Section E2

New frontiers for essential oils and spices industry – opportunities and challenges

Bimali Jayawardena

Department of Chemistry, University of Kelaniya, Kelaniya

Background

Essential oils and spices have long been used throughout the world in foods, fragrances and perfumery, cosmetics and medicines. In the last decade, these potent natural remedies have gained enormous popularity in industrialized countries as well, and a very large number of industries depend on essential oil or derived products. Besides its extensive use in the food, and beverage industries and cosmetics, these oils are used in paint, paper, insecticide preparation, petroleum industry, motor industry, adhesives, textile industry, and dental preparations. Essential oils are produced from plant flowers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits, and roots available in Mediterranean to tropical countries. There is a list of about 3000 essential oils, but only about 300 are used in various industries in the world.

Spices and essential oils are of historical significance to Sri Lanka. It was known as the 'spice island' and attracted western invaders to Sri Lanka. These spices motivated many historical voyages by early explorers like Christopher Columbus and Vasco De Gamma. Spices and essential oils have changed the destiny of our country. Even today 56% of our agricultural exports constitute of spices, allied products and essential oils. Sri Lanka is the world largest producer and exporter of Cinnamon. Ceylon cinnamon contains a negligible percentage of courmarin. Courmarin is an alkaloid present in cinnamon which is a liver toxin. Cassia contains a 1000 fold higher percentage of coumarin than true Ceylon cinnamon. Sri Lankan pepper has the highest piperine content which gives its superior quality and pungency. Cardamom, nutmeg, mace, and clove also have high aromatic flavor. For Sri Lanka to harness the benefit of these natural resources the way forward is to enhance the value addition process of spices and essential oils.

Chemical composition

Essential oils are volatile or ethereal oils, found in 10% of the plant kingdom. These oils evaporate when exposed to heat and are odorous. These oils are stored in plants in special brittle secretary structures, such as gland, secretary hairs, secretary ducts, secretary cavities or resin ducts.

Essential oils are mixtures of 20–60 compounds at varying concentrations, with some compounds at fairly high concentrations (20–70%), and others in trace amounts. The components can be divided in to two major categories; terpene hydrocarbons and the oxygenated compounds. Terpenes are a combination of two or several isoprene units. Essential oils consist of mainly monoterpenes (C_{10}) and sesquiterpenes (C_{15}), which are hydrocarbons with the general formula $(C_5H_8)_n$. The diterpenes (C_{20}), triterpenes (C_{30}), and tetraterpenes (C_{40}) exist in essential oils at low concentration. Terpenoids are terpenes containing oxygen and are also found in essential oils. The components at high concentrations (terpenes, terpenoids,) play a major role in the antimicrobial/biological effect of the essential oils. Essential oils with aldehydes or phenols as major components (cinnamaldehyde, citral, carvacrol, eugenol, or thymol) (Figure 1) are the most effective, followed by essential oils containing terpene alcohols. Essential oils with ketones or esters (β-myrcene, α-thujone, or geranyl acetate) possess a lower activity.