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Essential oil of *Stachys aleurites* from Turkey

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Abstract

The essential oil obtained from the aerial parts of the Turkish endemism *Stachys aleurites* (Lamiaceae) has been studied. The main constituents were sesquiterpene hydrocarbons: β -caryophyllene (33.7%), bicyclogermacrene (14.5%) and germacrene D (9.6%). The main monoterpene was α -pinene (8.4%). Some chemotaxonomical considerations have been provided.

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1. Introduction

Since the revision of the 72 Turkish species of *Stachys* (Lamiaceae) by Bhattacharjee (1982), nine new species have been described: *Stachys choruhensis* Kit Tan and Sorger, *Stachys antalyensis* Y. Ayasligil and P.H. Davis, *Stachys chasmosericea* Y. Ayasligil and P.H. Davis, *Stachys tundjeliensis* Kit Tan and Sorger (Davis et al., 1988), *Stachys*

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anamurensis Sumbul (1990), *Stachys sivasica* Kit Tan and Yildiz, *Stachys baytopiorum* Kit Tan and Yildiz, *Stachys willemsei* Kit Tan and Hedge (Yildiz and Tan, 1988), and *Stachys cydni* Kotschy ex Gemici and Leblebici (Gemici and Leblebici, 1998).

Stachys aleurites is a 80 cm perennial suffrutescent erect species with purple flowers. It is endemic to Anatolia, where it grows in Antalya province only. This plant may be described as a thermophilous species; it prefers calcareous rocks near the coast.

2. Materials and methods

The flowering aerial parts of *S. aleurites* Boiss. and Heldr. were collected in Turkey, C3 Antalya, Konyaalti, Varyant (36° 53' 068" N, 30° 40' 697" E), on calcareous rocks near the coast, about 10 m above the sea level at the end of May 2003. A voucher specimen is deposited at AKDU (Herbarium of the Biology Department of Akdeniz University) as Gokturk 5100. The plant material, deprived of the woody parts, was dried in the shade and hydrodistilled in a Clevenger-like apparatus for 2 h.

The GC analyses were accomplished with a HP-5890 Series II instrument equipped with HP-WAX and HP-5 capillary columns (both 30 m × 0.25 mm, 0.25 µm film thickness), working with the following temperature program: 60 °C for 10 min, ramp of 5 °C/min up to 220 °C; injector and detector temperatures 250 °C; carrier gas nitrogen (2 ml/min); detector dual FID; split ratio 1:30; injection of 0.5 µl). The identification of the components was performed, for both columns, by comparison of their retention times with those of pure authentic samples and by means of their linear retention indices (l.r.i.) relative to a series of *n*-hydrocarbons.

The relative proportions of the essential oil constituents were percentages obtained by FID peak-area normalization, without using response factors.

GC/EIMS analyses were performed with a Varian CP-3800 gas-chromatograph equipped with a DB-5 capillary column (30 m × 0.25 mm; coating thickness 0.25 µm) and a Varian Saturn 2000 ion trap mass detector. Analytical conditions: injector and transfer line temperatures 220 and 240 °C, respectively; oven temperature programmed from 60 °C to 240 °C at 3 °C/min; carrier gas helium at 1 ml/min; injection of 0.2 µl (10% hexane solution); split ratio 1:30. Identification of the constituents was based on comparison of the retention times with those of authentic samples, comparing their linear retention indices relative to the series of *n*-hydrocarbons, and on computer matching against commercial (NIST 98 and ADAMS) and home-made library mass spectra built up from pure substances and components of known oils and MS literature data (Stenhagen et al., 1974; Massada, 1976; Jennings and Shibamoto, 1980; Swigar and Silverstein, 1981; Davies, 1990; Adams, 1995). Moreover, the molecular weights of all the identified substances were confirmed by GC/CIMS, using MeOH as CI ionizing gas.

3. Results and discussion

The composition of the essential oil of *S. aleurites* is reported in Table 1. In total 51 compounds were identified, amounting to 92.2% of the whole oil.

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