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Many green plants contain biologically active substances that are or could be used in pharmaceutical or food processing industry. The traditional techniques of isolation of active compounds from plants are steam distillation and extraction by organic solvents. However, these processes show significant disadvantages, including the thermal degradation of unstable substances in case of distillation or a high consumption of organic solvents the traces of which remain in the product on conventional extraction. These drawbacks can be eliminated by application of modern separation techniques such as the supercritical fluid extraction (SFE) using carbon dioxide as a solvent. This technology is suitable especially for obtaining valuable plant isolates with almost the same chemical representation as that of the plant. Moreover, SFE allows for a separation of the isolate into several fractions during the extraction

The focus of this work was on using the SFE combined with different fractionation techniques (additional separator, sorption on silica gel in one step with the extraction) in a range of pressures and temperatures (9–30 MPa, 40–50 °C) to enhance volatiles in extracts from the leaves of eucalyptus. Its essential oil is widely used in cough pills or toothpastes and in addition, several studies proved insecticidal and repellent activity of eucalyptus extract.[1,2] The efficiency of SFE in terms of extract composition and yield was compared with hydrodistillation. The composition of volatiles in the isolates was determined using GC-MS and GC-FID.

The major compounds in the essential oil isolated with the yield 26.7 mg/g were 1,8-cineole (42.6 wt %), α-pinene (10.7 wt %) and globulol (5.9 wt %). The concentration of total volatiles in the extracts varied from 2.8 to 59.5 wt %, depending on the extraction and fractionation conditions. The use of additional separator under conditions of 9 MPa and 0 °C led to separation of cuticular waxes and other high molecular substances from the volatile fraction. The fractionation using silica gel as sorbent was effective in terms of separation of oxygenated

sesquiterpenes, mostly globulol, within the second fraction, which was obtained by extract desorption with pure CO_2 at 30 MPa and 40 °C. The validity of using SFE combined with different fractionation techniques as a method for enhancement of volatiles concentration in the extract was demonstrated, as well as its advantages over simple extraction.

Future work will be focused on a separation of pharmaceutically valuable non-volatile compounds from a plant material, with particular interest in sorption and desorption conditions (time, CO_2 consumption, feed to sorbent ratio). The experiments will be conducted with pure compounds as well as with the extract of defined chemical composition. The obtained thermodynamic data will serve as a basis for a mathematical description of sorption from supercritical solvent.

References

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