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CHEMICAL COMPOSITION OF *SANTOLINA CHAMAECYPARISSUS*
SSP. *SQUARROSA* ESSENTIAL OIL

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Santolina chamaecyparissus L. ssp. *squarrosa* DC. (Asteraceae) grows in eastern Spain. This plant is an aromatic dwarf shrub commonly known as "Manzanilla de Mahón" or "Abrótano hembra." The flower of this plant is used in folk medicine because of its antispasmodic, digestive, antiinflammatory, antiseptic, and antimicrobial properties (1).

Several studies concerning the composition of the essential oil from the species have been reported, but none have been about the essential oil from *squarrosa* ssp., which is endemic in the western Mediterranean area. This paper reports on the chemical composition of *S. chamaecyparissus* ssp. *squarrosa* essential oil.

EXPERIMENTAL

PLANT MATERIAL.—Fresh leaves and flowers of *S. chamaecyparissus* ssp. *squarrosa* were collected in Ayora-Enguera (Valencia) in June 1983. A voucher specimen has been deposited at the Department of Botany, Faculty of Pharmacy, University of Valencia.

EXTRACTION OF ESSENTIAL OIL.—Fresh plant material was subjected to steam distillation for 2.5 h using a modified Clevenger apparatus which yielded a yellowish essential oil (0.4% v/w).

LIQUID SOLID CHROMATOGRAPHY (lsc).—The oil was fractionated using lsc on a column (3.5 × 75 cm) of deactivated silica gel Merck (70-230 mesh ASTM) by addition of 5% H₂O followed by gradient elution with hexane, mixtures of hexane/CH₂Cl₂, and CH₂Cl₂ in order to separate the hydrocarbons and the oxygenated components of the oil.

GAS-LIQUID CHROMATOGRAPHY (glc).—The oil and its fractions obtained by lsc were analyzed by glc. Glc was performed using a Hewlett-Packard 5830 A gas chromatograph, equipped with FID, coupled to a 18850 A H-P data integrator. Conditions were as follows: High performance capillary column 5% OV-17 (25 m × 0.20 mm) programmed from 80-150° (rate 4°/min); the carrier gas was nitrogen (split technique ratio 1:100); injection 225°; FID 250°.

GAS CHROMATOGRAPHY-MASS SPECTROMETRY (gc/ms).—Gc/ms was performed using an H-P 5995 gas chromatograph mass spectrometer with a membrane separator coupled to an H-P 9825 B control system. Conditions were as follows: High performance capillary 5% OV-17 (25 m × 0.20 mm) was used in the same conditions as reported above for glc analyses; the carrier gas was helium (split technique ratio ca. 1:100); electron energy 70 eV; ion source temperature 150°.

Glc analysis showed the presence of 50 components: 39 compounds were identified, of which 28 corresponded to the monoterpenic fraction and 11 to the sesquiterpenic fraction. The essential oil contained a higher proportion of oxygenated compounds than hydrocarbons. Camphor (25.19%), *p*-cymene, 1,8-cineole, bornyl and isobornyl acetate, *allo*-aromadendrene, and α -muurolene are the main constituents, totalling 68.11% of the essential oil. Two sesquiterpene alcohols were detected ($M^+ = 222$ and $M^+ = 220$), but they have not been identified.

Identified compounds and their peak area percentages are listed in Table 1 according to their order of elution.

TABLE 1. The Main Components (in %) of Essential Oil from *Santolina chamaecyparissus* ssp. *squarrosa*

Compounds	Peak Area (%)	Technique
α -Pinene	0.26	gc, gc/ms
Camphene	2.96	gc, gc/ms
Sabinene	0.23	gc, gc/ms
β -Pinene	0.99	gc, gc/ms
Myrcene	t ^a	gc
α -Phellandrene	0.14	gc, gc/ms
Δ^3 -Carene		gc, gc/ms
α -Terpinene	0.83	gc, gc/ms
Limonene	1.24	gc
β -Phellandrene	t	gc, gc/ms
<i>p</i> -Cymene	9.99	gc, gc/ms
1,8-Cineole		gc, gc/ms
γ -Terpinene	1.55	gc, gc/ms
Artemisia ketone	0.64	gc, gc/ms
Terpinolene	0.15	gc, gc/ms
<i>p</i> -Cymenene	0.56	gc, gc/ms
Fenchone	0.37	gc
Thujone	0.20	gc
<i>cis</i> -Sabinene hydrate	0.26	gc, gc/ms
Camphor	25.19	gc, gc/ms
Borneol	3.61	gc, gc/ms
Terpinen-4-ol	4.78	gc, gc/ms
α -Terpineol	0.29	gc
Myrtenal	1.31	gc, gc/ms
Bornyl acetate	6.61	gc, gc/ms
Isobornyl acetate		gc, gc/ms
α -Cubebene	1.47	gc, gc/ms
α -Copaene		gc, gc/ms
4-Isopropyl benzaldehyde	0.14	gc, gc/ms
α -Ylangene		gc, gc/ms
β -Gurjunene	0.19	gc, gc/ms
Carvacrol		gc, gc/ms
α -Gurjunene	0.17	gc, gc/ms
Isocaryophyllene	1.45	gc, gc/ms
<i>allo</i> -Aromadendrene	19.04	gc, gc/ms
α -Muurolene	7.28	gc, gc/ms
Germacrene-b	0.45	gc, gc/ms
δ -Cadinene	1.29	gc, gc/ms
Sesquiterpene alcohol	0.12	gc, gc/ms
Sesquiterpene alcohol	0.75	gc, gc/ms
Cadinol	0.83	gc, gc/ms

^at = traces (<0.1%)

Identification is based on comparison of the mass spectral data obtained with literature data (2-3) and also by comparing the retention data with those of pure compounds. A total of five components were identified only by glc. These were: myrcene, limonene, fenchone, thujone, and α -terpineol.

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