

## CONSTITUENTS OF THE ESSENTIAL OIL OF *Scabiosa flavida* FROM IRAN

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*The composition of the essential oil of the aerial parts of Scabiosa flavida was investigated by GC and GC-MS. Forty-three components representing 94.2% of the essential oil were characterized. The main components of the oil were tricosane (15.5%), rosifoliol (15.3%), (E)-caryophyllene (10.7%), and  $\alpha$ -humulene (7.9%).*

**Key words:** *Scabiosa flavida*, Dipsacaceae, essential oil, GC-MS.

*Scabiosa* consists of 28 species that grown wildy in Iran. Triterpenoid saponins were isolated from the extract of *Scabiosa tschiliensis* with strong inhibition of pancreatic lipase activity [1]. Some other triterpenoid saponins were isolated from the roots of *S. rotate* [2]. *S. flavida* Boiss. & Hausskn. (Dipsacaceae) is a perennial plant, 30–60 cm tall with numerous slender erect stems. The leaves of the plant are pubescent and hairy, and the plant contains yellow flowers. A survey of the literature did not reveal any report on the constituents of the essential oils of *Scabiosa* species.

The oil was obtained by a hydrodistillation procedure with 0.03% yield. It was examined by GC and GC-MS. The constituents of the essential oil of *S. flavida* are presented in Table 1. The composition of the oil was identified by RI and mass spectra. Forty-three compounds representing 94.2% of the essential oil constituents were identified. The main components of the oil were tricosane (15.5%), rosifoliol (15.3%), (E)-caryophyllene (10.7%), and  $\alpha$ -humulene (7.9%). The oil consists mainly of sesquiterpenes (69.6%). Nonterpenic components and monoterpenes were present in the oil, 17.3% and 7.3% respectively. This is the first report on the chemical constituents of the essential oil of *Scabiosa flavida* and we cannot find any study on the oil of other *Scabiosa* species.

## EXPERIMENTAL

**Plant Material and Isolation Procedure.** The plant material was collected in June 2003 from Shiraz in Fars province during the flowering stage. The plant was identified by the Department of Botany of Shiraz University.

The aerial parts were air dried at ambient temperature in the shade and hydrodistilled by a Clevenger type apparatus for 4 hours [3]. The yield of the oil was 0.03 % (w/w) and the oil was yellow in color. It was dissolved in *n*-hexane (Merck), dried over anhydrous sodium sulfate, and stored at 4–6°C.

**Identification of the Oil Components.** GC analysis was carried out using a Varian GC 3600 chromatograph with DB-5 column (30m  $\times$  0.25 mm i.d.; 0.25  $\mu$ m). Oven temperature was as follows: 60°C to 260°C at 3°/min; injector temperature 250°C; detector temperature, 260°C; carrier gas, He (0.8 mL/min); split ratio of 1:20. GC-MS analysis was carried out using a Hewlett-Packard 6890 GC and 5973 MSD operating at 70 eV ionization energy, equipped with a HP-5 capillary column (30m  $\times$  0.25 mm i.d.; 0.25  $\mu$ m) and with He as the carrier gas and split ratio 1:20. Retention indices were determined using the retention times of *n*-alkanes that were injected after the essential oil under the same chromatographic conditions. The retention indices for all the components were determined according to the Van Den Dool method using *n*-alkanes as standard [4]. The compounds were identified by comparison of their retention indices (RI, HP-5) with those reported in the literature and by comparison of their mass spectra with the Wiley and Mass Finder 3. libraries or with the published mass spectra data [5–7].

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TABLE 1. Composition of the Essential Oil of *Scabiosa flavida* from Iran

Components	RI (HP-5)	% in oil	Components	RI (HP-5)	% in oil
$\alpha$ -Pinene	938	3.0	$\alpha$ -Muurokene	1502	0.6
Camphene	950	0.2	$\gamma$ -Cadinene	1515	1.6
$\beta$ -Pinene	976	0.4	$\delta$ -Cadinene	1525	2.4
2-Pentylfuran	990	0.2	$\alpha$ -Cadinene	1539	0.2
Octanal	1002	0.1	$\alpha$ -Calacorene	1544	0.5
Limonene	1025	0.2	Ledol	1567	0.2
1,8-Cineol	1031	0.5	Caryophyllene alcohol	1572	1.5
Acetophenone	1066	0.1	Caryophyllene oxide	1584	2.0
Linalool	1101	0.1	Globulol	1585	1.9
Nonanal	1104	0.5	Viridiflorol	1592	0.5
$\alpha$ -Terpineol	1190	2.7	Guaiol	1601	3.5
Isobornyl acetate	1283	0.2	<b>Rosifolol</b>	<b>1603</b>	<b>15.3</b>
$\alpha$ -Cubebene	1354	0.5	1- <i>epi</i> -Cubenol	1627	1.9
$\alpha$ -Copaene	1375	3.7	5-Guaiene-11-ol	1631	1.6
$\alpha$ -Gurjunene	1407	0.4	1- <i>epi</i> - $\alpha$ -Cadinol	1637	3.7
<b>(E)-Caryophyllene</b>	<b>1417</b>	<b>10.7</b>	$\beta$ -Eudesmol	1649	2.7
Aromadendrene	1438	1.5	$\alpha$ -Eudesmol	1653	1.0
<b><math>\alpha</math>-Humulene</b>	<b>1453</b>	<b>7.9</b>	$\alpha$ -Cadinol	1655	1.1
allo-Aromadendrene	1459	0.5	2-Pentadecanone-6,10,14-trimethyl	1845	0.2
$\gamma$ -Muurokene	1478	0.6	Eicosane	2100	0.7
$\beta$ -Selinene	1487	0.6	Tricosane	2300	<b>15.5</b>
Viridiflorene	1495	1.0			

Method of identification: RI, MS.

RI: retention indices relative to C<sub>8</sub>-C<sub>28</sub> *n*-alkanes on HP-5. The components are listed in order of elution from the HP-5 column.

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