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CHEMICAL COMPOSITION OF ESSENTIAL OIL
FROM *STACHYS CRETICA* SUBSP. *BULGARICA* RECH. FIL.

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Chemical composition of essential oil from *Stachys cretica* subsp. *bulgarica* Rech. fil.: *The chemical composition of essential oils from the aerial parts of Stachys cretica subsp. bulgarica Rech. fil. (Lamiaceae) endemic to Bulgaria was analyzed using GC/MS. The oil yield was 0.04%. Twenty components representing 89.27% of the total oil were identified. The main compounds (concentration higher than 3%) of oil were as follows: geranyl linalool (66.36%), germacrene D (9.01%) and geranylgeranylacetate (4.88%).*

Key words: *Stachys cretica subsp. bulgarica Rech. fil., essential oil, chemical composition.*

INTRODUCTION

The genus *Stachys* L. (Lamiaceae) contains around 270 species mainly centered in the warm temperature region of the Mediterranean and South-West Asia, Southern Africa and North and South America.

Stachys cretica Rech. fil. possesses different subspecies of which some are endemic. The essential oil composition of seven subspecies grown in different regions in Turkey and in Greece has been investigated. The main components of the essential oil are as follows: from Turkey of *S. cretica* ssp. *lesbiaca* Rech. fil. and *S. cretica* ssp. *trapezuntica* Rech. fil. - sesquiterpene hydrocarbon germacrene D (20.3%) [10], of *S. cretica* subsp. *smyrnae* Rech. fil. - trans- β -caryophyllene (51.0%) and germacrene D (32.8%) [8], of *S. cretica* L. subsp. *mersinaea* (Boiss.) Rech. - curcumene (34.1%) [7], of *S. cretica* subsp. *anatolica* - carvacrol 33% [5]; from Greece of *S. cretica* ssp. *vacillans* Rech. fil. - hexadecanoic acid (17.2%), germacrene D (9.5%), (Z,Z)-9,12-octadecadienoic acid (8.1%) and spatulenol (6.1%) [3] and of *S. cretica* ssp. *cretica* - germacrene (33.5%) and pimaradiene (18.6%) [11].

In Bulgaria the genus is represented with 18 species [4] which are widely used in folk and official medicine [6].

Essential oils of *S. cretica* subsp. *anatolica* [2] and *S. cretica* L. subsp. *mersinaea* [10] from Turkey and the oil of *S. cretica* ssp. *cretica* from Greece [11] have antimicrobial activities.

The species *Stachys cretica* subsp. *bulgarica* Rech. fil. is endemic and in Bulgaria there is no data on the use of the plant or its oil and extracts in folk medicine.

The aim of present investigated is to examine the oil and its chemical composition of *Stachys cretica* subsp. *bulgarica* Rech. fil. from Bulgaria.

Materials and methods

The wild plants from *S. cretica* subsp. *bulgarica* Rech. fil., endemic to Bulgaria grown in the region of Plovdiv town were collected during flowering stage in 2016. Voucher specimen was deposited in the Herbarium of the Higher Institute of Agriculture, Plovdiv, Bulgaria.

The raw material moisture content was determined by drying up to constant weight, at 105 °C [9].

The oil was prepared by hydrodistilled for 2 h in laboratory glass apparatus of British Pharmacopoeia, modified by Balinova and Diakov [1]. The oil was dried over anhydrous sulfate and stored in tightly closed dark vials at 4 °C until analysis.

GC analysis was performed using gas chromatograph Agilent 7890A; column HP-5 ms (30m x 250µm x 0,25µm); temperature: 35 °C/3 min, 5°C/min to 250°C for 3min, total 49 min; carrier gas helium 1 ml/min constant speed; split ratio 30:1. GC/MS analysis was carried out on a mass spectrometer Agilent 5975C, carrier gas helium, column and temperature as the same as the GC analysis. The components of the oils were identified by their retention indices and by comparison of their mass spectra with those of authentic samples or with data already available in the literature.

Results and discussions

The moisture of the plant was 64.83%. The yield of essential oil, % in abs. dry mass was 0.04%.

The chemical compositions of the oils are listed in Table 1.

Table 1. Chemical composition of oils from *S. cretica* subsp. *bulgarica* Rech. fil.

№	Compounds	RI	%
1	(Z)-3-Hexenal	800	0.09
2	(E)-2-Hexenal	855	0.16
3	α -Pinene	939	0.47
4	Camphene	952	0.32
5	β -Pinene	979	0.52
6	α -Copaene	1375	0.50
7	β -Bourbonene	1382	0.26
8	β -Elemene	1391	0.14
9	β -Sesquiphellandrene	1446	0.48
10	Germacrene D	1480	9.01
11	γ -Cadinene	1513	0.14
12	δ -Cadinene	1524	0.29
13	Hexahydrofarnesyl acetone	1755	0.64
14	β -Springene	1918	0.85
15	Geranyl linalool	2020	66.36
16	n-Heneicosane	2100	0.79
17	Geranylgeranylacetate	2316	4.88
18	n-Hexacosane	2600	0.84
19	n-Heptacosane	2700	1.03
20	n-Octacosane	2800	1.43

As seen 20 components representing 89.20% of the total content were identified in the oil. Five of them were in concentrations over 1% and the rest 15 constituents were in concentrations under 1%. As seen the major constituents (up 3%) of the oil are as follows: geranyl linalool (66.36%), germacrene D (9.01%) and geranylgeranylacetate (4.88%).

The difference in the chemical composition of our investigation and the reported data may be due to environmental conditions under which the plants have grown as well as the chemotaxonomic significance.

The classification of the identified compounds, based on functional groups, is summarized in Figure 1. The total oxygenated monoterpenes constituted the highest percentage of the components of the essential oil constituting 71.24% in the oil.

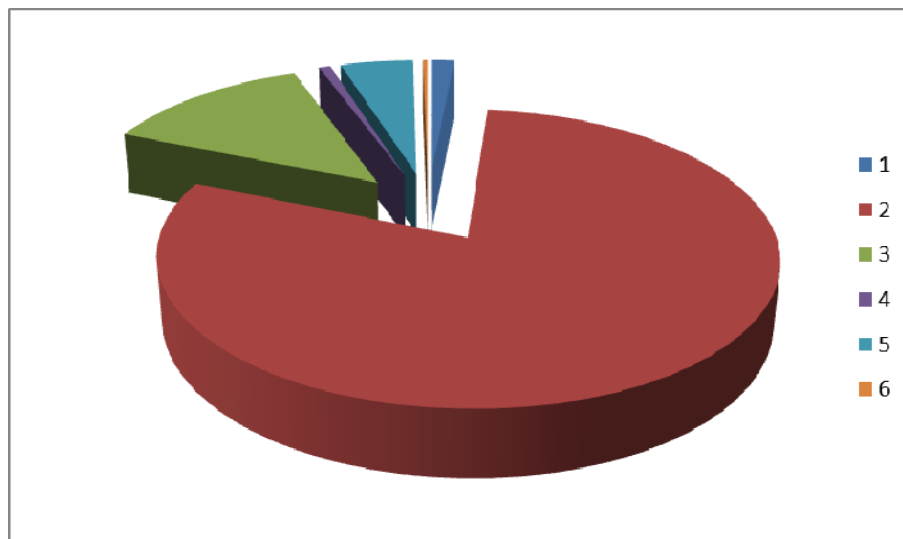


Figure 1. Group of components in essential oil from *S. cretica* subsp. *bulgarica* Rech. fil.,%.

1 - monoterpene hydrocarbons (1.47), 2 - oxygenated monoterpenes (71.24),
3 - sesquiterpene hydrocarbons (13.08), 4 - oxygenated sesquiterpenes (0.72),
5 – hydrocarbons (4.58), 6 – others (0.28).

CONCLUSION

For the first time in Bulgaria new essential oil from *Stachys cretica* subsp. *bulgarica* Rech. fil. was obtained by hydrodistillation.

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