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GC-MS analysis of constituents of essential oil from *Stachys pubescens*. growing wild in north-west of Iran

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ABSTRACT

The essential oil of *Stachys pubescens* Ten. growing wild in north-west of Iran was examined by GC and GC-MS methods. The yield of total volatiles was 0.06% (v/w). A total of 21 compounds were characterized in the essential oil. The main components of the oil were thymol (87.4%), trans-4-octene (4.8%) and linalool (1.6%). Other compounds present in appreciable amounts were nerol (0.7%), docosane (0.7%), α -terpineol (0.5%), and linalyl acetate (0.5%).

Keywords: *Stachys pubescens* Ten, Lamiaceae, Thymol, Trans-4-octene.

INTRODUCTION

The genus *Stachys* which belongs to the Lamiaceae family, is found in mild regions of the Mediterranean and in southwest Asia. This genus consists of 250 species widespread throughout the world. Among the 34 species present in Iran, 13 species are endemic [1]. The compositions of the oils of some *Stachys* species such as, *S. acerosa* [2], *S. aegyptiaca* [3], *S. athorekalyx* [4] and *S. recta* [5] have been reported. *Stachys* species also have several folkloric uses, e.g. the leaf of *S. officinalis* L. Trev. is used as a carminative and to relieve headaches [6]. *S. botenica* L. is used as a tonic, astringent and to relieve headaches, while *S. palustris* L. is used as an antiseptic, to relieve gout and to stop hemorrhage. *S. byzantina* is used as an ulcer healer and antiseptic too.

MATERIALS AND METHODS

Plant Material

The plant material was collected in July 29, 2009 in Ardabil area at an altitude of 1450 m from North- west Iran. A voucher specimen has been deposited at the Herbarium of the Agriculture Research Centre Ardabil, Iran.

Isolation of the Essential oil

The air-dried aerial parts of plant material (150g) were subjected to hydrodistillation for 4 h using a Clevenger-type apparatus, separately. The oil yield (v/w) on moisture free basis of aerial

part was 0.06 % (v/w). The oil was dried over anhydrous sodium sulfate and recovered with n-hexane, then stored in sealed vials and at low temperature before analysis.

GC analysis

GC analysis was performed on a Shimadzu 15A gas Chromatograph equipped with a split/splitless injector (250 °C) and a flame ionization detector (250 °C). N₂ was used as carrier gas (1 mL/min) and the capillary column used was DB-5 (50 m × 0.2 mm, film thickness 0.32 μm). The column temperature was kept at 60 °C for 3 min and then heated to 220 °C with a 5 °C/min rate and kept constant at 220 °C for 5 min. Alkanes (C₈- C₂₅) were used as reference points in the calculation of relative retention indices (RRI). The relative percentages of the characterized components are given in Table 1.

GC-MS analysis

GC-MS analysis was performed using a Hewlett Packard 5973 with an HP-5MS column (30 m × 0.25 mm, film thickness 0.25 μm). The column temperature was kept at 60 °C for 3 min and programmed to 220 °C at a rate of 5 °C/min and kept constant at 220 °C for 5 min. The flow rate of helium as carrier gas was 1 mL/min. MS were taken at 70 eV. Identification of the constituents of oils was made by comparison of their mass spectra and retention indices (RI) with those given in the literature and authentic samples [7]. Relative percentage amounts were calculated from peak area using a Shimadzu C-R4A chromatopac without the use of correction factors.

RESULTS AND DISCUSSION

The composition of the oil of *S. pubescens* aerial part is given in Table 1. Seven components, which represented about 96.2% of the total composition, were identified.

Table 1. Chemical composition of essential oils from *Stachys pubescens*

compound	RI	percentage
Thymol	1289	87.4
Trans-4-octene	802	4.8
Linalool	1097	1.6
Nerol	1231	0.7
α-Terpineol	1189	0.5
Docosane	2200	0.7
Linalyl acetate	1255	0.5
Total	---	96.2%

The oil of this oil consisted of four oxygenated compounds (90.0%), and two aliphatic components (5.5%). As can be seen in Table 1, Thymol was the major component in oil (87.4%), but the sesquiterpene compounds were not found. The oil of this plant was rich in monoterpenoids constituents. Previous investigations on the oils of the *Stachys* genus showed varying compositions. The dominant compound in the oil of *S. balansae* and *S. recta* were beta-caryophyllene (24.3%) and 1-octen-3-ol (33.8%) respectively [5]. The dominant compound in the oil of *S. aegyptiaca* was α-pinene (54.5%) [3]. Comparison of the results with the different conditions showed significant differences for the oils, which can be attributed to their different locality, weather and some other climatic conditions of the plants.

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