ESSENTIAL OILS (incl. Flavour and Fragrance)

NPARR 5(3), 2014-0231 Chemical composition and antifungal activity of essential oils from three Himalayan Erigeron species

Three Himalayan Erigeron (Asteraceae) species viz Erigeron mucronatus, Erigeron annuus and Erigeron karwinskianus growing in sub-alpine region revealed occurrence of isomeric polyacetylenic constituents viz., matricaria and lachnophyllum esters which accounted for 83.3%, 69.3% and 30.1% of the essential oils from these species, respectively, in addition to mono- and sesquiterpenoids as minor constituents. The antifungal activity tested by poisoned food (PF) techniques against Fusarium oxysporum, Helminthosporium maydis, Rhizoctonia solani, Alternaria solani and Sclerotinia sclerotiorum demonstrated significant inhibition of the mycelial growth of all strains (p<0.05). The oils (500 µg/mL) showed significant antifungal effect against tested fungi in the growth inhibition range of 37.6–85.5% with respective IC$_{50}$ values ranging from 88.8 to 660.0 µg/mL as compared to standard fungicides (100% inhibition) with IC$_{50}$ value in the range of 32.2–129.4 µg/mL. Significant inhibition of spore germination was noticed for F. oxysporum, Curvularia lunata and Albugo candida which were highly susceptible to E. annuus oil with their IC$_{50}$ values 120.7, 253.5 and 300.4 µg/mL, respectively. Thus, the results obtained in this study demonstrate the potential of essential oils from Himalayan Erigeron species as non-toxic, eco-friendly and biodegradable natural fungicides [Vinod Kumar, C.S. Mathela*, Geeta Tewari, Darshan Singh, A.K. Tewari, K.S. Bisht (Department of Chemistry, Kumaun University, Nainital 263 002, Uttarakhand, India) LWT - Food Science and Technology Volume 56, Issue 2, May 2014, Pages 278-283].


To determine chemical constituents and antioxidant properties of essential oil from rhizome of the medicinal plant, Kaempferia galanga (K. galanga) Linn. (Zingiberaceae) in conventionally propagated (CP) and in vitro propagated (IVP) plants.

In vitro (micro) propagation of K. galanga was done by inoculating explants on to Murashige and Skoog agar medium, supplemented with suitable combinations of phytohormones; the regenerants were transferred to soil for further growth. Essential oil preparations of both CP and IVP rhizomes grown in soil, obtained by the hydro-distillation method were analyzed by gas chromatography-mass spectrometry. Antioxidant activities of essential oil samples were monitored.

Maximum numbers of regenerated shoots were found in the medium supplemented with 1 mg/L benzyl adenine and 0.5 mg/L indole-3-acetic acid. A total of 6 compounds were identified from rhizomes from CP and IVP plants that yielded 96.9% and 97.81% of the total oil contents, respectively. The major compound of rhizome oil identified from CP and IVP rhizomes was ethyl p-methoxy cinnamate in quantities, 82.01% and 71.77%, respectively, without any compositional variation. Antioxidant properties of essential oil preparations were assessed by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) and hydrogen peroxide radical scavenging assays. Moreover, antioxidant activities of rhizome-oil from IVP plants were better than that of CP oil samples.

As IVP rhizomes had better oil yield, those could be used for a large scale commercial propagation for sustainable use of essential oil. The principal chemical in the essential oil, ethyl p-methoxy cinnamate could help apothecary, for several ailments [Suprava Sahoo, Reena Parida, Sikha Singh, Rabindra N. Padhy* and Sanghamitra Nayak (Central Research Laboratory, IMS and Sum Hospital, Siksha O Anusandhan University,
NPARR 5(3), 2014-0233 The effect of cryogenic grinding and hammer milling on the flavour quality of ground pepper (*Piper nigrum* L.)

In this study, we compared the effects of cryogenic grinding and hammer milling on the flavour attributes of black, white, and green pepper. The flavour attributes were analysed using headspace solid-phase micro-extraction (HS-SPME) and gas chromatography-mass spectrometry (GC/MS), sensory evaluation and electronic nose (e-nose) analysis. Cryogenic grinding resulted in minimal damage to the colour, flavour, and sensory attributes of the spices. Cryogenic grinding was also better than hammer milling at preserving the main potent aroma constituents, but the concentrations of the main aroma constituents were dramatically reduced after storing the samples at 4 °C for 6 months. Pattern matching performed by the e-nose further supported our sensory and instrumental findings. Overall, cryogenic grinding was superior to hammer milling for preserving the sensory properties and flavour attributes of pepper without significantly affecting its quality. However, we found that the flavour quality of ground pepper was reduced during storage [Hong Liu, Fankui Zeng, Qinghuang Wang*, Shiyi Ou, Lehe Tan, Fenglin Gu (Spice and Beverage Research Institute, Chinese Academy of Tropical Agricultural Sciences, Wanning 571533, China), *Food Chemistry*, 2013, 141(4), 3402-3408].

NPARR 5(3), 2014-0234 Removal of off-flavours from radish (*Raphanus sativus* L.) anthocyanin-rich pigments using chitosan and its mechanism(s)

In this paper, we examined the role of chitosan in the removal of off-flavours from radish anthocyanin-rich pigments and studied the mechanisms of the process. Four radish glucosinolates (glucoraphenin, dehydroerucin, glucobrassicin, and glucoerucin) were identified by LC–MSn from root extracts and dehydroerucin was found to be the major glucosinolate in red radish roots. Application of chitosan with 76%, 83% or 89% deacetylation in radish extracts attributed to 26%, 35% or 43% adsorption rate for glucosinolates, and 28%, 26% or 22% for anthocyanins, respectively. HS-SPME/GC–MS analysis demonstrated that the concentration of volatile compounds decreased by 70%, resulting in the loss of odorous compounds. The changes in chitosan spectra before/after adsorption and after desorption at 1590 and 3360 cm⁻¹ and at broad bands from 2600 to 2000 cm⁻¹ suggest that the dominant adsorption mechanisms of glucosinolates on chitosan may be electrostatic attractions, including hydrogen bonds and charge neutralisation [Ruichang Gao, Pu Jing*, Siyu Ruan, Yifan Zhang, Shujuan Zhao, Zhan Cai and Bingjun Qian (Research Center for Food Safety and Nutrition, Key Lab of Urban Agriculture, South, Bor S. Luh Food Safety Research Center, School of Agriculture & Biology, Shanghai Jiao Tong University, Shanghai 200240, China), *Food Chemistry*, 2014, 146, 423-428].

NPARR 5(3), 2014-0235 An integrated approach for flavour quality evaluation in muskmelon (*Cucumis melo* L. *reticulatus* group) during ripening

Numerous and diverse physiological changes occur during fruit ripening and maturity at harvest is one of the key factors influencing the flavour quality of fruits. The effect of ripening on chemical composition, physical parameters and sensory perception of three muskmelon (*Cucumis melo* L. *reticulatus* group) cultivars was evaluated. Significant correlations emerging from this extensive data set are discussed in the context of identifying potential targets for melon sensory quality improvement. A portable ultra-fast gas-
chromatograph coupled with a surface acoustic wave sensor (UFGC–SAW) was also used to monitor aroma volatile concentrations during fruit ripening and evaluated for its ability to predict the sensory perception of melon flavour. UFGC–SAW analysis allowed the discrimination of melon maturity stage based on six measured peaks, whose abundance was positively correlated to maturity-specific sensory attributes. Our findings suggest that this technology shows promise for future applications in rapid flavour quality evaluation [Simona Vallone, Hanne Sivertsen, Gordon E. Anthon, Diane M. Barrett, Elizabeth J. Mitcham, Susan E. Ebeler and Florence Zakharov* (Department of Plant Sciences, University of California, One Shields Avenue, Davis, CA 95616, USA), Food Chemistry, 2013, 139(1–4), 171-183].

NPARR 5(3), 2014-0236 Compositional variation in the leaf, flower and stem essential oils of Hyssop (Hyssopus officinalis L.) from Western-Himalaya

Hyssop (Hyssopus officinalis L.), family Lamiaceae is an important perennial culinary and medicinal plant cultivated in temperate regions of Asia, Europe and America. The hydrodistilled volatile oils derived from leaf, flower and stem of H. officinalis, collected from Chamoli, Uttarakhand, India (Western-Himalaya) were investigated by gas chromatography (GC–FID) and GC–mass spectrometry (GC–MS). Essential oil yield varied from 0.22% to 4.4% in the different parts of the plant. Fifty-seven constituents, representing 99.8% of the leaf oil composition; 44 constituents, representing 99.4% of the flower oil composition and 57 constituents, comprising 88.4% of the stem oil composition were identified. Major constituents of the oils were cis-pinocamphone (49.7–57.7%), pinocarvone (5.5–24.9%), β-pinene (5.7–9.3%), 1,8-cineole (2.9–8.0%), β-phellandrene (1.8–3.2%), myrtenyl methyl ether (2.7–3.0%), sabinene (0.8–1.9%), isopimara-9(11),15-diene (<0.05–1.9%), myrtenol (1.4–1.7%), myrcene (0.5–1.3%), and trans-pinocamphone (<0.05–1.3%). The comparative results clearly indicated that the leaf and stem oil compositions were quite similar in terms of cis-pinocamphone and pinocarvone content. However, the flower oil composition could be differentiated from the leaf and stem oils by the presence of a higher amount of pinocarvone [Vineeta Pandey, Ram S. Verma*, Amit Chauhan, Rakesh Tiwari (CSIR-Central Institute of Medicinal and Aromatic Plants, CSIR-CIMAP, Research Centre, Pantnagar, P.O.- Dairy farm Nagla, Udham Singh Nagar, Uttarakhand 263149, India), Journal of Herbal Medicine, 2014, 4(2), 89-95].