

Nowadays, a renaissance of curative plants is observed, which have been re-discovered worldwide. Herbal medicines in form of individual plants or plant mixtures have been utilized in human households from the times immemorial. However, an exact knowledge of chemical composition of most curative plants still remains unknown and therefore particular attention should be paid to the investigations on chemical composition of individual curative plants, with a possible classification thereof based on chemical composition. Scientific field focusing on classification of plants based on their chemical composition is known as chemotaxonomy, which is a branch of taxonomy.

In this study, the research material is presented valid for eighteen different plants from the thyme (*Thymus* L.) genus, which belong to the mint (*Lamiaceae*) family. One of the most representative specimens from the thyme genus is common thyme (*Thymus vulgaris* L.). This particular plant has found different applications in medicine and cosmetics, but also as a culinary spice. At the initial stage of this study, composition of the volatile fraction of the investigated thyme species was investigated with use of the headspace gas chromatography with mass spectrometric detection (HS-GC-MS). Moreover, volatile fraction for three different thyme species was isolated through hydrodistillation in the Deryng's apparatus, and then its chemical composition was assessed with use of gas chromatography with mass spectrometric detection (GC-MS).

Next step was the analysis of the non-volatile fraction. Firstly, chemometrical optimization of the extraction procedure targeting the phenolics fraction was performed upon an example of common thyme. To this effect, a comparison was performed of the extraction procedure carried out in the Soxhlet's apparatus with that performed with use of the accelerated solvent extraction (ASE), playing with different working parameters. Then the chromatographic "fingerprints" of the phenolic fraction extracts were recorded with use of the thin-layer chromatography (TLC) and the high-performance liquid chromatography (HPLC), in order to compare the investigated thyme species.

Eventually, one focused on the evaluation of biological properties of the extracts obtained under the optimal working parameters. In the framework of this study, the following biological properties of the investigated thyme species have been assessed:

- ✓ **antioxidant** properties with use of the two compounds acting as stable free radicals, i.e., DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2-azino-bis-3-ethylbenzothiazoline-6-sulfonic). For this purpose, three different analytical techniques were applied, i.e., the spectroscopy of electron paramagnetic resonance (EPR), the UV-Vis spectrophotometry, and the dot-blot test.

- ✓ **antibacterial** properties with use of the thin-layer chromatography with biological detection performed as direct bioautography (TLC-DB).
- ✓ **anticancer** properties against the human colon adenocarcinoma cells with use of the colorimetric MTS test.

The results obtained in this study make a relatively coherent yet broad entity which provides a comparison of the eighteen thyme specimens and species in terms of their curative properties.