P 14: Variability in essential oil of *Ducrosia anethifolia* (DC.) Boiss. growing wild in Fars province, Iran

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Abstract

Ducrosia anethifolia (DC.) Boiss. a traditional and popular herb grows wildly in several areas of Iran. The aerial parts, including flowers, were collected from *D. anethifolia* plant populations (Shiraz (1-2), Kazeroun, Noorabad, Farashband, Firoozabad, Ghir, Jahrom (1-2) and Darab) growing wild in Fars province, located in southwestern Iran. The essential oils (EOs) were subjected to hydro-distillation using a Clevenger-type apparatus.The essential oil yields ranged from 0.17 % to 0.93 % (w/w). Analysis of variance showed that geographic distinction had a significantly effect on the EO content in plants of different regions. Two populations, Jahrom 2 and Shiraz 2 engrossed the maximum EO yield. Seventy-five volatile compounds were identified by GC and GC–MS analysis. The main EO components were n-Decanal (1.493–45.062 %), Dodecanal (1.093–34.744 %), *cis*-Chrysanthenyl acetate (0–26.609 %), α-Pinene (0–16.539 %), n-Decanol (1.285–49.225 %), (2E)-Dodecenal (0.879–16.856 %), Decanoic acid (0–12.626 %), n-Nonanal (0.401–6.711 %), and Caryophyllene oxide (0.113–5.873 %). Analysis of the principal components based on the mean relative amounts of EO components led to the identification of four chemotypes: n-Decanal, Dodecanal, *cis*-Chrysanthenyl acetate, n-Decanol of which the n-Decanal chemotype is found more normally in different parts of Iran.

Keywords: Chemotypes, wild Population, essential oils

Introduction

Ducrosia anethifolia (DC.) Boiss. is a medicinal plant that belongs to Apiaceae family. It has been distributed mainly in Afghanistan, Iran, Iraq, Pakistan, and also to lesser extend can be found in Syria, Lebanon, and some of the Arabic and Persian Gulf countries. This species is used traditionally in animal nutrition, diseases eradication and cooking. It is also traditionally utilized to improve food taste and beverages. Their medical application ranged from cold therapy to cure stomach pain (Obaidi et al., 2012; Shooshtari et al., 2013). *D. anethiflia* is one of three species in this genus which grows wildly in several regions. *Ducrosia* is commonly known as Moshgak, Rishkag and Moshkbou in Iran (Mozaffarian, 2013). The aerial parts of plants are used as a pain killer and have analgesic activity which make them anti-headache, back pain, colic and colds. In some regions of Iran, it has been stated that they are effective against anxiety and insomnia (Obaidi et al., 2012).The antimicrobial, antibacterial and antianxiety activity of *D.anethifolia* has been previously defined in the available literature (Shahipour et al., 2012). In present study, the essential oil of D. *anethifolia* growing wild in Fars province, located in southwestern Iran, were investigated.

Materials and Methods

Plant material

Aerial parts of the plant were collected in April 2015 from *D. anethifolia* plant populations (Shiraz (1-2), Kazeroun, Noorabad, Farashband, Firoozabad, Ghir, Jahrom (1-2) and Darab) growing wild in Fars province, located in southwestern Iranat the time of flowering. The plant was identified by Fars Research Center for Agriculture. Voucher specimens were deposited at the Herbarium of Fars Research Center for Agriculture, Shiraz, Iran.

Analysis of the oil

The aerial parts were air-dried at ambient temperature in the shade and hydrodistilled by using a Clevenger-type apparatus for 3 h. The oil was dissolved in n-hexane (Merck), dried over anhydrous sodium sulfate and stored at 4 °C ± 2 °C. GC analysis was performed using an Agilent gas chromatograph series 7890-A with a flame ionization detector (FID). GC-MS analysis was carried out by use of Agilent gas chromatograph equipped with fused silica capillary HP-5MS column coupled with 5975-C mass spectrometer. The constituents of the essential oil were identified by calculation of their retention indices under temperature-programmed conditions for n-alkanes (C8-C25) and the essential oil on a HP-5 column under the same chromatographic conditions. Identification of individual compounds was made by comparison of their mass spectra with those of the internal reference mass spectra library or with authentic compounds and confirmed by comparison of their retention indices with authentic compounds or with those of reported in the literature (Adams, 2007). For quantification purpose, relative area percentages obtained by FID were used without the use of correction factors.

Results

The aerial parts, including flowers, were collected from *D. anethifolia* plant populations (Shiraz (1-2), Kazeroun, Noorabad, Farashband, Firoozabad, Ghir, Jahrom (1-2) and Darab) growing wild in Fars province, located in southwestern Iran. The essential oils (EOs) were subjected to hydrodistillation using a Clevenger-type apparatus.The essential oil yields ranged from 0.17 % to 0.93 % (w/w). Analysis of variance showed that geographic distinction had a significantly effect on the EO content in plants of different regions. Two populations, Jahrom 2 and Shiraz 2 engrossed the maximum EO yield. The applied GC × GC/MS metabolite profiling resulted in the identification of a total of 33 compounds based on comparison with MS library, consisting of compounds from *D. anethifolia* EOs. The constituents of the EOs are represented in Table 1. Seventy-five volatile compounds were identified by GC and GC–MS analysis. The main EO components were n-Decanal (1.493–45.062 %), Dodecanal (1.093–34.744 %), *cis*-Chrysanthenyl acetate (0–26.609 %), α-Pinene (0–16.539 %), n-Decanol (1.285–49.225 %), (2E)-Dodecenal (0.879–16.856 %), Decanoic acid (0–12.626 %), n-Nonanal (0.401–6.711 %), and Caryophyllene oxide (0.113–5.873 %). Analysis of the principal components based on the mean relative amounts of EO components led to the identification of four chemotypes: n-Decanal, Dodecanal, *cis*-Chrysanthenyl acetate, n-Decanol of which the n-Decanal chemotype is found more normally in different parts of Iran. In the present study different chemical compositions of this species is reported. It is known that many factors influence the chemical constitution of *D. anethifolia* EOs. The differences in the EOs content and composition of the present and previous investigation may be dependent on the collection time, chemotypes, geographic and climatic factors, drying conditions and mode of distillation. The chemical variability could be endorsed to genetic and environmental factors as well as being helpful in the enhancement of *D. anethifolia* resources for food and pharmaceutical industries.

Tab. 1 The major essential oils of D. anethifolia plant populations growing wild in Fars province, located in southwestern Iran.

Compound	RI	Dar	Firz	Fash	Ghir	Jahr1	Jahr2	Shz1	Shz2	Kaz	Nor
α-Pinene	935	2.93	14.1	8.30	6.27	6.92	16.5	5.02	0	8.19	8.75
Limonene	1030	0.87	1.49	2.28	1.72	1.53	3.07	2.34	0.04	1.68	2.14
n-Nonanal	1104	1.27	0.75	0.59	0.69	0.54	1.25	2.51	6.71	0.44	0.40
n-Decanal	1202	24.5	20.2	43.9	41.4	45.0	1.49	44.8	18.8	35.8	29.4
cis-Chrysanthenyl acetate	1264	26.6	0	0.11	0.39	6.78	0	0.91	0.89	0.05	0.54
n-Decanol	1271	8.62	10.9	4.82	2.57	5.62	49.2	9.15	11.1	2.34	1.28
Undecanal	1305	2.56	1.42	0.87	1.87	0.66	4.80	0.82	2.51	0.54	0.45
Decanoic acid	1365	0.12	0	0	0.07	0	0.06	2.40	12.6	0	0
Dodecanal	1408	11.6	34.7	19.2	18.5	12.2	1.09	11.5	16.6	34.0	21.8
(2E)-Dodecenal	1467	1.73	0.87	2.99	6.13	1.51	1.52	5.75	1.99	4.77	16.8
Caryophyllene oxide	1579	1.97	0.66	0.26	1.73	0.40	1.28	2.69	5.87	0.11	0.11
n-Tetradecanol	1670	0.36	0.40	2.02	2.64	2.66	0	1.61	1.74	2.21	4.87

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