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

NPARR 1(4), 2010-0622, Preparation and physicochemical evaluation of chitosan/poly(vinyl alcohol)/pectin ternary film for food-packaging applications

Chitosan/poly(vinyl alcohol)/pectin ternary film was prepared by solution casting method in this study. The prepared ternary film was characterized by Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and X-ray diffraction (XRD). The characteristic change of shapes in the IR spectra are observed in a strong peak at 1620 cm\(^{-1}\) for the interchain or intermolecular ionic salt bonds between amino groups of chitosan and carboxyl groups of pectin of the ternary film. The XRD result proves that the chitosan–poly(vinyl alcohol)–pectin ternary film is crystalline. The result of SEM indicates that the surface of chitosan–poly(vinyl alcohol)–pectin ternary film is rough, and heterogeneous. The thermogravimetric analysis (TGA) depicts the weight losses at 200-300°C resulting from ternary film for degradation of chitosan molecule. The microbial screening has demonstrated the antimicrobial activity of the film against pathogenic bacteria viz., Escherichia coli, Staphylococcus aureus, Bacillus subtilis, Pseudomonas, and Candida albicans against the measurement of clear zone diameter included diameter of film strips, the values of which were always higher than the diameter of film strips. Overall, the ternary film happens to be a suitable material for food-packaging applications [S. Tripathi, G.K. Mehrotra and P.K. Dutta* (Department of Chemistry, Motilal Nehru National Institute of Technology, Allahabad 211004, India), Carbohydrate Polymers, 2010, 79(3), 711-716].

NPARR 1(4), 2010-0623, Comparative studies on the physico-chemical properties of hemicelluloses obtained by DEAE-cellulose-52 chromatography from sugarcane bagasse

Water- and alkali-soluble hemicelluloses isolated from dewaxed sugarcane bagasse were sub-fractionated on DEAE-cellulose-52 chromatography and obtained six hemicellulosic sub-fractions by eluting with water, 0.1M and 0.3M NaCl aqueous solution, respectively. Sugar composition and molecular weight analysis revealed that the lower molecular weight (14,180-43,590gmol\(^{-1}\)) and more branches of hemicelluloses could be extracted by the hot water, which are rich in glucose, galactose, and xylose, while the higher molecular weight (75,430-138,170gmol\(^{-1}\)) and more linear hemicelluloses were able to be dissolved into 1% NaOH aqueous solution, which are rich in xylose, principally resulting from l-arabinino-(4-O-methyl-glucurono)-d-xylylans. In addition, it was found that with increasing the concentration of NaCl (aqueous), the hemicellulosic sub-fractions with both higher arabinose to xylose ratio and higher molecular weight were eluted. Based on the FT-IR, sugar composition and \(^1\)H and \(^13\)C NMR comparative studies, the alkali-soluble hemicellulosic sub-fractions had a classical structure, with a backbone of \(\beta-(1\rightarrow4)\)-linked xylosyl residue substituted with arabinose at C-2 and/or C-3 of main chain, whereas the difference may occur in the distribution of branches along the xylan backbone [Feng Peng, Jun-Li Ren, Feng Xu, Jing Bian, Pai Peng and Run-Cang Sun* (State Key Laboratory of Pulp and Paper Engineering, South China University of Technology, Guangzhou 510640, China), Food Research International, 2010, 43(3), 683-693].

NPARR 1(4), 2010-0624, Structure and physicochemical properties of palmyrah (Borassus flabellifer L.) seed-shoot starch grown in Sri Lanka

Starch from palmyrah (Borassus flabellifer Linn.) seed-shoot flour was isolated and its composition, morphology, structure and physicochemical properties were determined. The yield of starch was 38.4% on a whole flour basis. The shape of the granule ranged from round to elliptical. Bound lipid, total lipid, apparent amylose, total amylose and resistant starch contents were 0.03%, 0.04%, 30.9%, 32.7% and 32.2%, respectively. The X-ray pattern was of the A-type and relative crystallinity was 34.1%. Palmyrah starch exhibited a high proportion (31.8%) of short amylopectin chains (DP 6-12) and a low proportion (1.2%) of long amylopectin chains (DP>36). Gelatinization temperatures were 73.1-82.0°C and enthalpy of gelatinization was 13.6J/g. Pasting temperature, viscosity breakdown and set-back were 76.5°C, 147 and 74BU, respectively. Palmyrah starch exhibited high granular swelling, and restricted amylose leaching. Susceptibility towards \textit{in vitro} \(\alpha\)-amylolysis and retrogradation was low. The results showed that
physicochemical properties of palmyrah starch were largely influenced by strong interactions between amylose–amylose and/or amylose–amylopectin chains within the granule interior [S. Naguleswaran, T. Vasanthan*, R. Hoover and Q. Liu (Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada T6G 2P5), Food Chemistry, 2010, 118(3), 634-640].

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

NPARR 1(4), 2010-0625, Herbicidal activity of a medicinal plant, Peganum harmala Linn., and decomposition dynamics of its phytotoxins in the soil

This study evaluates the herbicidal potential of Peganum harmala Linn. (Zygophyllaceae) residues on seedling growth of Avena fatua Linn. (Poaceae) and Convolvulus arvensis Linn. (Convolvulaceae), and decomposition dynamics of its phytotoxins in the soil. Results show that among the different P. harmala plant parts used, leaves were the most toxic and caused the greatest negative effect on seedling length, seedling dry weight, leaf area and chlorophyll content of A. fatua and C. arvensis. Both weed species differed in their sensitivity to P. harmala residues. Higher reduction in plant growth parameters occurred in C. arvensis. In the presence of charcoal and depending on source of residue, receiver plants or amount of residues, the inhibitory effects of P. harmala on both test plants were eliminated or significantly reduced. Total phenolic acid content was higher in soil amended with leaf residues than that of soils with stem or root residues. Our findings revealed that a higher inhibitory effect P. harmala residues on both target species was obtained when weed seeds were sown 1 or 3 days after residue decomposition in the soil started. Total phenolic contents were maximum in the soil 1 day after decomposition, whereas phenolic amounts rapidly decreased with increasing decomposition. In conclusion, P. harmala residues had potent herbicidal activity and could be used as a natural herbicide for weed control [Hamid Sodaeizadeh*, Mohammad Rafieiolhossaini and Patrick Van Damme (Laboratory of Tropical and Subtropical Agronomy and Ethnobotany, Coupure links 653, B-9000 Gent, Belgium), Industrial Crops and Products, 2010, 31(2), 385-394].

NPARR 1(4), 2010-0626, Xanthium strumarium a possible biocontrol agent against Helicoverpa armigera

Water extract of 10%, 20% was not effective in causing death, even arresting growth of larve where as 10% and 20% acetone extract, and 20% methanol extract of plant part were most effective in causing death of Larve suggesting antifeedant properties. Results show possible use of X. strumarium in the control of bollworm [Alkari Sonali* and Chaturvedi Alka (Department of Botany, R.T.M. Nagpur University, Nagpur -440 033, Maharashtra, India), Journal of Entomological Research, 2010, 34(2)].

NPARR 1(4), 2010-0627, Effect of caffeine on larval mortality of Aedes aegypti: Efficiency related to solution concentration and age

In two experiments, the duration of the effect of caffeine (CAF) solutions on larval mortality (LM) of Aedes aegypti was analyzed. In the first, LM was studied using solutions at 0.2, 0.5, 1.0 and 2.0 mg/mL aged from zero to five days in artificial breeding sites exposed to the laboratory environment (LE). In the second, the solutions aged at 1.0, 2.0 and 2.5 mg/ml closed flasks were stored in LE or in the refrigerator (R), and the effect on LM was tested in the experimental breeding sites at 30 days interval. In the first, the duration of the effect increased with the solution age in each CAF concentration. CAF at 1.0 and 2.0 mg/ml, without addition of food, produced 100% LM until 25 days after preparation; with food, at 11 and 18 days, respectively. In the second the effectiveness of CAF solutions lasted up to the seventh month, irrespective of whether they were stored in R or in LE. No adult emerged at any of the CAF concentrations used in second experiment [Guiardo Marluci Monteiro* and de Campos Bicudo Hermione Elly Melara (São Paulo State University - UNESP, Instituto de Biociências, Letras e Ciências Exatas, Departamento de Biologia, Laboratório de Vetores, Brazil), Journal of Entomological Research, 2010, 34(1)].

NPARR 1(4), 2010-0628, Chemical composition and larvicidal activity of leaf essential oil from Clausena dentata (Willd) M. Roam. (Rutaceae)