

Chemical composition of essential oil of endemic *Ferula parva* Freyn & Bornm

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Abstract

In this study, essential oil constituents of *Ferula parva* fruit growing in endemic in Konya (Karaman-Mut road) in Turkey were determined. Essential oil from dried aerial parts of *Ferula parva* Freyn & Bornm were determined by GC-MS. The air dried plant material was subjected to hydrodistillation for 4 h using a Clevenger type apparatus to give yellow oils in 0.22% (*F.parva*). Forty constituents were identified, and they are representing 72.17% of the total oil. α -Pinene (26.39%), 2,6-dimethyl heptane (6.48%), β -pinene (6.99%), *trans*-verbenol (2.38%) and α -ylangene (2.83%) were established as major constituents of *F.parva* essential oil. *Ferula parva* Freyn & Bornm especially contained monoterpene hydrocarbons constituents These results show that this plant is remarkably important due to its constituents.

Keywords: *Ferula parva*, fruit, essential oil, α -pinene, GC-MS

1. Introduction

Essential oils and their derivatives of Aromatic plants are being used in folk medicine for prevention and treatment of different human diseases [1,2]. The *Ferula* genus are source of gum-resinas a folk medicine [3,4]. It is considered to be a sedative, carminative, digestive, analgesic, anthelmintic, diuretic and used against rheumatism, digestive disorders, headaches, arthritis, toothaches, diabetes. Also, ferula is believed to have aphrodisiac properties [5,6], and *Ferula* genus is a good source of biologically active compounds [7,8]. It is called as Çakşır or Çaşır in Turkey. The aim of current study was to determine essential oil constituents of *Ferula parva* fruit growing in endemic in Konya (Karaman-Mut road) in Turkey.

2. Materials and Methods

2.1. Materials

Plant materials were collected from Taurus mountains in Turkey. *Ferula parva* Freyn & Bornm from C4 Konya provinces (Karaman-Mut road 8 km, steppe, 970 m). Herbarium specimens (*Ferula parva* Freyn & Bornm (Voucher number: S.Doğu 2981)) were deposited at the Department of Biology, Faculty of Science, Necmettin Erbakan University, Turkey.

2.2. Methods

Recovery of the essential oils. Essential oil (light yellow with yield of 0.22%, v/w) was extracted from ground fruits of *F.parva* (200 g) using a

Clevenger-type apparatus for 4 h. The oil was kept at -18 °C by analysing.

Gas Chromatography: The essential oil is diluted in hexane: 1/100. Gas chromatograph (Agilent-6890) equipped with a DB5 MS column (20m X 0,18mm, 0,18µm) was used at analyses of essential oil. GC conditions are: programming from 50°C (3.2 min) to 300°C at 10°C/min, 5 min hold. Hydrogen as carrier gas (1,0 ml/min); injection in split mode (1: 120); injector and detector temperature, 280 and 300°C respectively.

Gas chromatography - mass spectrometry analyses: Agilent gas chromatograph Model 7890, coupled to a Agilent MS model 5975, equipped with a DB5 MS column (20m X0.18mm, 0.18µm), programming from 50°C (3.2 min) to 300°C at 8°C/min, 5 min hold was used for analyses of essential oil. GC-MS conditions are : Helium as carrier gas (1,0 ml/min); injection in splitmode (1 : 100); injector and detector temperature, 280 and 150°C respectively. The MS working in electron impact mode at 70 eV; electron multiplier, 1200 V; ion source temperature, 230°C; mass spectra data were acquired in the scan mode

in m/z range 33-550. The library search was carried out using a Adams Library, Library NIST and the laboratory library [9].

3. Results and discussion

Chemical constituents of essential oils of *Ferula parva* Freyn & Bornm are given in Table 1. Essential oil of *F. parva* were analysed using GC-MS (Figure 1). Forty constituents were determined in the oil of *F. parva*. α -Pinene (26.39%), 2,6-dimethyl heptane (6.48%), β -pinene (6.99%), trans-verbenol (2.38%) and α -ylangene (2.83%) were established as major constituents of *F. parva* essential oil. In addition, α -longipinene (1.90%), menth-6-ene-2,8-diol trans para (1.54%), trans-pinocarveol (1.71%), myrtenol (1.70), 3-methyl-nonane (1.28%) and verbenone (1.26%) followed to major constituents of *F. parva* oil. In previous study, *Ferula* oil contained α -pinene (59.89%), β -pinene (19.01%), limonene (3.21%) and bornyl acetate (2.10%) [10]. Başer et al. [11] reported that the essential oil of *F. parva* fruits contained 34.0% α -pinene, 9.0% eremophilene and 5.0% naphthalene.

Table 1. Chemical composition of essential oil of *F. parva* fruit

RT	RI Exp	RI litt	Components	%	RT	RI exp	RI litt	Components	%
3.78	857	-	2-Methyloctane	6.48	9.87	1198	11.94	Myrtenol	1.70
4.53	901	900	Nonane	4.62	10.05	1210	1204	Verbenone	1.26
5.06	927	931	α -thujene	0.22	10.18	1219	1220	Endo fenchyle Acetate	0.51
5.21	935	939	α -pinene	26.39	12.05	1353	1350	α -Longipinene	1.90
5.54	951	953	Camphene	0.46	12.30	1371	1372	α -Ylangene	2.83
5.62	955	957	Thuja-2,4(10)-diene	0.07	12.38	1377	1376	α -Copaene	0.82
5.98	973	-	3-methyl-nonane	1.28	12.48	1385	1371	Menth-6-ene-2,8-diol trans para	1.54
6.09	979	980	β -pinene	6.90	12.73	1404	1400	Sibirene	0.30
6.34	991	991	myrcene	0.28	12.84	1413	1402	Longifolene	0.16
6.55	1002	1000	Decane	0.18	12.99	1425	1418	β -Caryophyllene	0.14
7.00	1027	1026	p-cymene	0.43	13.11	1434	1436	α -trans-Bergamotene	0.12
7.08	1031	1031	limonene	0.53	13.35	1453	1447	α -Himachalene	0.44
7.14	1035	1033	Eucalyptol	0.50	13.75	1485	1476	γ -Himachalene	0.75
7.56	1058	1062	γ -terpinene	0.02	13.96	1502	1499	β -Himachalene	0.16
8.78	1130	1125	Campholaldehyde	0.48	14.03	1508	1492	δ -Amorphene	0.04
9.01	1144	1139	Trans-pinocarveol	1.71	14.11	1514	1513	γ -cadinene	0.08
9.09	1149	1144	Trans-verbenol	2.38	14.17	1519	1524	δ -cadinene	0.06
9.35	1165	1162	Pinocarvone	0.98	14.36	1536	1536	Himachalene γ -dehydro-Ar	0.63
9.51	1175	1165	Borneol	0.03	14.94	1585	1581	Caryophyllene oxyde	0.21
9.63	1183	1177	Terpinene-4-ol	0.25	15.30	1616	1615	β -Himachalene oxyde	0.89
					15.75	1656	-	Unknown MW 222	3.44
			Total						72.17

The main constituents found in the *Ferula-assafoetida* aerial parts prepared from Sari forest (mazandaran, Iran) were phenol, 2-methyl-5-(1-methylethyl) (18.2%); bisabolol (10.4%); fenchyl acetate(4.7%); and α -pinene (0.6%)(Dehpouret al. 2009). Özet et al. [12] reported that the oil of *F. Szowitsiana* leave contained β -Eudesmol (32.0%), α -eudesmol (18.2%), α -pinene (8.6%). In addition, β -Phellandrene (16.6), germacra-1(10),5-dien,11-ol (15.4) were found in *F. Arrijonii* [13]. Myrcene (53.5), aristolene (8.5) in *F. communis* oils are the major components [14]. According to literature related of the composition of *Ferula* species, our data showed differences. These differences can be probably due to location, climatic factors, soil structure and genetic factors. The essential oil compositions of plants are effected from some factors such as collection time, plant maturity, drying conditions, mode of distillation, geographic and climatic factors.

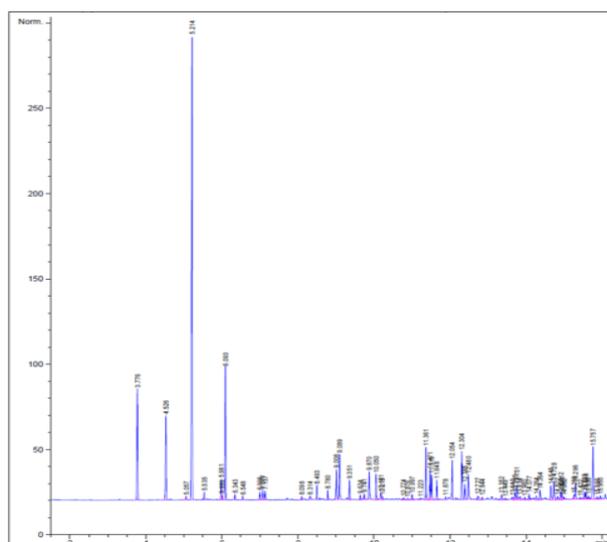


Figure 1. *Ferula parva* chromatogram

4. Conclusion

- These results show that this plant is remarkably important due to its constituents.
- α -Pinene, β -pinene, α -ylangene are major components.
- *Ferula parva* Freyn & Bornm especially contained monoterpene hydrocarbons constituents.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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