THE COMPOSITION OF THE ESSENTIAL OIL OF *Stachys iberica* SUBSP. *stenostachya* GROWING IN TURKEY*

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The water distilled essential oil from dried aerial parts of Stachys iberica *subsp.* stenostachya *(Lamiaceae) was analyzed by GC/MS. Seventy-one compounds were characterized representing 96% of the oil. The main constituents were found as linalyl acetate (42.2%), linalool (18.9%), geranyl acetate (8.2%), and α-terpineol (5.3 %).*

Key words: *Stachys iberica* Bieb. subsp. *stenostachya* (Boiss) Rech.fil., Lamiaceae, essential oil composition, linalyl acetate, linalool, geranyl acetate, α-terpineol.

Stachys is a Greek word, meaning " ear of corn," or "spike," and refers to the arrangement of flowers on the stem. This genus with about 300 species of annuals and perennials occurs in all parts of the world, except for Australia and New Zealand [1].

It is represented by 76 species comprising 103 taxa in the Flora of Turkey. *Stachys iberica* Bieb. is a perennial, 20-60 cm, leaves linear-oblong to oblanceolate, verticillasters (2-)4-8 flowered, and corolla purplish-pink to creamy white with pink markings. It is also represented by 3 subspecies and 2 varieties in the Flora of Turkey. These taxa are: *S. iberica* Bieb. subsp. *iberica* var. *iberica*, *S. iberica* Bieb. subsp. *iberica* var. *densipilosa* Bhattacharjee (endemic), *S. iberica* Bieb. subsp. *georgica* Rech. fil., and *S. iberica* Bieb. subsp. *stenostachya* (Boiss) Rech.fil. All the taxa are Irano-Turanian elements.

Subsp. *stenostachya* grows at 450–1900 m. in Central and South Anatolia, and the commonest subspecies in Central Anatolia. It grows on igneous rocky and serpentine screes, sometimes in field banks, where it forms a herb with creamy yellow to white with pink markings flowers and erect stems [2].

Water-distilled essential oil from aerial parts of *S. iberica* subsp. *stenostachya* was analyzed by GC/MS. The compounds identified are given in Table 1 with their percentages. Seventy-one compounds were characterized in the oil of *S. iberica* subsp. *stenostachya*, representing 96.0% of the oil with linalyl acetate (42.2%), linalool (18.9%), geranyl acetate (8.2%), and α-terpineol (5.3%) as the main constituents.

EXPERIMENTAL

Plant Material. *S. iberica* subsp. *stenostachya* was collected in September 1999 from Eskisehir (Inonu) province in Turkey. Voucher specimens are deposited in the Herbarium of the Faculty of Pharmacy of Anadolu University, in Eskisehir Turkey (ESSE 13047).

Isolation of the Essential oil. Aerial parts of the plants were subjected to hydrodistillation for 3 h using a Clevenger-type apparatus to produce essential oil in 0.08% yield.

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TABLE 1. The Composition of the Essential Oil of *S. iberica* Subsp. *stenostachya*

RRI*	Compound	%	RRI	Compound	%
1032	α-Pinene	0.02	1741	β-Bisabolene	0.08
1118	β-Pinene	0.01	1743	α-Cadinene	0.08
1174	Myrcene	0.48	1765	Geranyl acetate	**8.17**
1203	Limonene	0.15	1773	δ-Cadinene	0.31
1213	1,8-Cineole	0.02	1776	γ-Cadinene	0.14
1246	(*Z*)-β-Ocimene	0.64	1808	Nerol	1.53
1255	γ-Terpinene	0.01	1838	(*E*)-β-Damascenone	0.16
1266	(*E*)-β-Ocimene	0.56	1857	Geraniol	4.30
1280	*p*-Cymene	0.02	1868	(*E*)-Geranyl acetone	0.07
1290	Terpinolene	0.13	1882	Aplotaxene	0.23
1300	Tridecane	0.02	1900	*epi*-Cubebol	0.03
1360	Hexanol	0.04	1949	(*Z*)-3-Hexenyl nonanoate	0.01
1393	3-Octanol	0.02	1958	(*E*)-β-Ionone	0.09
1400	Nonanal	0.24	1961	3,7-Dimethyl-1,5-octadiene-3,7-diol	0.04
1441	(*E*)-2-Octenal	0.02	2045	Carotol	0.23
1450	*trans*-Linalool oxide (Furanoid)	0.03	2069	Germacrene D-4-ol	0.27
1452	1-Octen-3-ol	0.60	2092	β-Oplopenone	0.12
1478	*cis*-Linalool oxide (Furanoid)	0.04	2096	Elemol	0.09
1480	Nerol oxide	0.03	2104	Viridiflorol	0.34
1506	Decanal	0.03	2131	Hexahydrofarnesyl acetone	0.52
1535	β-Bourbonene	0.06	2179	Tetradecanol	0.14
1553	Linalool	18.86	2187	T-Cadinol	0.17
1565	Linalyl acetate	42.16	2198	Thymol	0.05
1584	Nonyl acetate	0.02	2209	T-Muurolol	0.27
1600	β-Elemene	0.06	2232	α-Bisabolol	0.13
1611	Terpinen-4-ol	0.04	2239	Carvacrol	0.18
1637	*p*-Menth-1-en-9-al	0.03	2250	α-Eudesmol	0.04
1661	Alloaromadendrene	0.04	2255	α-Cadinol	0.64
1664	Nonanol	0.04	2300	Tricosane	0.13
1668	(*Z*)-β-Farnesene	0.05	2384	Hexadecanol	0.18
1694	Neral	0.02	2500	Pentacosane	0.16
1706	α-Terpineol	**5.27**	2622	Phytol	0.86
1709	α-Terpinyl acetate	0.10	2700	Heptacosane	0.43
1726	Germacrene D	0.67	2900	Nonacosane	0.01
1733	Neryl acetate	4.17	2931	Hexadecanoic acid	1.01
1740	Geranial	0.09		**Total**	**96.0**

*RRI - Relative retention indices calculated against n-alkanes, % calculated from TIC data**.**

GC/MS Analysis. The oil was analyzed by GC/MS using a Hewlett Packard GCD system. An HP-Innowax FSC column (60m × 0.25 mm ⌀, with 0.25 μm film thickness) was used with helium as carrier gas (1 mL/min). GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min, then kept constant at 220°C for 10 min and then programmed to 240°C at a rate of 1°C/min. Alkanes were used as reference points in the calculation of relative retention indices (RRI). The split ratio was adjusted at 50:1. The injector temperature was at 250°C. MS were taken at 70 eV. Mass range was from 35 to 425 *m/z*. Library search was carried out using Wiley GC/MS Library and TBAM Library of Essential Oil Constituents. Relative percentage amount were calculated from TIC by computer. The compounds identified in the oil can be seen in Table I.

REFERENCES

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