Editorial

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Essential oils

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Most higher plants produce secondary metabolic end products and store them in leaves, flowers, roots and other parts of the plant. Among other functions, these chemical compounds serve as defense against potential predators, such as insects or vertebrates (herbivores and plant suckers), and thus represent a kind of chemical weapon. They are produced in special cells, and are not essential for the plant. The most important plant secondary substances are phenolic compounds (e.g., phenols, phenylpropanoids, stilbenes and their glycosides), isoprenoids (e.g., terpenes, carotenoids, storage lipids), alkaloids and special amino acids (alliin, canavanine). In addition to protection against herbivores, they also protect against pathogens, UV light, water evaporation or serve to attract pollinators.

The essential oils (volatile oils, ethereal oils) are a group of plant-based secondary substances. The name “essential oil” is derived from the fact that they are responsible for the characteristic fragrance of the plant. Essential oils consist of a mixture of different terpenes, sesquiterpenes and aromatic compounds such as phenols and phenylpropanes.

Most essential oils can be obtained from various parts of the plant by distillation. Others are mechanically pressed from plant tissues, or they can be extracted with a solvent such as hexane or supercritical carbon dioxide.

In many countries, essential oils are used in traditional medicine (folk medicine) for centuries. Ancient Egypt was the “birthplace” for the use of essential oils. Egyptians used essential oils as early as 3500 BC in their religious ceremonies, in cosmetics and for medicinal purposes. Around the same time in China and India aromatic plants were in use, which became a part of the Indian Ayurvedic medical system. In Europe, a rebirth of the use of essential oils occurred in the Renaissance, when “aromatherapy” and folk medicine found favor again. In the last 50 years, an increased interest in “natural medicine” as well as an increased environmental concern regarding the use of synthetic drugs, fertilizers or pesticides has resulted in a growing interest in essential oils.

The present Special Issue provides an overview of the current state of scientific research in the use of essential oils in alternative human and animal healthcare, in cosmetic and makeup industry and, especially, in integrated pest management. There are important unanswered questions about the mechanisms of action of essential oils in animals and humans.

Isman Murray from the University of British Columbia (Canada) provides in his invited short review an overview of the current status of the use of essential oils as bio-insecticides. Irina Fierascu and her colleagues from the University of Bucharest (Romania) also deal with the use of essential oils as “next-generation” pesticides. The review article by Ingrid Leherbauer and Iris Stappen from the University of Vienna (Austria) reports on selected essential oils and their mechanisms of action for therapeutic use against human health disorders, such as obesity, diabetes or depression. Masakazu Hara from the Shizuoka University (Japan) reports on the use of essential oils in agriculture. For example, essential oils may enhance the heat tolerance of plants by inducing the expression of heat shock proteins. This may maintain or even increase the yield and quality of crops under increasing environmental temperatures. The last invited review by Jessica Vairinhos and Maria Graça Miguel from the University of Algarve (Portugal) reports on the effects of essential oils on microorganism from five species of *Lavendula*, growing spontaneously on uncultivated fields in Portugal.

The reviews are followed by seven original papers describing the chemical composition of essential oils from cultivated or wild plants growing in Iran, Lebanon, Italy, Turkey, and Malaysia. Most of them were tested for their cytostatic, anticarcinogenic or antimicrobial activity in specific bioassays. The poor water solubility of essential oils has limited their applications *in vitro* and *in vivo*. Therefore, Franceso Donsi and his team used different nanoemulsions of essential oils in their bioassays.

Sincere thanks are extended to the authors and reviewers for their valuable contributions to this Special Issue. We look forward to the practical applications of essential oils, utilizing the increasing knowledge of their chemistry and mechanisms of action, in the development of novel plant protection agents and human alternative medical products.

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