a unique co-digestion strategy to improve methane yields and reduce digestion times for farm-scale systems. By adding both piggery wastewater and paper mill sludge, specific methane yields in laboratory-scale digesters reached the theoretical value for rice straw (i.e. 330 L/N\textsubscript{CH\textsubscript{4}}/kgVS) over the 92-day period. Accelerated hydrolysis of the straw was directly related to the quantity of sludge added. The most stable digester, with sufficient buffering capacity and nutrients, contained equal parts of straw, wastewater and sludge. This approach is feasible for farm-scale applications since it requires no additional energy inputs or changes to existing infrastructure for dry systems. [Wendy Mussoline*, Giovanni Esposito, Piet Lens, Alessandro Spagni and ndrea Giordano (University of Cassino, via Di Biasio 43, 03043 Cassino, Italy), Bioresource Technology, 2013, 148, 135–143].


In this study, Pinus pinaster and Populus tremula chip mixtures were kraft cooked and resulting pulp and paper properties were investigated. The chemical properties and fiber morphology of both species were examined. Cooks were made for five different pine/aspen chip mixtures (0, 25, 50, 75, and 100%). Results of this study showed that pulps with higher kappa number, viscosity, and reject ratio were observed for chips mixtures with higher pine ratio. Higher pine in the mixture resulted in lower total and screened yield. Increase in poplar ratio in mixture gave pulps that were easier to beat. Pine chips improved the strength properties and lowered the brightness and smoothness. [Sezgin Koray Gulsoy* and Saduman Tufek (Faculty of Forestry, Forest Products Engineering, Bartin University, Bartin, Turkey), Ind. Eng. Chem. Res., 2013, 52 (6), 2304–2308].
NPARR 5(1), 2014-058 A model study on effect of glucose on the basic characteristics and physical properties of natural rubber

Glucose at various concentrations was incorporated into sugar free purified natural rubber (PNR) latex to model the effect of carbohydrate on the basic characteristics and physical properties of natural rubber (NR). PNR samples treated with various concentrations of glucose were characterized for the basic properties of unvulcanized NR, i.e., gel content, molecular weight distribution and Mooney viscosity to evaluate the effect of sugar on these parameters. In addition, the effect of glucose on the physical properties of vulcanizates derived using sulfur and peroxide vulcanization was investigated. Glucose was shown to affect the viscosity of unvulcanized NR and the discoloration of vulcanized NR. Moreover, glucose was found to have a strong effect on crosslink density, as well as tensile and dynamic properties of sulfur vulcanizates, while those properties of peroxide vulcanizates was not much affected by glucose. [Adun Nimpaiboon and Jitladda Sakdapipanich* (Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand) Polymer Testing, 2013, 32(8), 1408–1416].

NPARR 5(1), 2014-059 Ethephon: a tool to boost gum arabic production from Acacia senegal and to enhance gummosis processes

Gum arabic production from Acacia senegal is lower in sub-humid areas than arid areas. Water stress is thought to be the reason for higher yields in arid areas. The application of ethephon is thought to mimic the effect of water stress in other plants. The objective of this study was to determine if the application of ethephon would increase the gum yields of Acacia senegal under sub-humid conditions in Cameroon. Trees receiving 40 or 120 mg ethephon were compared to controls in field experiments at a semi-arid and a sub-humid location in Northern Cameroon, over two seasons. Two provenances from drier areas (Sudan) were compared to the local one. In the first season, gum yield of the local provenance treated with ethephon was increased by 400–600 % compared to the untreated trees. Gum yield at the semi-arid location was 77, 313 and 214g/tree with 0, 40 and 120 mg ethephon/tree, respectively, while at the sub-humid location, it was 30, 186 and 114g/tree with 0, 40 and 120 mg ethephon/tree. However, in the second season, the effect of ethephon was not significant in the semi-arid area, whereas it was evident in the sub-humid area (up to 478g/tree). Moreover, ethephon did not affect gum yield of provenances from drier areas (Sudan). This showed that the water-stress hypothesis has to be refined. The development of ethephon-based tapping systems is promising, but requires further studies with a wider range of environmental conditions and A. senegal provenances [Chimène Fanta Abib, Mama Ntoupka, Régis Peltier, Jean-Michel Harmand and Philippe Thaler* (UMR Eco&sols, CIRAD, 2 place Viala, Bat. 12, 34060, Montpellier Cedex 2, France), Agroforestry Systems, 2013, 87(2), 427-438].

NPARR 5(1), 2014-060 Clarification of rubber mill wastewater by a plant based biopolymer – comparison with common inorganic coagulants

In this study, the efficiency of Guar gum as a biopolymer has been compared with two other widely used inorganic coagulants, ferric chloride (FeCl₃) and aluminum chloride (AlCl₃), for the treatment of effluent collected from the rubber-washing tanks of a rubber concentrate factory. Settling velocity distribution curves were plotted to demonstrate the flocculating effect of FeCl₃, AlCl₃ and Guar gum. FeCl₃ and AlCl₃ displayed better turbidity removal than Guar gum
at all settling velocities. FeCl$_3$, AlCl$_3$ and Guar gum removed 92.8%, 88.2% and 88.1% turbidity, respectively, of raw wastewater at a settling velocity of 0.1 cm min$^{-1}$, respectively. Scanning electron microscopic (SEM) study conducted on the flocs revealed that Guar gum and FeCl$_3$ produced strong intercoiled honeycomb patterned floc structure capable of entrapping suspended particulate matter. Statistical experimental design Response Surface Methodology (RSM) was used to design all experiments, where the type and dosage of flocculant, pH and mixing speed were taken as control factors and, an optimum operational setting was proposed [Sumona Mukherjee, Agamuthu Pariatamby, Jaya Narayan Sahu and Bhaskar Sen Gupta (Department of Chemical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia), *Journal of Chemical Technology and Biotechnology*, 2013, 88(10), 1864-1873]
Effects of Ylang-Ylang aroma on blood pressure and heart rate in healthy men

Although the Ylang-Ylang aroma (YYA) has used as a general method for enhancing sedative effect, there was a little report on the efficacy of YYA on heart function using the electrocardiogram (EKG). Therefore, identifying of the effects of YYA on blood pressure (BP) and heart rate (HR) is important in order to demonstrate the effectiveness of YYA. The aim of this study was to investigate the effects of YYA on BP and HR in healthy men. Twenty-nine men took part in this study. The subjects were randomly divided into 2 groups: Ylang-Ylang group (YYG, n= 15) and control group (CG, n= 14). Physiological parameters recorded were BP by using a sphygmomanometer and HR by using an EKG. The present results demonstrated that inhalation of YYA significantly decreased the systolic and diastolic blood pressure. Inhalation of YYA also significantly decreased the HRs in 10 leads, except in lead I and aVR. This indicates that the HRs recorded in lead I and aVR were less sensitive or obtuse compared to those in the 10 other leads. Therefore, such a result reveals that it is necessary to be aware of the terms regarding the position. In the present results, YYA caused a reduction of HR and BP, and a relief of the arousal level in healthy men. The present results show a sedative effect of YYA, and this study provides some evidences for the usage of YYA in medicinal agent [Da-Jung Jung, Jun-Youl Cha, Sung-Eun Kim, Il-Gyu Ko,and Yong-Seok Jee (Department of Microbial Engineering, College of Engineering, Konkuk University, Seoul, Korea), J Exerc Rehabil. 2013, 9(2), 250-255].

Improving the stability and radical-scavenging activity of sunflower oil upon blending with black cumin (Nigella sativa) and coriander (Coriandrum sativum) seed oils

Blends (10 and 20%, w/w) of black cumin oil (BCO) and coriander oil (CO) with sunflower oil (SFO) were formulated. Oxidative stability (OS) and radical-scavenging activity of SFO and blends stored under oxidative conditions (60°C) for 15 days were studied. By increasing the proportion of BCO and CO in SFO, linoleic acid content decreased, while oleic acid content increased. Progression of oxidation was followed by measuring peroxide value (PV), conjugated dienes (CDs) and conjugated trienes (CTs). Inverse relationships were noted between PV and OS at termination of storage. Levels of CDs and CTs in SFO and blends increased with an increase in time. SFO: BCO and SFO : CO blends gave 8-18 and 22-32% inhibition of DPPH radicals, respectively. OS of oil blends was better than SFO, most likely as a consequence of changes in fatty acids' and tocopherols' profile, and minor bioactive lipids found in CO and BCO. Blending of vegetable oil has emerged as an economical way of modifying the physicochemical characteristics of vegetable oils besides enhancement in oxidative stability. Among new sources of vegetable oils, black cumin seed oil (BCO) and coriander seed oil (CO) are of interest and may play a major role in human nutrition and health. At different concentrations of BCO and CO, oxidative stability of high-linoleic sunflower oil (SFO) was enhanced. Furthermore, blends enriched with BCO and CO had a strong antiradical action. The optimal levels of BCO and CO enrichment will depend on the actual application. It is anticipated that commercial exploitation of SFO: CO and SFO : BCO blends will soon be realized [MOHAMED FAWZY RAMADAN (Agricultural Biochemistry Department, Faculty of Agriculture, Zagazig University, Zagazig 44519, Egypt), Journal of Food Biochemistry, 2013, 37(3), 286-295].

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. [I.P.S. Kapoor, Bandana Singh, Gurdip Singh*, Carola S. De Heluani, M. P. De Lampasona and Cesar A.N. Catalan (Chemistry Department, D.D.U. Gorakhpur University, Gorakhpur, India) *International Journal of Food Properties*, 2013, 16(5), 1059-1070].

NPARR 5(1), 2014-064 *Comparison of yields and quality of nutmeg butter obtained by extraction of nutmeg rind by soxhlet and supercritical carbon dioxide (SC-CO₂)*

Nutmeg is a native South East Asian plant which has medicinal properties. In this work, supercritical extraction was studied in order to obtain experimental data of the influence of pressure, temperature and particle size and in comparison to soxhlet extraction. Supercritical extraction was conducted at operating temperatures of 40, 50 and 60 °C, operating pressures of 20.7, 27.6, 34.5 and 41.4 MPa and dynamic extraction time was 90 min. The effect of three different sieved particle sizes ≤0.500, ≤1 mm and ≤2 mm on the extraction yield was examined. The results show that the highest yield was 38.8 g oil/100 g sample obtained under extraction temperature of 60 °C, pressure 41.4 MPa using particle size of ≤0.5 mm. Soxhlet extraction yields 34 g oil/100 g sample for 6 h of extraction time. The GCTOFMS shows that the supercritical extracts exhibited significantly higher aromatic ether group comparable to those obtained by soxhlet. [Sawsan S. Al-Rawi, Ahmad H. Ibrahim, Aman Shah Abdul Majid, Amin M.S. Abdul Majid and Mohd Omar Ab Kadir (EMAN Testing & Research Laboratory, Universiti Sains Malaysia, Penang 11800, Malaysia) *Journal of Food Engineering*, 2013, 119(3), 595–601]

NPARR 5(1), 2014-065 *Evaluation of analgesic activity and toxicity of alkaloids in Myristica fragrans seeds in mice*

To examine the analgesic effect of alkaloids in *Myristica fragrans* seed in a mouse model of acetic acid-induced visceral pain. Alkaloids were extracted from ground nutmeg seed kernels with 10% acetic acid in 95% ethyl alcohol. Visceral pain was induced in male and female BALB/c mice by intraperitoneal injection of 0.6% acetic acid. Analgesic effect of alkaloids (0.5 gram or 1 gram per kilogram [g/kg], by mouth) was assessed by evaluating writhing response. Acute toxicity was tested in response to 2, 3, 4, 5, or 6 g/kg of alkaloid extract; the median lethal dose (LD₅₀) was determined by probit analysis. Alkaloid extract at a dose of 1 g/kg significantly reduced the number of writhing responses in female, but not male mice; 0.5 g/kg of alkaloid extract had no effect in either sex. The LD₅₀ was 5.1 g/kg. Signs of abnormal behavior, including hypoactivity, unstable gait, and dizziness were seen in animals
given a dose of 4 g/kg or higher; abnormal behavior lasted for several hours after administration of the alkaloids. According to the classification of Loomis and Hayes, *M. fragrans* seed alkaloids have analgesic activity and are slightly toxic [A Al-Shammary Hayfaa* AA Malik Al-Saadi Sahar and M Al-Saeidy Awatif (College of Science, Department of Medical Analysis, Thi-Qar University, Thi-Qar, Iraq) *J Pain Res.* 2013, 6, 611–615].
SUGARS

NPARR 5(1), 2014-066 Processing packaging and storage of jaggery from sugarcane

Jaggery is a specific type of sugar popular in India derived from sugarcane juice. A study was conducted to evaluate jaggery quality by packaging jaggery in different material and packaging conditions. The results revealed that, the best packaging material for storing jaggery in ambient atmosphere was triple layered vacuum packaging material followed by double layer and single layer material. The change in total colour, sucrose content, hardness, reducing sugar content, moisture content, porosity and microbial load in jaggery were observed to be very minimum in jaggery packaged under vacuum in triple layer material. Not much variation was observed in the ash content at the end of storage period. Further, the jaggery product stored under the above condition had scored highest values in the sensory evaluation [P. Arunkumar, R. Nirmala and E. P. Bhavya (Dairy Engineering Division, National Dairy Research Institute, Southern Regional Station, Adugodi, Bengaluru, Karnataka, India) International Journal of Processing and Post harvest Technology, 2013, 4(1), 7-12].

NPARR 5(1), 2014-067 A study on personal profile and information sources used by the farmers in production of organic jaggery.

The Kolhapur district is the basket for jaggery. Nearly eleven hundred jaggery preparation units are working (Feb. 2009) in this district. Farmers from Kolhapur district prepare and sell organic jaggery. The study was undertaken in Kolhapur district of Maharashtra State. The data were collected from 20 organic jaggery making farmers. The majority of the respondents were from the middle age group of 36 to 50 years (65.00%); 45.00 per cent had secondary education (std 5th to 10th), 70.00 per cent possessed medium family size (6 to 9 members), and 55.00 per cent of them owned 1 to 2 ha. of land. 100.00 per cent of the organic jaggery making farmers always obtained information regarding organic jaggery making from their friends and relatives; the next most popular source was the farmers club for organic farming (80.00%). The majority of them suggested that there should be a separate marketing system for the sale of organic jaggery (100.00%). [Gurav, K. V* and Jagdale, U. D.(Department of Extension education, Zonal Agriculture research station(NARP), Kolhapur (M.S.) India), Agriculture Update, 2013, 8(1/2), 19-21].

NPARR 5(1), 2014-068 Influence of storage period on nutritional and microbial quality of concentrate jaggery scum feed blocks for pigs

In most swine diet formulations, ingredients that provide most of the energy usually represent highest cost among all dietary ingredients. Concentrate jaggery scum (CJS) is an agro-industrial by-product mainly fed to pigs and dairy cattle. Present study was undertaken to observe influence of storage period on nutritional and microbial quality of concentrate jaggery scum feed blocks for pigs. Nine hundred feed blocks were prepared by using 50, 60, and 70% concentrate jaggery scum, along with wheat bran and dhuta, and of three different shapes i.e. circular, brick and prill. All the treatment feed blocks were analyzed for nutritional and microbial quality for a storage period of two months. Feed block containing 70% CJS and of prill shaped had highest DM of 85.00±1.73% and feed block containing 60% CJS and of circular shaped had lowest DM of 77.75±0.62%. There was a non-significant difference between different treatments and storage period of CJS feed blocks on CP%, CF%, EE%, TA%, OM%, NFE%, and TC%. Microbial quality was assessed by estimating total bacterial count of feed blocks. Feed block containing 60% CJS and of circular shaped showed highest TBC (7.29±0.011 log10 cfu/ml) and feed block containing 70% CJS and
of prill shaped showed lowest TBC (6.88±0.06 log10 cfu/ml). It can be concluded that there was a significant difference in dry matter and total bacterial count between different treatments and storage periods. A declining trend was observed during storage period in dry matter percentage while an increasing trend was observed in total bacterial count within permissible limit and no nutritional change was observed in different concentrate jaggery scum feed blocks during the storage period [Patoo R.A.*, Kumar Sanjay, Singh D.V., Mandel B.C, Kaushal S. (Department of Livestock Production Management, College of Veterinary and Animal Sciences, G B Pant University of Agriculture and Technology, Pantnagar-263 145, UK (India) Indian Journal of Animal Nutrition, 2013, 30,(1), 103-105].

NPARR 5(1), 2014-069 Ethanol production from cashew apple juice using statistical designs

Statistical experimental designs were carried out for enhancing the ethanol production from cashew apple juice after obtaining the biochemical analysis of cashew apple juice. The biochemical analysis of the cashew apple juice was as follows: 79.2 % moisture, 12.5 % total sugars, 4.9 % reducing sugars, 0.16 % protein, 0.2 % fat, 1.91 % tannin and 1.13 % ascorbic acid. Cashew apple juice can be preserved at -18°C for several months. The Plackett - Burman design was used initially to screen seven nutritional parameters which are critical and important for growth of Saccharomyces cerevisiae as well as enhancing ethanol production. Among them three parameters were found to have a significant effect on ethanol production and these three elements were further optimized using central composite design (CCD) by response surface methodology. The optimal values of three variables obtained for maximum production of ethanol was (g/l): ammonium chloride 0.45, magnesium sulfate 0.08 and dipotassium phosphate 0.21 and the predicted ethanol production was 61.34 g/l. With the predicted optimal values, experiments conducted in the laboratory yielded an ethanol production of 59.80 g/l equal to 93.62% of its theoretical yield. Statistical experimental designs such as Plackett-Burman design and CCD are critical and important for rapid screening and determining significant nutritional parameters and then optimizing them for enhancing the ethanol production [Srinivasarao B*, Ratnam BVV, Subbarao S, Narasimharao M and Ayyanna C (KIMS Foundation and Research Centre, Minister Road, Secunderabad - 500003, India), J Biochem Microb Technol, 2013 1, 8-15].
**THERAPEUTICS**

*NPARR* 5(1), 2014-070  **Evaluation of antiangiogenic and antiproliferative potential of the organic extract of green algae Chlorella pyrenoidosa**

Algae isolates obtained from fresh and marine resources could be one of the richest sources of novel bioactive secondary metabolites expected to have pharmaceutical significance for new drug development. This study was conducted to evaluate the antiangiogenic and antiproliferative activity of Chlorella pyrenoidosa in experimental models of angiogenesis and by MTT assay. Lyophilized extract of C. pyrenoidosa was extracted using dichloromethane/methanol (2:1), concentrated and vacuum evaporated to obtain the dried extract. The crude extract was evaluated in the vascular endothelial growth factor (VEGF)-induced angiogenesis in in ovo chick chorioallantoic membrane assay (CAM) at various concentrations (n = 8) using thalidomide and normal saline as positive and untreated control groups, respectively. The crude extract was also subjected to the antiangiogenic activity in the silver nitrate/potassium nitrate cautery model of corneal neovascularization (CN) in rats where topical bevacizumab was used as a positive control. The vasculature was photographed and blood vessel density was quantified using Aphelion imaging software. The extract was also evaluated for its anti proliferative activity by microculture tetrazolium test (MTT) assay using HeLa cancer cell line (ATCC). VEGF increased the blood vessel density by 220% as compared to normal and thalidomide treatment decreased it to 67.2% in in ovo assay. In the in-vivo CN model, the mean neovascular density in the control group, the C. pyrenoidosa extract and bevacizumab group were found to be 100%, 59.02%, and 32.20%, respectively. The Chlorella pyrenoidosa extract negatively affected the viability of HeLa cells. An IC$_{50}$ value of the extract was 570 µg/ml, respectively. A significant antiangiogenic activity was observed against VEGF-induced neovascularization and antiproliferative activity by MTT assay. In this study, it could be attributed that the activity may be due to the presence of secondary metabolites in the C. pyrenoidosa extract [Mahender Kyadari, Tasneem Fatma, Rajvardhan Azad and Thirumurthy Velpandian (Department of Ocular Pharmacology and Pharmacy, Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi India), *Indian J Pharmacol*, 2013 45(6),569-574].

*NPARR* 5(1), 2014-071  **The polyphenol-rich baobab fruit (Adansonia digitata L.) reduces starch digestion and glycemic response in humans**

The baobab fruit (*Adansonia digitata* L.) is found throughout regions of Africa and is becoming increasingly recognized for its high nutrient and polyphenol content. Polyphenols have been beneficial for their effects on reducing the glycemic response (GR) and for improving various other metabolic parameters. Based on previous research, it was hypothesized that the baobab fruit extract would reduce starch digestion in vitro and would show potential for reducing the GR and for increasing satiety and diet-induced thermogenesis in humans. Six extracts of baobab from 6 different locations in Africa were measured for their antioxidant and polyphenol content using the ferric ion–reducing antioxidant power and the Folin-Ciocalteu methods, respectively. Baobab extract was baked into white bread at different doses to determine the optimal dose for reducing starch breakdown and sugar release from white bread after an in vitro digestion procedure. In vivo, baobab extract was consumed in solution at both a low-dose (18.5 g) and a high-dose (37 g) aqueous drink in 250 mL of water along with white bread, and resulting GR, satiety, and postprandial energy expenditure were measured. All extracts in this study were shown to be good sources of
polyphenols. Baobab fruit extract added to white bread at 1.88 % significantly (P < .05) reduced rapidly digestible starch from white bread samples. In vivo, the baobab fruit extract at both low and high doses significantly (P < .05) reduced GR, although there was no significant effect on satiety or on energy expenditure [Shelly A. Coe, Miriam Clegg, Mar Armengol and Lisa Ryan* (Functional Food Centre, Oxford Brookes University, Gipsy Lane, Oxford, OX3 0BP, UK) Nutrition Research, 2013, 33(11), 888–896].

NPARR 5(1), 2014-072 Antioxidant and anti-inflammatory activities of six flavonoids separated from licorice

Licorice, the roots and rhizomes of several Glycyrrhiza species (Leguminosae), is an important natural sweetening agent and a widely used herbal medicine. In this work, six flavonoids, 5-(1,1-dimethylallyl)-3,4,4′-trihydroxy-2-methoxychalcone (1), licochalcone B (2), licochalcone A (3), echinatin (4), glycyourmarin (5) and glycurallin B (6), were isolated from the extracts of licorice (Glycyrrhiza inflata and Glycyrrhiza uralensis). Their structures were elucidated using various spectroscopic methods. To our knowledge, compound 1 was isolated from natural plants for the first time. All the isolates were tested by antioxidant and anti-inflammatory assays. Compounds 2, 4 and 5 showed strong scavenging activity toward the ABTS**+ radical, and compounds 1, 2, 3, 5 and 6 exhibited potent inhibition of lipid peroxidation in rat liver microsomes compared with the reference controls. Compounds 1–4 dose-dependently inhibited LPS induced reactive oxygen species (ROS) production in RAW 264.7 cells. Furthermore, compounds 1–5 were demonstrated to inhibit the production of nitric oxide (NO), interleukin-6 (IL-6) and prostaglandin E2 (PGE2) in LPS-induced macrophage cells. Moreover, the contents of the six compounds, in different Glycyrrhiza species, were quantified by HPLC–MS. Yu Fu, Jun Chen*, Yan-Jing Li, Yun-Feng Zheng and Ping Li (State Key Laboratory of Natural Medicines, China Pharmaceutical University, Nanjing 210009, China) Food Chemistry, 2013, 141(2), 1063-1071

NPARR 5(1), 2014-073 Pomegranate seed oil prevents bone loss in a mice model of osteoporosis, through osteoblastic stimulation, osteoclastic inhibition and decreased inflammatory status

In the current context of longer life expectancy, the prevalence of osteoporosis is increasingly important. This is why development of new strategies of prevention is highly suitable. Pomegranate seed oil (PSO) and its major component, punicic acid (a conjugated linolenic acid), have potent anti-inflammatory and anti-oxidative properties both in vitro and in vivo, two processes strongly involved in osteoporosis establishment. In this study, we demonstrated that PSO consumption (5% of the diet) improved significantly bone mineral density (240.24±11.85 vs. 203.04±34.19 mg/cm^3) and prevented trabecular microarchitecture impairment in ovariectomized (OVX) mice C57BL/6J, compared to OVX control animals. Those findings are associated with transcriptional changes in bone tissue, suggesting involvement of both osteoclastogenesis inhibition and osteoblastogenesis improvement. In addition, thanks to an ex vivo experiment, we provided evidence that serum from mice fed PSO (5% by gavage) had the ability to significantly down-regulate the expression of specific osteoclast differentiation markers and RANK-RANKL downstream signaling targets in osteoclast-like cells (RAW264.7) (RANK: negative 0.49-fold vs. control conditions). Moreover, in osteoblast-like cells (MC3T3-E1), it elicited significant increase in alkaline phosphatase activity (+159% at day 7), matrix mineralization (+271% on day 21) and transcriptional levels of major osteoblast lineage markers involving the Wnt/β-catenin signaling pathways. Our data also reveal that PSO inhibited pro-inflammatory factors expression while
stimulating anti-inflammatory ones. These results demonstrate that PSO is highly relevant regarding osteoporosis. Indeed, it offers promising alternatives in the design of new strategies in nutritional management of age-related bone complications. [Mélanie Spilmont, Laurent Léotoing, Marie-Jeanne Davicco, Patrice Lebecque, Sylvie Mercier, Elisabeth Miot-Noirault, Paul Pilet, Laurent Rios, Yohann Wittrant and Véronique Coxam* (INRA, UMR 1019, UNH, CRNH Auvergne, F-63009 Clermont-Ferrand, France), The Journal of Nutritional Biochemistry, 2013, 24(11), 1840–1848]

NPARR 5(1), 2014-074 Screening of phytochemical, physico-chemical and bioactivity of different parts of Acmella oleraceae Murr. (Asteraceae), a natural remedy for toothache

Acmella oleraceae Murr. (Asteraceae) is a natural source of bioactive secondary metabolites which are responsible for an array of therapeutic properties. Therapeutic effects are mainly due to the secondary metabolites and antioxidant activity present in different parts of the plant. Purpose of this work was to compare the physico-chemical, phytochemical, total phenol content (TPC), total antioxidant capacity (TAC) and cytotoxicity of different parts of A. oleraceae. Physico-chemical and phytochemical parameters were performed according to the methods described in WHO guidelines. The TAC and TPC were determined using Ferric Reducing Antioxidant Power assay (FRAP) and modified Folin–Ciocalteu colorimetric method respectively. Presence of a prominent, bright light green color spot ($R_f – 0.78$) in TLC fingerprints was characteristic for flower extracts. The highest values for all the physico-chemical parameters, TAC and TPC were found in leaves while higher cytotoxicity was exhibited from flower extracts. Order of cytotoxicity was flower > leaf > stem. Presence of higher cytotoxicity in flower and leaf extracts scientifically validates the extensive use of flower and leaf in traditional systems of medicine in Sri Lanka. Information generated are vital important for the quality control and standardization of A. oleracea in order to validate/upgrade the Sri Lankan pharmacopeia. [G.R.P.I. Abeysiri, R.M. Dharmadasa*, D.C. Abeysinghe and K. Samarasinghe(Industrial Technology Institute, BaudhalokaMawatha, Colombo, Sri Lanka) Industrial Crops and Products, 2013, 50, 852–856]
NPARR 5(1), 2014-075 Effect of alginate/nano-Ag coating on microbial and physicochemical characteristics of shiitake mushroom (*Lentinus edodes*) during cold storage

The effect of a novel alginate/nano-Ag coating material on the preservation quality of shiitake mushroom (*Lentinus edodes*) during 4 ± 1 °C storage was investigated. The results showed that the alginate/nano-Ag coating had quite a beneficial effect on the physicochemical and sensory quality, compared to the control treatment. After a 16-day storage, mushroom weight loss, softening, and browning of the alginate/nano-Ag coating were significantly inhibited. The lower microbial counts, including mesophilic, psychrophilic, pseudomonad, and yeasts and moulds, in treated mushrooms during storage should be attributed to the alginate/nano-Ag coating. Meanwhile, the contents of the reducing sugar, total sugar, total soluble solids and electrolyte leakage rate were increased to 3.9 mg/g, 11.2 mg/g, 5.1% and 16.5% for the alginate/nano-Ag coating and 3.7 mg/g, 8.3 mg/g, 6.3% and 31.7% for the control treatment. Therefore, the alginate/nano-Ag coating could be applied for preservation of the shiitake mushroom to expand its shelf life and improve its preservation quality. [Tianjia Jiang, Lifang Feng and Yanbo Wang (College of Food Science and Biotechnology, Zhejiang Gongshang University, Food Safety Key Lab of Zhejiang Province, Hangzhou 310035, PR China) *Food Chemistry*, 2013, **141**(2), 954–960].

NPARR 5(1), 2014-076 Partial purification and kinetic properties of myrosinase from cauliflower (*Brassica oleracea* var. *botrytis*).

Myrosinase is an important enzyme of cruciferous vegetables having several biological functions in the plant cells. In order to study its nature and behavior from a rather new source, it has been purified to apparent homogeneity from 5 days old germinated cauliflower seedlings having a specific activity of 12.71 units/mg protein with 54.6% recovery using ammonium sulfate fractionation and gel filtration chromatography on Sephadex G-100. The native molecular mass of the purified enzyme was estimated, using gel filtration, to be about 128kDa. The purified enzyme migrated as a single band on SDS-PAGE with molecular mass of about 64 kDa, suggesting that myrosinase from cauliflower seedling consists of two subunits of similar molecular mass. The enzyme exhibited its highest activity at pH 6.0. The optimum temperature for the purified enzyme was found to be 50°C but maintained nearly 60% of its activity even at 70°C. The purified enzyme remained stable at 4°C for several months. Using sinigrin as a substrate, the $K_m$ and $V_{max}$ values for the purified enzyme were estimated to be 117 µM and 550 µMol/ min, respectively. The enzyme was strongly activated by 0.5 mM ascorbic acid. The results revealed that the cauliflower myrosinase being homodimer has wider pH and temperature optima, hence is suitable for wider applications [Om Prakash, Rai, A. K*. Jagdish Singh and Singh, P. M. (Indian Institute of Vegetable Research, Varanasi-221305, India), *Indian Journal of Agricultural Biochemistry*, 2013, **26**(2), 190-194].


This research report is about the potential of coconut coir dust (CD) amended with oil palm frond (OPF) compost soilless growing media for cauliflower cultivation. Five different soilless growing media comprising of CD alone and as mixtures of CD and peat [CDP]; CD and OPF compost A (CDC$_a$); CD and OPF compost B (CDC$_b$); CD and OPF compost C (CDC$_c$) were evaluated in a tropical humid planthouse. The treatment CDC$_a$ provided optimum plant growth
conditions of cauliflower throughout the growing period due to superiority in physiological traits (stomatal conductance, photosynthesis rate and chlorophyll content in leaves) and higher rate of nutrients uptake resulting maximum total dry mass production thereby economic yield i.e., production of biggest curd (302 g/plant). Moreover, Plants grown on CDC\textsubscript{a} media mature six days earlier than the control plants. Therefore, plants grown in soilless growing medium, CDC\textsubscript{a} might suitable growing medium for commercial cultivation of cauliflower in tropical conditions. [Erwan, Mohd Razi Ismail\textsuperscript{*}, Halimi Mohd Saud, Radziah Othman, Habib, S. H., Kausar, H. and Laila Naher (Laboratory of Food Crops, Institute of Tropical Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia), \textit{International Journal of Agriculture and Biology}, 2013, \textbf{15}(4), 731-736].

\textit{NPARR} 5(1), 2014-078 \textbf{Upgrading the utilization of brassica wastes: physicochemical properties and sensory evaluation of fermented brassica stalks.}

The potential to utilize brassica harvest residue and processing waste to add-value and/or to eliminate environmental concerns through fermentation was investigated. Some physicochemical properties (moisture, protein, ash, acid detergent fibre, vitamin C, total phenolic and amino acids contents, acidity and shear and compression forces) for broccoli and cauliflower stalks before and after fermentation were measured. Considerable vitamin C and total phenolics concentrations were found in fresh broccoli and cauliflower stalks before and after fermentation were measured. Considerable vitamin C and total phenolics concentrations were found in fresh broccoli and cauliflower stalks. Fermentation decreased (P<0.001) vitamin C concentration to about 55% of that found in fresh stalks of broccoli and cauliflower and decreased (P<0.001) total phenolics concentrations (by 15% and 28% for broccoli and cauliflower, respectively). The results from the sensory analysis indicated that the fermented broccoli and cauliflower stalks may be successful as condiment products for consumers familiar with fermented products. [Bekhit, A. E. D., Lingming, K., Mason, S. L., Zhou, J. H. and Sedcole, J. R. (Food Science Department, University of Otago, Dunedin, New Zealand), \textit{International Food Research Journal}, 2013, \textbf{20}(4), 1961-1969].

\textit{NPARR} 5(1), 2014-079 \textbf{Effect of incorporation of cauliflower leaf powder on quality attributes of malted wheat noodles.}

The noodle market is growing fast and is gaining popularity in the world market. Thus, the wheat flour in the traditional noodle formulation was replaced with 10, 15 and 20% cauliflower leaf powder. The flours were mixed with other ingredients and instant noodle samples were prepared through hand extruder using specific die using a standard method. The samples were evaluated for changes in rehydration ratio, water activity and sugar contents. The results revealed that the rehydration ratio, reducing sugars and total sugars increased with the increase in cauliflower leaf powder concentration, whereas, water activity decreased. Among the various treatments 90% malted wheat flour: 10% cauliflower leaf powder was found to the best. The results showed that cauliflower leaf powder can be incorporated up to 10% in noodles to improve the nutrient value without affecting the sensory properties. [Wani, T. A., Monika Sood\textsuperscript{*}, Kaul, R. K and . Moni Gupta(1Division of Post-Harvest Technology, SK University of Agricultural Sciences and Technology-Jammu, Udheywalla, Jammu-180002, Jammu and Kashmir, India), \textit{Indian Journal of Agricultural Biochemistry}, 2013, \textbf{26}(2), 135-140].

\textit{NPARR} 5(1), 2014-080 \textbf{Bioactive Compounds and Antioxidant Activity of Fresh and Processed White Cauliflower}

Brassica species are very rich in health-promoting phytochemicals, including phenolic compounds, vitamin C, and minerals. The objective of this study was to investigate the effect of different blanching (i.e., water and
steam) and cooking (i.e., water boiling, steam boiling, microwaving, and stir-frying) methods on the nutrient components, phytochemical contents (i.e., polyphenols, carotenoids, flavonoid, and ascorbic acid), antioxidant activity measured by DPPH assay, and phenolic profiles of white cauliflower. Results showed that water boiling and water blanching processes had a great effect on the nutrient components and caused significant losses of dry matter, protein, and mineral and phytochemical contents. However, steam treatments (blanching and cooking), stir-frying, and microwaving presented the lowest reductions. Methanolic extract of fresh cauliflower had significantly the highest antioxidant activity (68.91%) followed by the extracts of steam-blanched, steam-boiled, stir-fried, and microwaved cauliflower 61.83%, 59.15%, 58.93%, and 58.24%, respectively. HPLC analysis revealed that the predominant phenolics of raw cauliflower were protocatechuic acid (192.45), quercetin (202.4), pyrogallol (18.9), vanillic acid (11.90), coumaric acid (6.94), and kaempferol (25.91) mg/100 g DW, respectively. [Fouad A. Ahmed and Rehab F. M. Ali* (Department of Biochemistry, Faculty of Agriculture, Cairo University, Giza 12613, Egypt) BioMed Research International, 2013, 2013, 9 pages]
WOOD

NPARR 5(1), 2014-081 Performance of oak, beech and spruce beams after more than 100 years in service

The aim of this study was to investigate differences in the mechanical and fungicidal properties of three different wood species (English oak (Quercus sp.), common beech (Fagus sylvatica) and Norway spruce (Picea abies)) that had been in indoor use for several decades, compared to control specimens of freshly cut timber. The collected material was cut into smaller samples prior to further analysis. Extractive content, mechanical, fungicidal and sorption properties were determined according to standard procedures. The obtained results showed that the mechanical properties of oak wood do not deteriorate over the investigated time frame. On the other hand, the resistance of oak wood against fungi decreases over time. The reason for this is yet to be confirmed; it may be due to degradation of secondary metabolites. Similar results have been reported for spruce wood. There were no statistically significant differences in the mechanical properties of old and new spruce wood. In contrast to oak wood, there were also no significant differences in fungicidal properties, bearing in mind that spruce wood has lower durability than oak wood. Aging of beech wood resulted in a considerable decrease in the tested mechanical properties but showed no significant differences in fungicidal properties. Old beech wood specimens were moderately deteriorated by insects and fungi, which was the reason for the loss of bending and compressive strength. Our results confirm that most of the relevant properties do not deteriorate with time and that wood can be reused for a variety of other applications even after decades in service. [Nejc Thaler and Miha Humar* (University of Ljubljana, Biotechnical Faculty, Department of Wood Science and Technology, Jamnikarjeva 101, SI-100 Ljubljana, Slovenia) International Biodeterioration & Biodegradation, 2013, 85, 305–310]

NPARR 5(1), 2014-082 Efficacy of linseed- and tung-oil-treated wood against wood-decay fungi and water uptake

Most European wood species do not have durable wood. In order to be used in outdoor conditions, non-durable material must be protected. Non-biocidal solutions for wood protection have been attracting a lot of attention, particularly in class 2 and 3 applications. One non-biocidal technique is treatment of wood with water repellents, such as wax emulsions and oils. Linseed oil and tung oil are frequently used water repellents. This research reports on the performance of linseed- and tung-oil-treated Norway spruce and beech wood against wood-decay fungi. Additionally, short-term hydrophobic properties were determined (with a tensiometer), as well as long-term hydrophobic properties (by soaking in water) in laboratory and outdoor conditions (electrical resistance measurements). Wood treated with tung oil and linseed oil is protected against brown- and white-rot fungi; however, tung oil was found more effective. Not only did the oils tested prove efficacious against wood-decay fungi, but also they worked against short-, medium-, and long-term water uptake as well. Oil treated wood takes up less water during laboratory tests, as well as during outdoor testing. [Miha Humar* and Boštjan Lesar (University of Ljubljana, Biotechnical Faculty, Jamnikarjeva 101, SI-100 Ljubljana, Slovenia) International Biodeterioration & Biodegradation, 2013, 85, 223–227]

NPARR 5(1), 2014-083 Durability of phenolic-resin-treated oil palm wood against subterranean termites a white-rot fungus

Oil palm wood (OPW) is seen as a strategic alternative wood material, especially in a country with huge oil-palm-planted areas such as Malaysia. The material is low in quality and various techniques have been used to improve its quality. This study was carried out to evaluate the
resistance of low-molecular-weight phenol formaldehyde (Lmw-PF) resin treated OPW against subterranean termites and a white-rot fungus. Four sample groups including untreated OPW and treated OPW samples with three different compression levels (0%, 25%, and 50%) were prepared. Five specimens for each sample group were tested for resistance against subterranean termites (Coptotermes curvignathus) and the white-rot fungus Pycnoporus sanguineus, based on ASTM D 3345-74 and ASTM D 1413-99, respectively. Results showed that both treatment and compression level had significant effects on the percentage weight loss and mean decayed surface of the samples. Treated OPW with 50% compression yielded the best performance with the lowest weight loss on both termite and decay tests. Overall, Lmw-PF resin treated OPW with 25–50% compression can be used as an effective method to improve the durability of OPW. [Edi Suhaimi Bakar*, Jun HaoZaidon Ashaari and Adrian Choo Cheng Yong (Faculty of Forestry, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia), International Biodeterioration & Biodegradation, 2013, 85, 126–130].

NPARR 5(1), 2014-084 Antifungal properties of some plant extracts used as wood preservatives

This study evaluated antifungal resistance of some commercial and environmentally friendly plant extracts. Four different concentrations of mimosa (Acacia mollissima), quebracho (Schinopsis lorentzii) and pine (Pinus brutia) bark extracts known with their high condense tannin amounts were used to impregnate Scotch pine (Pinus sylvestris L.), beech (Fagus orientalis L.) and poplar (Populus tremula) wood specimens. Extract treated wood specimens were tested against two types of white rot fungi (Trametes versicolor and Pleurotus ostreatus) and two types of brown rot fungi (Fomitopsis palustris and Gloeophyllum trabeum) for 16 weeks. The lowest mass loss rates were recorded for mimosa and quebracho extract treated wood blocks at the 9% and 12% concentration levels against both white and brown rot fungi. Pine bark extract, on the other hand, seemed to be ineffective against all fungi species tested even at the highest concentration level (12%). The current study suggests that commercial mimosa and quebracho extracts can be utilized as alternative wood preservative chemicals against common wood decay fungi in indoor applications. [Cihat Tascioglu* Mesut Yalcin, Selim Sen and Caglar Akcay (Department of Forest Products Engineering, Faculty of Forestry, Duzce University, 81620 Duzce, Turkey), International Biodeterioration & Biodegradation, 2013, 85, 23-28].

NPARR 5(1), 2014-085 Imported wood decomposition by termites in different agro-eco zones of India

Some imported timbers are well known for their durability and their reputation has carried them far from their original homes, although some have not maintained their reputation under different conditions or where new varieties of termites have appeared. It is necessary to know the behaviour of wood species under different environmental conditions and their durability class before the timber or timber product is put into use. The degree of wood deterioration is dependent on conditions such as soil, rainfall, altitude, temperature, and other environmental conditions under which the timber is put to use. Natural durability refers to the ability of wood species to resist attack by different agents, especially biological ones. This paper describes the natural resistance of important imported timber species of India against termites in different agro-eco zones. Field experiments were carried out at six locations falling under five Indian agro-eco zones with the aim of evaluating the natural resistance of 20 species of imported woods. Wood stakes measuring 30.5×3.8 ×3.8 cm as per IS:401-1982
s standards were implanted in the soil and observed for a period of 4 yr, and visual damage assessment was done. The termites active in the test yard and on the test stakes were collected, preserved in 70% ethanol, and identified using taxonomic keys. Results revealed significant variation in rate of degradation of wood species with climatic zones producing significant variation as well. The tested timbers were categorized into three groups: susceptible, resistant, and moderately resistant. Termites collected belonged to nine species under four genera and the single family Termitidae. *Odontotermes obesus* was the dominant species in most of the locations. [Rashmi Ramesh Shanbhag and R. Sundararaj (Institute of Wood Science and Technology, 18th Cross, Malleswaram, Bangalore 560003, India) *International Biodeterioration & Biodegradation*, 2013, **85**, 16–22].
OTHERS (incl. Cultivation, Distribution, New species, Postharvest Technologies, Packaging Technology, New technologies/Know How Developed, Book reviews, Forthcoming events)

CULTIVATION

NPARR 5(1), 2014-086 Benefits of mycorrhizal inoculation in reintroduction of endangered plant species under drought conditions

Numerous human activities constitute threats to biodiversity. The effects of climate change, including increasing drought in already arid lands, pose an additional layer of uncertainty in the fate of rare species. In the case of plants, reintroduction is becoming an important active management practice in species conservation. We hypothesized that even under extreme drought inoculation with mycorrhizal fungi would increase growth rates of an endangered plant in experimental reintroduction. We selected a plant species, Abronia macrocarpa, and conducted the experiment in Texas while the area was experiencing mild and extreme drought intensities. Treatment plots were planted with seed inoculated with arbuscular mycorrhizal fungi and control plots were planted with seed coated with autoclaved inoculant. We analyzed measurements of growth and development of germinated plants. Mean number of leaves was greater in treatment plants ($P = 0.005$) and mean aerial diameter was larger in treatment plants ($P = 0.02$) than in control plants. Significantly improved growth suggests that inoculation is a viable technique to increase reintroduction success in plant species especially during periods of drought [Stefanie Ferrazzano and Paula S. Williamson* (Department of Biology, 601 University Dr., Texas State University, San Marcos, TX 78666, USA), Journal of Arid Environments, 2013, 98, 123-125].

NPARR 5(1), 2014-087 Protected cultivation as an option of livelihood in mountain region of central Himalaya, India

Protected farming is an alternative new technique for seasonal and off-seasonal vegetable cultivation, particularly in high-altitude region, and can be successfully employed for niche areas of agriculture. Experimentation on vegetable crops under protected conditions was carried out to see the feasibility of their farming at different altitudes in the central Himalayan region. For evaluating the suitable conditions required for the cultivation of vegetables, three treatments, viz., polyhouse, shade net, and plastic-mulch, were selected in comparison to open condition at both the altitudes. Capacity building through organizing training program was adopted for demonstration and dissemination of this technology to rural farmers of the region. The yield of selected vegetables was found to be significantly ($P < 0.05$) high under protected cultivation, and the productivity of vegetables has been observed to increase from 15.85% to 932.20% as compared to that in open field condition at both the altitudes. As a result of capacity building, a number of households (78) at high and low altitudes (41) adopted seasonal and off-seasonal vegetable cultivation through protected cultivation technology at various levels. This is the first study of its kind, and in the present case, we demonstrated that protected cultivation is an alternative and efficient technology for seasonal and off-seasonal vegetable cultivation, particularly at high-altitude region. The production of vegetable seedling is gradually changing from open field nurseries to protected raised bed or seedling tray production after obtaining technical know-how. It is hoped that the improved capacities of local farmers would help in spreading this technology through adoption of protected cultivation in the central Himalaya and other high-altitude region of other countries having similar environmental and socio-economic conditions [Vikram S. Negi*, R. K. Maikhuri*, L. S. Rawat* & D. Parshwan (G.B. Pant Institute of Himalayan Environment and Development, Garhwal Unit, Srinagar Garhwal, Uttarakhand, India), International Journal of Sustainable Development & World Ecology, 2013, 20(5), 416-425].
Organic agriculture in developing countries is becoming a tool for socio-economic development and is supported by various international and national development initiatives. In India spices being major contributors to national income, are gaining attentions regarding the organic farming practices. Present study conducted in Idukki district of Kerala was aimed to identify the extent of adoption of various recommended practices and reasons for adopting organic cultivation practices of cardamom. Data were collected from 120 respondents, comprising 90 organic and 30 inorganic cardamom farmers’ which were selected through multistage sampling procedure. The results of the study on different aspects of extent of adoption in case of organic and inorganic farmers clearly showed that most of the practicing farmers were innovative in the complete adoption of the relevant technologies. Organic cardamom growers were found to be more innovative in the adoption of practices like planting material selection, the water and soil conservation technologies, and plant protection measures contributing higher benefit for the overall improvement of their farmland and the income generating capacity of farmers. The apprehension for the pollution free environment, chemical free produce, and increased demand for the organic cardamom in the international and the domestic markets horde farmers briskly to adopt organic farming practices in cardamom [Gills Reshma, Singh Rashmi and Nain Manjeet Singh (Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi-110012), *Journal of Community Mobilization and Sustainable Development*, 2013, 8(1), 41-47].
**POST HARVEST TECHNOLOGY**

*NPARR* 5(1), 2014-089 **Model study on effect of glucose on the basic characteristics and physical properties of natural rubber**

Glucose at various concentrations was incorporated into sugar free purified natural rubber (PNR) latex to model the effect of carbohydrate on the basic characteristics and physical properties of natural rubber (NR). PNR samples treated with various concentrations of glucose were characterized for the basic properties of unvulcanized NR, i.e., gel content, molecular weight distribution and Mooney viscosity to evaluate the effect of sugar on these parameters. In addition, the effect of glucose on the physical properties of vulcanizates derived using sulfur and peroxide vulcanization was investigated. Glucose was shown to affect the viscosity of unvulcanized NR and the discoloration of vulcanized NR. Moreover, glucose was found to have a strong effect on crosslink density, as well as tensile and dynamic properties of sulfur vulcanizates, while those properties of peroxide vulcanizates was not much affected by glucose. [Adun Nimpaiboon and Jitladda Sakdapipanich* (Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand), *Polymer Testing*, 2013, 32(8), 1408–1416].

*NPARR* 5(1), 2014-090 **Ethephon: a tool to boost gum arabic production from *Acacia senegal* and to enhance gummosis processes**

Gum arabic production from *Acacia senegal* is lower in sub-humid areas than arid areas. Water stress is thought to be the reason for higher yields in arid areas. The application of ethephon is thought to mimic the effect of water stress in other plants. The objective of this study was to determine if the application of ethephon would increase the gum yields of *Acacia senegal* under sub-humid conditions in Cameroon. Trees receiving 40 or 120 mg ethephon were compared to controls in field experiments at a semi-arid and a sub-humid location in Northern Cameroon, over two seasons. Two provenances from drier areas (Sudan) were compared to the local one. In the first season, gum yield of the local provenance treated with ethephon was increased by 400–600 % compared to the untreated trees. Gum yield at the semi-arid location was 77, 313 and 214 g/tree with 0, 40 and 120 mg ethephon/tree, respectively, while at the sub-humid location, it was 30, 186 and 114 g/tree with 0, 40 and 120 mg ethephon/tree. However, in the second season, the effect of ethephon was not significant in the semi-arid area, whereas it was evident in the sub-humid area (up to 478 g/tree). Moreover, ethephon did not affect gum yield of provenances from drier areas (Sudan). This showed that the water-stress hypothesis has to be refined. The development of ethephon-based tapping systems is promising, but requires further studies with a wider range of environmental conditions and *A. senegal* provenances [Chimène Fanta Abib, Mama Ntoupka, Régis Peltier, Jean-Michel Harmand and Philippe Thaler* (UMR Eco&sols, CIRAD, 2 place Viala, Bat. 12, 34060, Montpellier Cedex 2, France), *Agroforestry Systems*, 2013, 87(2), 427-438].
Forthcoming Conferences, Seminars, Exhibitions and Trainings

1. International Conference On Science, Technology & Management, 1st to 1st February 2015, New Delhi, India; Website: http://www.conferenceworld.in

2. 3rd International Conference on Nanoscience and Nanotechnology - ICONN 2015, 4th to 6th February 2015 Chennai, Tamilnadu, India; Website: http://www.srmuniv.ac.in/iconn2015/

3. 2nd International Conference on Biotechnology and Bioinformatics (ICBB-2015), 6th to 8th February 2015 Pune, Maharashtra, India; Website: http://www.icbb.in


5. 5th Annual International Conference on Advances in Biotechnology (BIOTECH 2015), 13th to 15th March 2015 Kanpur, India; Website: http://www.advbiotech.org/index.html

6. International Seminar on Utilization of Non-Conventional Energy Sources for Sustainable Development of Rural Areas, ISNCESR’15 Seminar, 21st to 22nd March 2015, Bhilai, Chhattisgarh, India; Website: http://www.parthiviparas2015.in


8. Current Scenario and Future Prospects of Biotechnology in Diverse Sectors (CSFPB-2015), 22nd to 24th October 2015, Sathyamangalam-Erode, Tamil Nadu, India; Website: http://www.bitsathy.ac.in/csfpb2015/
ANNOUNCEMENTS

INDIAN JOURNAL OF NATURAL PRODUCTS AND RESOURCES

Original research Papers and Reviews on topics dealt within this repository are invited for publication in peer reviewed, quarterly journal (March, June, September and December), *Indian Journal of Natural Products and Resources* (Formerly known as *Natural Product Radiance*). For details visit: nopr@niscair.res.in. The papers may be sent to Dr (Mrs) Sunita Garg, Editor Periodicals Division, National Institute of Science Communication and Information Resources (NISCAIR), CSIR, Dr K. S. Krishnan Marg (Inside Pusa Campus). New Delhi-110012; Phone: (091)-11-25846001, (091)-11-25846304-07, Ext.258, 255. Fax: (091)-11-2584 7062. E-mail: sunitag@niscair.res.in; ijnpr@niscair.res.in

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 ethnomedical 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 authentication of dried well pressed plant specimens properly fixed on a herbarium sheet with leaves, flower, fruit, etc. or crude drug (Leaves, fruits, flowers, root, rhizome etc.) we charge Rs.500/- per sample. DD may be sent to the Director NISCAIR.
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)
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: