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Short Communication

Essential oil composition of *Iphiona scabra* (DC) grow wild in Egypt

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Abstract

Chemical composition of Egyptian *Iphiona scabra* (DC) essential oil has a very few studies, so, this present investigation was carried out to study the essential oil content and chemical composition of *Iphiona scabra* (DC) plants as a new natural source of essential oil. Plant material was collected from wild plant populations of *Iphiona scabra* (DC) [family Compositae (Astraceae)]: growing in sandy soils on Gebel Elba region approximately 1200 km south of Cairo. The essential oils obtained by water distillation from dry aerial parts of *Iphiona scabra* (DC). The percentage of essential oil was 0.2%. Seventeen constituents representing 86% of the Egyptian *Iphiona scabra* (DC) essential oil were identified. The major components of Egyptian *Iphiona scabra* (DC) essential are alpha-cadinol (29.0%), gamma-muurolene (23.5%), alpha-eudesmol (8.0%), beta-gurjunene (7.0%), cis-nerolidol (6.4%) and delta-cadinene (3.1%). Minor component is limonene (0.2%). It is evident that the oxygenated sesquiterpene reached its highest concentrations (49.7%), followed by sesquiterpene hydrocarbons (34.6%) in essential oil compared with the other chemical classes' monoterpene hydrocarbons (1.7) and oxygenated monoterpene (0.9%). It may report that the essential oil obtained from dry aerial parts of Egyptian *Iphiona scabra* (DC) belongs to the alpha-cadinol chemo-type.

Introduction

The use of natural products with therapeutic properties is as ancient as human civilization and for a long time, plant products were the main sources of drugs (De Pasquale, 1984). The World Health Organization (WHO, 1997) estimated that 80% of the populations of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. Also, modern pharmacopoeia still contains at least 25% drugs derived from plants and many others which are synthetic analogues built on prototype compounds isolated from plants (Bodeker *et al*., 1997).

Iphiona scabra (DC) belonging to family Compositae (Astraceae) is an endangered medicinal plant of Egypt. *Iphiona* is a small genus of about ten species, which is distributed from North-East Africa to central Asia (Merxmüller *et al.*, 1977). Two species are found in Egypt: *Iphiona scabra* and *Iphiona mucronata*. Previous studies dealing with *Iphiona scabra* and *Iphiona mucronata*. The aerial parts of *Iphiona scabra* afforded a complex mixture of sesquiterpene xylopyranosides. Separation of the peracetylated derivatives gave 10 compounds, seven eudesmane derivatives, a secoeudesmane and two sesquiterpene glycosides with new skeletons, named iphionane and isoiphionane (El-Ghazouly *et al.*, 1987). Previous investigators revealed that polysulphated flavonoids were the major constituents and seem to be characteristic for this genus (Ahmed and Mabry, 1987). Fourteen flavonoids were isolated from the aerial parts of *Iphiona mucronata*; seven sulphated and seven non-sulphated (Ahmed and Mabry, 1987). Thirteen flavonoids were isolated from the aerial parts of *Iphiona scabra*: the 3-sulphate, 3,4′-disulphate and 3,7,4′-trisulphate of isorhamnetin; the 3,7-disulphate and 3,7,4′-trisulphate of quercetin; and the 7-sulphate of hispidulin; the 3-glucosides and 3-galactosides of isorhamnetin and quercetin; and artemetin, salvigenin and 5-hydroxy-3,6,4′-tetramethoxyflavone (Ahmed and Mabr, 1987). Chemical composition of *Iphiona scabra* (DC) essential oil has a few studies, so, this present investigation was carried out to study the essential oil content and chemical composition of *Iphiona scabra* (DC) plants as a new natural source of essential oil.

Materials and Methods

Plant material

Plant material was collected from wild plant populations of *Iphiona scabra* (DC) (Figure 1.) growing in sandy soils on Gebel Elba region

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Figure 1. Egyptian *Iphiona scabra* (DC)

approximately 1200 km south of Cairo in March 2013 Identification of the species was achieved by Prof. Dr. Loutfy Boulos (Boulos, 1995 and 2000), National Research Centre Cairo Egypt Voucher specimens are in the herbarium of NRC, Cairo, Egypt.

Essential oil isolation

Dried herbs [divided into small pieces (0.5 - 1 cm)] were collected then 500 g from each replicate (three replicates) from many places were subjected to hydro-distillation for 3 h using a Clevenger-type apparatus (Clevenger, 1928). The essential oil content was calculated as a relative percentage (v/w). The samples of essential oils were dried over anhydrous sodium sulphate to identify the chemical constituents of the essential oil.

Gas chromatography (GC)

GC analyses were performed using a Shimadzu GC- 9A gas chromatograph equipped with a DB5 fused silica column (30 m x 0.25 mm i.d., film thickness 0.25 µm). Oven temperature was held at 40°C for 5 min and then programmed until 250°C at a rate of 4°C/min. Injector and detector (FID) temperature were 260°C; helium was used as carrier gas with a linear velocity of 32 cm/s.

Gas chromatography-Mass spectrometry (GC-MS)

GC-MS analyses were carried out on a Varian 3400 system equipped with a DB-5 fused silica column (30 m x 0.25 mm i.d.); Oven temperature was 40 to 240°C at a rate of 4°C/min, transfer line temperature 260°C, injector temperature 250°C, carrier gas helium with a linear velocity of 31.5 cm/s, split ratio 1/60, flow rate 1.1 ml/ min, Ionization energy 70 eV; scan time 1 s ; mass range 40-350 amu.

The components of the oils were identified by comparison of their mass-spectra with those of a computer library or with authentic compounds and confirmed by comparison of their retention indices either with those of authentic compounds. Kovat's indices (Kováts, 1958) were determined by co-injection of the sample with a solution containing a homologous series of n-hydrocarbons, in a temperature run identical to that described above.

Qualitative and quantitative analyses of essential oil

Identifications were made by library searches (Adams, 1995) combining MS and retention data of authentic compounds by comparison of their GC retention indices (RI) with those of the literature or with those of standards available in our laboratories. The retention indices were determined in relation to a homologous series of n-alkanes (C8–C22) under the same operating conditions. Further identification was made by comparison of their mass spectra on both columns with those stored in NIST 98 and Wiley 5 Libraries or with mass spectra from literature. Component relative concentrations were calculated based on GC peak areas without using correction factors.

Results and Discussion

The essential oil obtained by water distillation from aerial parts of *Iphiona scabra* (DC) yielded 0.2%.v/w on - a dry weight. Seventeen constituents representing 86% of the Egyptian *Iphiona scabra* (DC) essential oil were identified (Table 1). The major components of Egyptian *Iphiona scabra* (DC) essential are alpha-cadinol (29.0%), gamma-muurolene (23.5%), alpha-eudesmol (8.0%), beta-gurjunene (7.0%), cis-nerolidol (6.4%) and delta-cadinene (3.1%). Minor component is limonene (0.2%). Table 1 represents the obtained compounds from *Iphiona scabra* (DC) essential oil under Egyptian conditions grouped into four classes which are monoterpene hydrocarbons (MH), oxygenated monoterpene (OM), sesquiterpene hydrocarbons (SH) and oxygenated sesquiterpene (OS). From the data in the same Table it is evident that the OS reached its highest concentrations (49.7%), followed by SH (34.6%) in essential oil compared with the other chemical classes MH (1.7) and OM (0.9%). OS included the components of cis-Nerolidol, alpha-calacorene, beta-calacorene, carotol, alpha-eudesmol, alpha-cadinol, cedranone and bisabolol oxide. Alcohols are the major constituents of the OS of *Iphiona scabra* (DC) essential oil. Alpha-cadinol represented the highest concentration among the alcohols. This indicates that *Iphiona scabra* (DC) essential oil grown in Egypt belongs to the alpha-cadinol chemo-type. These compounds represent 29.0% (area percent) of the total oil. Some previous studies indicated that in Taiwania (Taiwania cryptomerioides Hayata) essential oil the total content of alpha-cadinol was 36.8% (Chang *et*

Table 1. Chemical constituents of essential oil extracted from *Iphiona scabra* (DC).

No.	Components	KI	Class	IM	Peak area (%)
1	*Para*–Cymene	1026	MH	RI, MS	0.5
2	Limonene	1039	MH	RI, MS	0.2
3	*Gamma*-Terpinene	1062	MH	RI, MS	1.0
4	Estragole	1195	OM	RI, MS	0.9
5	*Beta*-Gurjunene	1432	SH	RI, MS	7.0
6	*Gamma*-Muurolene	1477	SH	RI, MS	23.5
7	*Cis*-Calamenene	1521	SH	RI, MS	0.6
8	*Delta*-Cadinene	1524	SH	RI, MS	3.1
9	*Alpha*-Cadinene	1525	SH	RI, MS	0.4
10	*Cis*-Nerolidol	1534	OS	RI, MS	6.4
11	*Alpha*-Calacorene	1548	OS	RI, MS	1.7
12	*Beta*- Calacorene	1550	OS	RI, MS	0.9
13	Carotol	1594	OS	RI, MS	1.2
14	*Alpha*-Eudesmol	1652	OS	RI, MS	8.0
15	*Alpha*-Cadinol	1653	OS	RI, MS	29.0
16	Cedranone	1923	OS	RI, MS	1.8
17	Bisabolol oxide	1744	OS	RI, MS	0.7
MH = Monoterpene hydrocarbons					1.7
OM = Oxygenated monoterpene					0.9
SH = Sesquiterpene hydrocarbons					34.6
OS = Oxygenated sesquiterpene					49.7
Total identified					86.0
IM= Identification method KI = Confirmed by comparison with Kovats index on DB5 column (Adams, 1995).					

al., 2000). Alpha-cadinol was the main constituent of essential oil extracted from *Calendula officinalis* L. with the values of 32.0 – 64.5% under pre-sowing low temperature (Khalid and EL-Ghorab, 2006), 32 – 67% under stress conditions (Khalid and Da Silva, 2010) and 32 -53% under potassium fertilization conditions (Khalid, 2013) .

The beneficial effect of alpha-cadinol on therapeutic properties is well documented. On the other hand alpha-cadinol very important in European and Western Asian folk medicines and are used to treat inflammatory conditions had relatively good antifungal activity (Msayuki *et al.*, 2001). Alpha-cadinol can be broadly applied as an antiseptic, anti inflammatory and cicatrizing (Correa, 1994), as well as a light antibacterial (Boucaud, 1988) and antiviral (Bogdanova and Farmakol, 1977). It may be concluded that the essential oils obtained from aerial parts of *Iphiona scabra* (DC) yielded 0.2%.v/w. *Iphiona scabra* (DC) essential oil grown in Egypt belongs to the alpha-cadinol chemo-type.

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