

INVESTIGATION OF VOLATILE COMPOUNDS IN *TAGETES* SPECIES

Sz. Szarka^a, É. B. Héthelyi^a, É. Lemberkovics^a, I. N. Kuzovkina^b, I. Bálványos^a, É. Szóke^a

^aSemmelweis University, Department of Pharmacognosy, H-1085 Budapest,
Üllői str. 26. Hungary;

^bTimiryazev Institute of Plant Physiology, Russian Academy of Sciences,
Botanicheskaya ul. 35, Moscow, 127276 Russia

Tagetes patula L. and *T. lucida* L. are native to the warmer parts of America, but now it is cultivated world-wide. These plants synthesise many bioactive compounds, that can be used by the agriculture and medicine: biocid polyacetylenes with thiophene structure, antibacterial and antifungal essential oil, carotenoids and flavonoids.

We aimed to study the essential oil production of the genetically transformed hairy root cultures of *T. patula* and intact *T. patula* and *T. lucida* plants. Hairy roots were cultivated in liquid Gamborg's B5 medium (in 500 mL Erlenmeyer flasks filled with 100 mL medium) on rotary shaker (140 rpm) at 23±2 °C in dark. *In vitro T. lucida* plants were cultivated on solid Murashige and Skoog medium supplemented with 2 % sucrose under light conditions.

The occurrence of volatile compounds was researched by GC and GC-MS. The essential oil was produced by steam distillation in a Clevenger apparatus for 3 hours. The content of oil was measured gravimetrically. The analysis was carried out by a Finnigan MAT GCQ mass spectrometer with ion trap analyzer. A capillary column (column: 30 m × 0,25 mm ID × 0,25 µm film thickness MDN-5S) was used to fractionate the samples. The electron impact method was used to ionize the fractions. The carrier gas was helium. Samples were injected with a split ratio of 1: 62. The identification of the compounds was done by comparing the retention time, retention index and the recorded spectra with spectra known from literature and spectra of authentic standards.

The main essential oil components of the intact plants were found to be 'classical' terpenoids while the hairy roots and intact roots of *T. patula* and *in vitro T. lucida* roots produced aromatic sulphurated thiophene structures.

The main constituent of *T. patula* capitula was β-caryophyllene (50,25 %) and the leaves had high concentrations of terpinolene (20,70 %).

The aerial parts of intact and *in vitro T. lucida* had the phenylpropanoid methyl chavicol (83,97 % and 71,96 % respectively) as the main oil compound.

The main volatile component of *T. patula* hairy roots and intact roots was 5-(3-buten-1-ynyl)-2,2'-bithienyl (BBT) of 28.87%. Other sulfurated compounds were also identified, such as α-terthienyl (15.51%) and 5-(4-acetoxy-1-butynyl)-2,2'- bithienyl (BBTOAc) of 11.55%.

T. lucida in vitro root oil was also rich in thiophenes: BBT (9,41 %) and BBTOAc (12,20 %). These thiophenes are the main secondary metabolites of the intact roots, and can be found even in the essential oil of the intact plants. It is interesting to note that α-terthienyl was not detected in the essential oils of *T. lucida*.