RUBBER/GUM/RESIN

NPARR, 6(3 & 4), 2015-190 **Karanja [*Millettia pinnata* (L.) Panigrahi] seed oil as a renewable raw material for the synthesis of alkyd resin**

Non-edible vegetable oils are an important class of bio-resource for producing polymeric materials due to their large abundance, low cost and renewability. Karanja (*Millettia pinnata*) tree is an evergreen, drought resistant, nitrogen fixing tree belonging to Leguminaceae family. Karanja seed oil (~27 wt%) mainly consisting of triglycerides is a good source of non-edible vegetable oil for synthesizing alkyd resin. Triglyceride was first converted to monoglyceride by glycerolysis process. The monoglyceride was then reacted with phthalic and/or maleic anhydride to produce alkyd resins. The synthesized resins were characterized by FT-IR and ^{1}H NMR spectroscopy. The surface characteristic of the cured resins was studied by SE microscopy. The physico-chemical properties of the resins such as colour, acid value, free fatty acid content and iodine value were evaluated. The coating performance of the cured resins was tested by measuring chemical resistance, thermal stability, pencil hardness, gloss and adhesion [Montu Moni Bora, Riblu Deka, Nuruddin Ahmed and Dilip Kumar Kakati* (Department of Chemistry, Gauhati University, Guwahati, Assam 781014, India), *Industrial Crops and Products*, 2014, **61**, 106–114].

NPARR, 6(3 & 4), 2015-191 **Greener approach for synthesis of antibacterial silver nanoparticles using aqueous solution of neem gum (*Azadirachta indica* L.)**

A simple method for the green synthesis of silver nanoparticles (AgNPs) using autoclave assisted gum extract of neem (*Azadirachta indica*) has been investigated for the first time. Silver nanoparticles were formed due to reduction of silver nitrate solution when mixed with the gum extract after autoclaving at 121 °C and 15 psi. The UV–vis absorption spectrum of the biologically reduced reaction mixture showed the surface plasmon peak at 418 nm which is characteristic peak of silver nanoparticles. The functional biomolecules present in the gum extract and the interaction between the nanoparticles were identified by the Fourier transform infrared spectroscopy (FTIR) analysis. Average diameter of the synthesized nanoparticles was found to be <30 nm, as revealed from transmission electron microscopy (TEM) and atomic force microscopy (AFM) analysis. X-ray diffraction (XRD) analysis confirmed the face-centered cubic crystalline structure of metallic silver. The synthesized silver nanoparticles exhibited antibacterial activity against clinical isolates of *Salmonella enteritidis* and *Bacillus cereus*. Moreover, the antibacterial activity of the silver nanoparticles was further confirmed by degradation of test bacterial DNA. The results suggest that the gum mediated synthesized silver nanoparticles could be used as a promising antibacterial agent against clinical pathogens [Palaniyandi Velusamy*, Jayabrata Das, Raman Pachaiappan, Baskaralingam Vaseeharan, and Kannaiyan Pandian (Department of Biotechnology, School of Bioengineering, SRM University, Chennai 603 203, Tamil Nadu, India), *Industrial Crops and Products*, 2015, **66**, 103–109].

NPARR, 6(3 & 4), 2015-192 **Physicochemical, shear flow behaviour and emulsifying properties of *Acacia cochliacantha* and *Acacia farnesiana* gums**

The physicochemical, shear flow behaviour and emulsifying properties of gum exudates from *Acacia cochliacantha* and *Acacia farnesiana* were analysed and compared to those for *Acacia senegal* gum. Evaluation of physicochemical properties showed that *A. farnesiana* and *A. senegal* gums displayed levorotatory activity, relatively high carbohydrate/protein ratio and high content of

dietary fibre. Similarly, *A. farnesiana* and *A. senegal* gums formed stable oil-in-water emulsions with smaller droplet sizes and coalescence rates in the order of 10^{-8}, meaning for very stable disperse systems. Otherwise, *A. cochliacantha* gum was the only with dextrorotatory activity, high content of protein and arabinogalactan-proteins (AGPs), but low carbohydrate fraction; nevertheless, despite the possible advantages of high protein content associated with emulsifying properties, this polysaccharide showed lesser stability on emulsions. These results indicate that there is correlation between emulsion stability and an adequate carbohydrate/protein balance in the gums; additionally of the AGPs presence. Thus, *A. farnesiana* gum may be considered for oil-in-water emulsion stabilization and sources of soluble dietary fibre due to their relatively high polysaccharide fraction [Roberto Sibaja-Hernández, Angélica Román-Guerrero, Gabriela Sepúlveda-Jiménez and Mario Rodríguez-Monroy* (Departamento de Biotecnología, Centro de Desarrollo de Productos Bióticos del Instituto Politécnico Nacional, Calle CEPROBI No. 8, Col. San Isidro, C.P. 62731 Yautepec, Morelos, Mexico), *Industrial Crops and Products*, 2015, **67**, 161–168].

NPARR, 6(3 & 4), 2015-193 **A sustainability review of domestic rubber from the guayule plant**

Guayule (*Parthenium argentatum* Gray) is an arid-adapted, low-input perennial shrub native to Mexico and southern Texas that has received considerable attention as an alternative source of natural rubber. It has potential to replace the most common types of rubbers, including synthetic rubber derived from petroleum and natural rubber, which is tapped from Hevea (*Hevea brasiliensis*) trees grown in tropical regions, primarily Southeast Asia. The guayule plant produces natural rubber in its bark parenchyma cells and the shrub is processed to extract the latex. Guayule rubber is comparable in quality to Hevea natural rubber and the residual, non-latex guayule plant material can be transformed into valuable co-products, such as bioenergy. This review introduces the reader to guayule rubber production (agriculture, processing and products) and explores the sustainability implications of guayule rubber commercialization related to the three pillars of sustainability, including environmental impacts of rubber production, economic barriers and advantages, and social implications. The review highlights areas of focus that could be leveraged to help guayule become a more sustainable source of natural rubber. Guayule rubber provides an opportunity to lower the environmental impacts of a major commodity, to develop an industry to support the local U.S, economy, and to reduce U.S. dependence on non-renewable petroleum sources and rubber imports. Proposed recommendations to further support guayule sustainability include improving the efficiency of agricultural and processing activities, utilization of guayule co-products to improve economics of guayule cultivation, and the establishment of a secure guayule rubber supply at a production level that could consistently meet rubber demands. A better understanding of guayule rubber life-cycle impacts could be a way to reduce the environmental footprint of guayule rubber products and expedite its commercialization [Daina Rasutis, Kullapa Soratana, Colleen McMahan[c], Amy E. Landis* (School of Sustainable Engineering and the Built Environment, Arizona State University, 781 E. Terrace Rd., Tempe, AZ, USA), *Industrial Crops and Products*, 2015, **70**, 383–394].