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THYMUS CAPITATUS (L.) HOFFM. ET LINK ÜZERİNDE FARMAKOĞNOZİK ARAŞTIRMALAR

PHARMACOGNOSTIC RESEARCHES ON THYMUS CAPITATUS (L.) HOFFM. ET LINK

Mekin TANKER* and Filiz (İlisulu) MERİÇLİ**

SUMMARY

In this research, volatile oils of *Thymus capitatus* (L.) Hoffm. et Link, collected from different regions of Turkey and different vegetation periods, were examined by GLC.

The volatile oil contents of samples and compounds of volatile oil contents have shown considerable variations depending upon the collection regions and seasons.

ÖZET

Bu çalışmada Türkiye'nin farklı bölgelerinden farklı gelişme dönemlerinde toplanan *Thymus capitatus* (L.) Hoffm. et Link örneklerinin uçucu yağları GLC ile incelenmiştir.

Örneklerin taşıdıkları uçucu yağ miktarları ve uçucu yağ bileşiminde yer alan bileşiklerin miktarları, bölgelere ve mevsimlere göre önemli farklılıklar göstermiştir.

INTRODUCTION

Thymus capitatus (L.) Hoffm. et Link is one of the plants used as thyme in Turkey. It is also named as *Coridothymus capi-*

* Ankara University, Faculty of Pharmacy, Department of Pharmacognosy, ANKARA.

** İstanbul University, Faculty of Pharmacy, Department of Pharmacognosy, İSTANBUL.

tatus Reichb. fil.* (1). Its leaves are widely used as a folk-medicine and also as spice. It is collected and exported to foreign countries from İzmir. Due to its widespread usage this plant was chosen and investigated with a pharmacognosical approach**.

Investigation is carried out in two parts, namely, botanical and phytochemical. Morphological and anatomical properties of the plants were investigated in the botanical part and reported previously (2).

In the phytochemical part, the volatile oils of the plants collected from different regions and vegetation periods were investigated presented in this article.

MATERIAL AND METHOD

Flowering and leafy branches of aerial parts of the plant were collected from 4 different regions given below.

- 1 — Eceabat, Eceabat to Gelibolu road, 1 km from Eceabat, 10 m coastal phrygana.

August 1978 flowering material, September 1979 fruiting material. (AEF, 6336).

- 2 — Ezine, Çanakale to Ezine road, 30 km to Ezine *Pinus brutia* woodland, a. 100 m.,

August 1978 flowering material, September 1979 fruiting material (AEF, 6650).

- 3 — Zeytinalan, İzmir - Urla road, above Zeytinalan village, macchie, 40 m.

August 1978 - flowering material, September 1979 fruiting material (AEF, 6334).

- 4 — Datça, Çiftlik peninsula, Aktur, *Pinus brutia* woodland, 10 m., August 1979 - flowering material, September 1979 fruiting material (AEF, 7031).

Volatile oil contents of these materials were determined utilizing a volumetric-method in a clewenger apparatus.

Volatile oils were obtained by hydrodistillation and their

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physiochemical properties were examined by using classical procedures given previously (3).

Volatile oils were analyzed by Gas-liquid chromatography using a Packard 419 gas-chromatograph equipped with FID dedector. Carbowax 20 M, SF-96 and ODPN were used as the stationary phases. Carrier gas was nitrogen.

Volatile oils were dissolved in EtOAc and applied to Carbowax 20 M (170°C) and SF-96 (150°C) columns of GLC.

Monoterpene hydrocarbons and oxygenated compounds were separated by the method reported previously (4). After separation, the monoterpene hydrocarbon fraction was analyzed on ODPN (65°C) and Carbowax 20 M (70°C) columns. Oxygenated compounds were analyzed on Carbowax 20 M (140°C) and SF-96 (150°C) respectively.

The percentage of the compounds in the oil were assigned by the square measuring method using the Kauzumi - 27 planimetry.

The percentage of compounds were found to be more or less different depending upon the collection seasons and regions. The statistical significance of the seasonal and regional variations were determined by «t-test» (5, 6).

RESULTS AND DISCUSSION

Volatile oil contents of the materials collected from 4 different regions in 2 vegetation periods were determined as given in Table 1.

Table 1. Volatile oil contents of *Thymus capitatus* samples from different regions and vegetation periods.

Material	Volatile oil %
Eceabat	flowering 4.04
	fruiting 3.57
Ezine	flowering 4.80
	fruiting 4.20
Zeytinalan	flowering 5.10
	fruiting 4.47
Datça	flowering 5.22
	fruiting 4.81

All of the volatile oils obtained by hydrodistillation were light-yellow colored, thyme smelling, spicy-tasting and irritating for the skin.

The physicochemical properties of the volatile oils were determined by the classical-method; the results are given in Table 2.

As the results of GLC analysis; 7 monoterpene hydrocarbones, (α -pinene, camphene, β -pinene, α -terpinene, limonene, γ -terpinene and p-cymene) and 6 oxygenated compounds (linalool, bornylacetate, terpinene-4-ol, borneol, thymol and carvacrol) were determined. The percentage of the components in the oils are given in Table 3. The percentage of the components were found to be more or less different between 8 volatile oils obtained from the materials collected from 4 different regions and in vegetation periods. The highest and the lowest amounts of the compounds encountered and the volatile oils bearing them are given in Table 4.

The regional variations were examined by «t test». «t-value» of the compounds for the seasonal variation and regional variations aren't given here, because most of compounds have shown considerable variations in this respect (6, 7).

Regional variations were explained by climate-conditions (temperature, rain, soil temperature), kind of soil and the plants living in the same habitat.

Seasonal variations were thought to result from internal factors of the plants.

As the results of the study on the volatile oils *Thymus capitatus* samples;

— *Thymus capitatus* seems to be rich in volatile oil (3,5 % - 5.22 %).

— Total phenolic compounds seem to be abundant (62 % - 74 %).

— Although regional variations are found considerably, it can't be said that chemotypes of *Thymus capitatus* exists as it do in other *Thymus* species (7-9).

— *Thymus capitatus* volatile oils can be used in a similar way that other thyme volatile oils with high levels of phenolic compounds are being used and they may even be used safer because of the absence of the toxic compound thujone.

Table 2. Physicochemical properties of *Thymus capitatus* volatile oils.

Properties	Eceabat		Ezine		Zeytinalan		Datça	
	Flowering	Fruiting	Flowering	Fruiting	Flowering	Fruiting	Flowering	Fruiting
Specific Gravity	0.9498 0.9380	0.9496 0.9430	0.9550 0.9485	0.9555 0.9470	0.9503 0.9479	0.9599 0.9495	0.9551 0.9369	0.9540 0.9365
Specific optical Rotation	— 5.0	— 6.00	— 5.0	— 6.25	— 8.50	— 10.5	— 8.75	— 11.25
Refractive index at 20°C	1.5105	1.5104	1.5105	1.5105	1.5094	1.5092	1.5085	1.5080
Solubility	Soluble in 1 to 4 vol. of 70 % alcohol							
Acid index	5.70	5.80	6.10	5.71	6.40	5.79	5.80	5.75
Saponification index	8.62	8.11	8.46	8.23	8.71	8.25	8.59	8.60
Ester index	2.92	3.11	2.36	2.52	2.31	2.46	2.79	2.85
Total phenol content	65 %	62 %	71 %	67 %	74 %	70 %	69 %	68 %

Table 3. Percentage of the compounds of *T. capitatus* volatile oils.

Compound	Eceabat		Ezine		Zeytinalan		Datça	
	Flowering	Fruiting	Flowering	Fruiting	Flowering	Fruiting	Flowering	Fruiting
α -pinene	0.44	0.32	0.35	0.32	0.51	0.83	0.23	0.14
camphene	0.41	0.14	0.34	0.24	0.71	1.10	0.40	0.30
β -pinene	0.12	0.32	0.10	0.17	0.31	0.16	0.09	0.13
α -terpinene	1.47	0.98	0.73	0.66	1.07	1.39	0.71	0.77
limonene	1.38	1.49	0.36	0.97	0.72	1.40	0.37	1.39
γ -terpinene	4.48	6.82	1.94	3.65	3.81	7.05	3.05	6.51
p-cymene	6.58	6.12	5.44	2.92	6.18	3.89	7.96	5.43
linalool	2.56	3.06	1.73	1.60	1.10	1.01	1.10	0.98
bornylacetate	2.60	2.93	1.62	1.92	1.39	1.82	2.34	2.41
terpinene-4-ol	7.70	7.63	4.72	6.24	4.86	6.72	6.88	6.37
borneol	2.56	2.83	2.02	3.12	3.11	2.95	2.19	2.33
thymol	1.32	1.12	18.77	16.04	11.83	11.18	17.32	22.27
carvacrol	60.55	57.65	49.82	47.74	60.80	54.50	49.69	44.32

Table 4. The highest and the lowest amounts of the compounds and the volatile oils bearing them.

Compound	Volatile oil, lowest amount (%)	Volatile oil, highest amount (%)
α -pinene	Datça-fruiting oil, 0.14 %	Zeytinalan-fruiting oil, 0.81 %
camphene	Ezine-fruiting oil, 0.24%	Zeytinalan-fruiting oil, 1.10 %
β -pinene	Ebine-flowering oil, 0.10 %	Eceabat-fruiting oil, 0.32 %
α -terpinene	Ezine-flowering oil, 0.66 %	Eceabat-flowering oil, 1.47 %
limonene	Ezine-flowering oil, 0.36 %	Eceabat-fruiting oil, 1.49 %
γ -terpinene	Ezine-flowering oil, 1.94 %	Eceabat-fruiting oil, 6.82 %
p-cymene	Ezine-fruiting oil, 2.22 %	Datça-flowering oil, 7.96 %
linalool	Datça-fruiting oil, 0.98 %	Eceabat-fruiting oil, 3.06 %
bornylacetate	Zeytinalan-flowering oil, 1.39 %	Eceabat-fruiting oil, 2.93 %
terpinene 4-ol	Ezine-flowering oil, 4.72 %	Eceabat-flowering oil, 7.70 %
borneol	Ezine-flowering oil, 2.02 %	Zeytinalan-flowering oil, 3.11 %
thymol	Eceabat-fruiting oil, 1.12 %	Datça-fruiting oil, 22.27 %
carvacrol	Datça-fruiting oil, 44.32 %	Zeytinalan-flowering oil, 60.80 %

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