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Essential oil content in *Thymus alpestris* in Slovakia

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ABSTRACT: The variability of essential oil of *T. alpestris* was studied by gas chromatography in samples from Slovakia. Prevailingly, monoterpenes of the phenol biosynthetic pathway were present (which is frequent in other species as well). The material studied can be divided into two groups according to their main component: thymol-type (T) and carvacrol-type (C). Mean content of five essential oil components in chemotypes is as follows: γ-terpinene (T: 7.9%; C: 7.3%); p-cymene (T: 8.8%, C: 6.6%); β-caryophyllene (T: 10.5%; C: 8.6%); thymol (T: 41.0%; C: 2.4%); carvacrol (T: 3.6%; C: 47.0%).

KEYWORDS: *Lamiaceae*, *Thymus alpestris*, chemical polymorphism, thymol, carvacrol.

Introduction

Thymus alpestris TAUSCH is a diploid species (2n=28), which occurs in mountain regions of Central Europe. Stems with hairs confined to the angles and with monopodial branching are characteristic for it. The latter character distinguishes *T. alpestris* from *T. pulegioides* L., having sympodial branching and representing the most widespread member of the genus in Czechoslovakia. For *T. pulegioides* five chemotypes based on the composition of essential oil (STAHL-BISKUP 1986, MÁRTONFI 1992) were described. A review of *Thymus* essential oil is given by STAHL-BISKUP (1991). Essential oil variability in *T. alpestris* has not been studied up to now.

Materials and methods

Upper parts of flowering stems of *T. alpestris* were collected from wild populations in the Vysoké Tatry, Belianske Tatry and Spišská Magura mountains (Slovakia) during 1989 and 1990. The plants (64 samples) were at the stage of full flower. Voucher specimens are deposited in the KO herbarium (Botanical Garden, University of P. J. Šafárik, Košice, Czecho-slovakia). The essential oil was obtained by a two-hour hydrodistillation of air-dried powdered plant material (2 g sample of each plant). The essential oil samples were analyzed by gas chromatography using a Packard Instrument Model No. 429, FID detector fitted with 30 m x 0.25 mm fused silica capillary Carbowax 20 M column. The operating parameters were: carrier gas N_2, injector temperature 230° C, detector temperature 230°C. Temperature program 50 - 200°C, 4°C/min. Quantitative data were obtained by means of a Packard Model 602 integrator. The oil components were identified by GC, by comparing the component retention times with the retention times of standard compounds (fy. Fluka, Roth).

Results and discussion

T. alpestris essential oil contains more than 30 compounds (Tab. 1). Only 5 components were found to occur in average content higher than 1.5%. They were chiefly monoterpenes of phenol biosynthetic pathway: γ-terpinene, p-cymene, thymol, carvacrol, β-caryophyllene was found to occur in average content higher than 1.5%, too.

The material studied can be divided into two groups, each group of plants can be characterized by richness of one essential oil component. In this way two chemotypes can be distinguished in the *T. alpestris* plants: thymol-type (T) and carvacrol-type (C). Mean content of five major components of these chemotypes is in Tab. 2. Likewise other *Thymus* species, within a single population, *T. alpestris* plants of various chemotypes were observed. This fact represents another example of chemical poly-morphism as defined by HESLOP-HARISON (1963) and HEGNAUER (1975).

The frequency of chemotypes in the studied set is as follows: T-type: 56% and C-type: 41 %. 3% of plants of the studied set can not be reliably classed to any of the groups.

The comparison with situation in *T. pulegioides* is interesting. STAHL-BISKUP (1986) inform about 25% thymol-type and 75% carvacrol-type in Norway plants, in Slovakia MÁRTONFI (1992) found 6.6% of thymol-type, 33.7% of carvacrol-type and 59.7% of other chemotypes (linalool, citral-geraniol, fenchone-type and other unclear cases).

Differences in essential oil composition of equivalent *T. alpestris* and *T. pulegioides* chemotypes are in Tab. 2. In this connection it can be concluded that in *T. alpestris* the main component of essential oil plays a more dominant role than that in *T. pulegioides*.

Tab. 1. Composition of *Thymus alpestris* essential oil from North Slovakia, loc. no. 7 (see list of localities); t-traces.

component	%	component	%
α-pinene	1.1	camphene	0.5
β-pinene	t	sabinene	t
myrcene	1.4	α-terpinene	1.3
limonene	t	eucalyptol (1,8-cineol)	t
γ-terpinene	10.1	p-cymene	9.0
α+β thujone	1.5	fenchone	2.2
camphor	t	linalool	10.0
linalyl acetate	0.6	β-caryophyllene	12.2
α-humulene	0.4	citral (cis+trans)	1.8
geranyl acetate	t	geraniol	t
thymol	7.9	carvacrol	38.5
other (no identified)	1.5		

Tab. 2. Comparison of mean content of five major components of *Thymus alpestris* and *Thymus pulegioides* essential oil (thymol and carvacrol chemotype, % in essential oil).

	Thymus alpestris		*Thymus pulegioides*	
component	T-type	C-type	T-type	C-type
γ-terpinene	7.9	7.3	14.9	17.2
p-cymene	8.8	6.6	9.9	9.0
β-caryophyllene	10.5	8.6	15.2	16.6
thymol	41.0	2.4	20.8	0.8
carvacrol	3.6	47.0	0.8	32.9

List of localities

1. Slovakia borealis, montes Belanské Tatry, ad viam inter montium Predné Jatky et Zadné Jatky, ca. 1910 m, 7. 9. 1989, (6 plants).
2. Slovakia borealis, montes Belanské Tatry, in valle Predné Med'odoly, ca. 1520 m, 20. 7. 1989, (9 plants).
3. Slovakia borealis, montes Vysoké Tatry, in valle Kôprová dolina, ca. 1340 m, 6. 9. 1989, (4 plants).
4. Slovakia borealis, montes Vysoké Tatry, ad viam prope laci Temnosmrečinové pleso, 6. 9. 1989, (6 plants).

5. Slovakia borealis, montes Vysoké Tatry, locis saxosis in valle Javorová dolina, ca. 1400 m, 26. 7. 1990, (10 plants).
6. Slovakia borealis, montes Vysoké Tatry, locis saxosis in valle Javorová dolina, ca. 1360 m, 26. 7. 1990, (4 plants).
7. Slovakia borealis, montes Spišská Magura, oppidum Ždiar, in pratis in valle Bachledova dolina, ca. 1000 m, 27. 7. 1990, (13 plants).
8. Slovakia borealis, montes Spišská Magura, in decl. montis Príslop, ca. 1080 m, 27. 7. 1990, (12 plants)

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