ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 3(2), 2012-0132, Extraction and refining of essential oil from Australian tea tree, *Melaleuca alternifolia*, and the antimicrobial activity in cosmetic products

Tea tree oil (TTO) comes from the leaves of *Melaleuca alternifolia* that belongs to the myrtle family (Myrtaceae). It is one of the most powerful immune system stimulants and sorts out most viral, bacterial and fungal infections in a snap, while it is great to heal wounds and acne. In Vietnam, Melaleuca trees can grow on acid land that stretches in a large portion of lands in the Mekong Delta region. So, there are some Melaleuca plantations developed under the Vietnamese government plans of increasing plantation forests now. However, TTO contains various amounts of 1,8-cineole that causes skin irritant. So TTO purification is very necessary. In this study, the purification of TTO that meet International Standard ISO 4730 was carried out via two steps. The first step is steam distillation to obtain crude TTO (terpinen-4-ol 35% v/v) and the average productivity is among 2.37% (v/wet-wt) or 1.23% (v/dry-wt). In the second step, the cleaned TTO is collected by vacuum distillation column and extraction yield of the whole process is about 0.3% (w/w). Besides, high concentration essential oil was applied in the cosmetic products to increase its commercial value [Q Huynh*, T D Phan, V Q Q Thieu, S T Tran and S H Do (Faculty of Chemical Engineering, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, Ho Chi Minh City, Vietnam), *Journal of Physics: Conference Series Volume 352 conference 1*].

NPARR 3(2), 2012-0133, The essential oil of *Melaleuca alternifolia* (Tea Tree Oil) and its main component, terpinen-4-ol protect mice from experimental oral candidiasis

The therapeutic efficacy of tea tree oil (TTO), *Melaleuca alternifolia*, and its main component, terpinen-4-ol, were evaluated in a murine oral candidiasis model. Prednisolone -pretreated mice were orally infected with a fluconazole-susceptible (TIMM 2640) or a resistant (TIMM 3163) strain of *Candida albicans* to induce oral candidiasis. TTO or terpinen-4-ol was administrated with a cotton swab 3 h and 24 h after *candida* infection. These treatments clearly showed a decrease in the symptom score of tongues and in the viable *candida* cell number in the oral cavity at 2 d after azole-susceptible *C. albicans* infection, although the degree of the efficacy was less than that of fluconazole. Even against oral candidiasis caused by azole-resistant *C. albicans*, TTO and terpinen-4-ol were similarly effective, while fluconazole appeared ineffective. These results suggest that TTO and terpinen-4-ol may have the potential of therapeutic ability for mucosal candidiasis which may also be applicable to *C. albicans* oral candidiasis induced by the azole-resistant strain. [Kentaro Ninomiya*, Naho Maruyama, Shigebaru Inoue, Hiroko Ishibashi, Toshio Takizawa, Haruyuki Oshima 2), Shigeru Abe (Institute of Medical Mycology, Teikyo University), *Biological and Pharmaceutical Bulletin, 2012, 35*(6), 861-865].

NPARR 3(2), 2012-0134, Assessment of in vitro antioxidant activity of essential oil of *Eucalyptus citriodora* (lemon-scented Eucalypt; Myrtaceae) and its major constituents

The investigation on chemical composition and antioxidant activity of *Eucalyptus citriodora* (lemon-scented eucalyptus) leaf oil in terms of total antioxidant activity, ferric reducing antioxidant power (FRAP) assay, ferrous ion chelating activity, and scavenging of hydrogen peroxide (H$_2$O$_2$) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals and inhibition of lipid peroxidation. GC–MS analysis of essential oil revealed the presence of 43 components constituting 99.2% of oil. The oil was monoterpenoid (94.35% of oil) with
citronellal (60.66%), β-citronellol (12.58%) and isopulegol (8.19%) as the major monoterpenoids. Oil and its major monoterpenes exhibited moderate to strong antioxidant activity in terms of TAA, FRAP and Fe$^{2+}$ chelating, DPPH, and $H_2O_2$ scavenging, and lipid peroxidation inhibition. The study concludes that *E. citriodora* leaves contain monoterpenoid rich oil exhibiting antioxidant activity [Harminder Pal Singh*, Shalinder Kaur, Kirti Negi, Savita Kumari, Varinder Saini, Daizy R. Batish, Ravinder Kumar Kohli (Department of Environment Studies, Panjab University, Chandigarh 160014, India), *LWT - Food Science and Technology*, 2012, 48 (2), 237-241].

**NPARR** 3(2), 2012-0135, *Antifungal and antiaflatoxigenic efficacy of Caesulia axillaris Roxb. essential oil against fungi deteriorating some herbal raw materials, and its antioxidant activity*

The study deals with evaluation of antifungal and antiaflatoxigenic *Caesulia axillaris* Roxb. Essential oil (EO) against herbal raw materials deteriorating fungi and its free radical scavenging activity. During mycoflora analysis these herbal raw materials were found to be severely contaminated by different fungi and aflatoxins. A total of nine different fungal species were isolated from three herbal raw materials. *Aspergillus flavus* LHPtc was recorded as the highest aflatoxin B1 producing strain. EOs of some plants were tested for their fungitoxicity against the toxigenic strain *A. flavus* LHPtc, and *C. axillaris* EO was found as potent fungitoxicant. *C. axillaris* EO was chemically characterized through GC–MS analysis which depicted the presence of 18 compounds, dl-limonene and Euasarone being the major components. The EO exhibited broad spectrum of fungitoxicity against fungi causing postharvest deterioration of herbal raw materials. At 1.0 μl ml$^{-1}$ the oil showed complete inhibition of fungal growth and aflatoxin B1 production was inhibited at 0.8 μl ml$^{-1}$. Free radical scavenging activity of the oil was also recorded by 2,2-diphenyl-1-picrylhydrazyl assay, and its IC$_{50}$ value was found 18μlml$^{-1}$. The safety limit of the EO was determined in terms of LD$_{50}$ on mice, which was 9166.6μlkg$^{-1}$, suggesting its non mammalian toxicity. The EO of *C. axillaris* may be recommended as a plant based preservative in enhancement of shelf life of herbal raw materials by preventing their lipid peroxidation as well as biodeterioration due to fungal and aflatoxin contamination [Prashant Kumar Mishra, Ravindra Shukla, Priyanka Singh, Bhanu Prakash, Nawal Kishore Dubey*(Laboratory of Herbal Pesticides, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi 221005, India), *Industrial Crops and Products*, 2012, 36 (1), 74-80].

**NPARR** 3(2), 2012-0136, *Therapeutic effects of essential oil from waste leaves of Psidium guajava Linn. against cosmetic embarrassment using phylogenetic approach*

Medicinal plants are facing threats due to loss of habitat and overexploitation of know species. Therefore the present work shows utilization of essential oil from discarded leaves of *Psidium guajava* Linn. against human dermatophytic fungi *Trichophyton rubrum*, *T. mentagrophytes*, *Trichophyton violaceum*, *Trichophyton tonsurans*, *Epidermophyton floccosum*, *Microsporum gypseum* and *Microsporum canis*. The oil was found to be fungicidal at 3.0 μl/ml and it toler- ated heavy inoculum of pathogens at fungicidal concentrations. The fungicidal activity of the oil was thermostable, up to 70°C and shelf life was found to be six months, which was maximum the time taken into consideration. The oil hav- ing cineole, caryophyllane, copaene, azulene and eucalyptol as main constituents, exhibited broad fungicidal activity. The oil did not show any adverse effect on mammalian skin upto 5% concentration. Phylogeny of the dermatophytes with respect to toxicity of the oil has also been discussed using molecular data [Ahsan Kamran,
Optimization of pineapple flavour synthesis by esterification catalysed by immobilized lipase from *Rhizomucor miehei*

The synthesis of pineapple flavour (butyl butyrate) catalysed by lipase from *Rhizomucor miehei* has been optimized using central composite design and response surface methodology. Initially, the best butyric acid concentration in the mixture was defined and found that 1M butyric acid presented the highest initial reaction rate. The reaction parameters substrate molar ratio, enzyme content, and initial added water were evaluated in the central composite design with the reaction conversion yield as the dependent variable. The optimal conditions for butyl butyrate synthesis were found to be substrate molar ratio of 3.6:1 butanol: butyric acid; enzyme content of 6.5% of substrate mass fraction; added water 0.0% of substrate mass fraction. Under these conditions, over 90% of conversion was obtained in 16 h of reaction. Enzyme reuse was tested performing a treatment before each batch by washing the enzyme system with *n*-hexane, or simply reusing the biocatalyst in a new fresh reaction. Direct enzyme reuse caused a rapid decrease on the enzyme activity, while washings with *n*-hexane allowed the enzyme to be reused for six cycles keeping around 75% of its original activity [André S. G. Lorenzoni, Natália G. Graebin, Andréa B. Martins, Roberto Fernandez-Lafuente, Marco A. Záchia Ayub, Rafael C. Rodrigues*(Biocatalysis and Enzyme Technology Lab, Institute of Food Science and Technology, Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil), *Flavour and Fragrance Journal*, 2012, 27(2), 196-200].