Kinetic modeling of spice extraction from *S. aromaticum* and *C. cassia*

A mathematical model was developed for the extracts obtained from *Syzygium aromaticum* and *Cinnamomum cassia* with different particle size, solvent–solid ratios on extraction yield. Different particle sizes in the range of 2.8 mm to \( \leq 0.5 \) mm were employed and maximum extraction efficiency was achieved with particles of size \( \leq 0.5 \) mm. Among the solvent–solid ratios (20:1, 30:1, 40:1 and 50:1) ratio of 50:1 showed higher extraction yield. In the extraction kinetics, higher effective diffusivity value of \( 36.01 \times 10^{-10} \) m\(^2\)/s for *S. aromaticum* and \( 26.78 \times 10^{-10} \) m\(^2\)/s for *C. cassia* were achieved. Antioxidant values were determined and extracts prepared from ethanol showed higher scavenging activities for *S. aromaticum* and *C. cassia* as 78 \% and 85 \%, respectively. Maximum phenolic content of 1.6 and 12.4 mg GAE/g of sample were achieved for *S. aromaticum* and *C. cassia* by hexane and water respectively [K. Radha Krishnan, M. Sivarajan, S. Babuskin, G. Archana, P. Azhagu Saravana Babu and M. Sukumar* (Centre for Biotechnology, AC Tech., Anna University, Chennai 600 025, India), *Journal of Food Engineering*, 2013, 117(3), 326-332].

**NPARR 5(2), 2014-0175 A rapid multi-residue method for pesticide residues determination in white and black pepper (Piper nigrum L.)**

The current analytical methods for pesticide residues determination in white and black pepper are laborious and time-consuming. A rapid multi-residue method was developed to determine 16 organochlorine and pyrethroid pesticide residues in white and black pepper using gas chromatography with electron capture detector. All pesticides were extracted and partitioned with acetonitrile. The extract was cleaned up with silica gel packed in a Pasteur glass pipette to remove matrix interferences due to volatile oils. Recoveries of the pesticides fortified at 0.01, 0.1 and 0.5 mg kg\(^{-1}\) ranged from 86.8 to 118\% with relative standard deviation of less than 11.0\%. The limit of detection for most of the pesticides studied was 0.002 mg kg\(^{-1}\). This method has high selectivity for pesticides in white and black pepper which contain different amounts of volatile oils. The method developed was successfully used to analyse 20 pepper samples purchased from the local markets in Kuching, Malaysia and all the residues detected were below the permitted levels of European Union [Lian-Kuet Chai* and Fatimah Elie (Agriculture Research Centre, Semongok, Asia].
Growth and survival of *Salmonella* in ground black pepper (*Piper nigrum*)

A four serovar cocktail of *Salmonella* was inoculated into ground black pepper (*Piper nigrum*) at different water activity ($a_w$) levels at a starting level of 4–5 log cfu/g and incubated at 25 and 35°C. At 35°C and $a_w$ of 0.9886 ± 0.0006, the generation time in ground black pepper was 31 ± 3 min with a lag time of 4 ± 1 h. Growth at 25°C had a longer lag, but generation time was not statistically different from growth at 35°C. The $a_w$ threshold for growth was determined to be 0.9793 ± 0.0027 at 35°C. To determine survival during storage conditions, ground black pepper was inoculated at approximately 8 log cfu/g and stored at 25 and 35°C at high (97% RH) and ambient (≤40% RH) humidity. At high relative humidity, $a_w$ increased to approximately 0.8–0.9 after approximately 20 days at both temperatures and no *Salmonella* was detected after 100 and 45 days at 25 and 35°C, respectively. Under ambient humidity, populations showed an initial decrease of 3–4 log cfu/g, then remained stable for over 8 months at 25 and 35°C. Results of this study indicate *Salmonella* can readily grow at permissive $a_w$ in ground black pepper and may persist for an extended period of time under typical storage conditions [Susanne E. Keller*, Jane M. VanDoren, Elizabeth M. Grasso and Lindsay A. Halik (U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, 6502 South Archer Road, Bedford Park, IL 60501, USA), *Food Microbiology*, 2013, 34(1), 182–188].

Spiny coriander (*Eryngium foetidum* L.) is a leafy spice herb of tropical regions of world (America, South Asia, Pacific Islands, South Europe and Africa) which is used extensively for garnishing, marinating, flavouring and seasoning of foods. It is also used as an ethno-medicinal plant for the treatment of a number of ailments such as fevers, chills, vomiting, burns, fevers, hypertension, headache, earache, stomachache, asthma, arthritis, snake bites, scorpion stings, diarrhea, malaria and epilepsy. The main constituent of essential oil of the plant is eryngial (E-2-dodecenal). However, a significant variation in the plant morphology, composition of essential oil ([60 constituents reported] and secondary metabolites resulted from genetic variability and geographic location. Pharmacological investigations have demonstrated anthelmintic, anti-inflammatory, analgesic, anti-convulsant, anti-clastogenic, anti-carcinogenic, anti-diabetic and anti-bacterial activity. Focus on holistic research approaches such as genetic enhancement to develop high yielding varieties (collection, conservation, evaluation, breeding and development of potential genotypes); efficient production technologies to harvest the plants in mass (cultivation under 50–75% shed-net and spray of gibberellic acid at a concentration of 100 ppm); post-harvest management to minimize marketing loss; and medicinal/pharmaceutical investigations would be the best strategies to increase the yield and to promote industrial uses of *E. foetidum* as an economically relevant crop [B. K. Singh*, Y. Ramakrishna and S. V. Ngachan (Indian Institute of Vegetable Research (IIVR), Shahanshahpur, Varanasi 221305, Uttar Pradesh, India), *Genetic Resources and Crop Evolution*, 2014, 61(6), 1085-1090].