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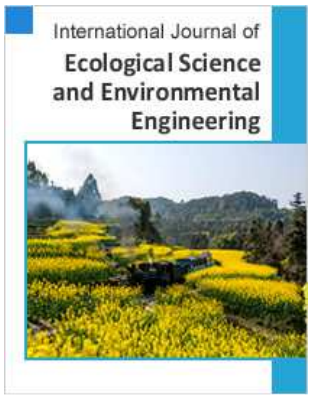

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Determination to Volatile Oil Components of *Phlomis grandiflora* H. S. Thompson var. *grandiflora* According to Various Vegetation Periods in the Lake District of Turkey

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Abstract
This study was conducted to determine volatile oil components of *Phlomis grandiflora* H. S. Thompson var. *grandiflora*. Samples of leaf and flower were collected from the distribution areas of the Lakes District in different vegetation period as pre-flowering, flowering and post flowering periods and volatile oil components were determine SPME analyses. As a result of the analysis, 60 volatile components were found. Of them α-Pinene, α-Cedrene and α-Curcumene were determined as the main components.

1. Introduction

Turkey has three different flora regions due to that it acts as a bridge between Asian and European continents. Therefore, so many Asian and European origin species has been expanding in our country. While flora of Turkey has approximately more than 11.000 plant species, whole Europe continent has approximately 12.000 plant species. This situation is an indication of that how much our country is rich in terms of plant diversity [1].

In the traditional and modern medicine application, the plant that is used at the treatment of diseases as a drug is called as ‘’Medicinal Plant’’ [2]. It is known that approximately 20 thousands of approximately 300 thousands flowering and seedy plant species that is registered in the world in nowadays are used for medical purposes and approximately 4000 medicinal drug is densely used and especially approximately 500 of these are dealt with economic purposes [3].

The ones that are rich in terms of especially volatile oil content among the medicinal and aromatic plants has a special importance. The volatile oils (oils, etheric oils) and aromatic extracts of these are widely used at the production of perfumes, food additives, cleaning products, cosmetics and drugs in the fragrance and food industries as source of aroma-chemicals or starting materials of nature identical and semi-synthetic useful aroma chemicals. Significant increase has been observed at demand of volatile oils to be used at the aromatherapy application especially in the recent years [4].

Turkey has an important place in the production and commerce of medicinal and

aromatic plants. In our country, especially mainly Isparta province and the Lakes District have become one of the most important medicinal and aromatic production centers of Turkey. As Isparta province is located at the cross-section point of Mediterranean and Iran-Turan Flora in terms of plant geography, it is our province that is very rich in terms of floristic although it has a small surface area. Today, approximately 40 taxa definitions has been made for science from Isparta province at which more than 600 endemic taxa are grown. By the studies on Isparta flora, it was detected that total 2280 different plant taxon have expanded and medical, aromatic and perfume value of 190 of these were high and spice value of 160 of these species was high [5].

Phlomis L. genus has an important place among the medicinal plants that naturally show distribution in our country. It is one of the genus of *Lamiaceae* family that has the most specie number. It has approximately 100 species whole the world. Distribution areas of this genus is Asia, Southern Europe and Northern Europe [6]. *Phlomis* L. genus members represented with total 50 taxa as 40 species and sub-species and 10 crossbreeds in the study of Davis under the name of Flora of Turkey were assessed as total 58 taxa as 39 species and sub-species and 19 crossbreeds as a result of the revision study of Dadandı [7]. The *Phlomis* species are known as "Ballık Otu", "Calba", "Çalba" and "Şalba" in Turkey with local names [8, 9].

The leaves, flowers, seeds and roots of *Phlomis* are consumed. These parts of plants are used as decoction, brewing and boiling [10].

Leaves and flowers are used as appetizing, anti-allergic, diuretic, diarrhea cutter, carminative, against stomach discomfort, pain relievers, anti-diabetic herbal teas and tonics. At the same time, it is known that it is colloquially used as respiratory tract diseases and hemorrhoid diseases [11].

Although there are so many fields of use, there are too less studies in our country that have been done on *Phlomis* L. taxa. Also there are very limited researches concerning to the volatile oil of leaves as relevant to these species. For this reason, it is aimed to reveal out the effect of specifications of habitat of *Phlomis* species expanded in the Lakes District and different collection periods on the volatile oil content and components and detect the appropriate collection period.

2. Materials and Methods

The research material was formed from *Phlomis grandiflora* H. S. Thompson *grandiflora* samples that were collected from C2, C3, C4 squares according to the quadrature system in the study of Davis [12] under the name of Flora of Turkey concerning to expansion of the Lakes District between the years of 2012 and 2015 (Figure 1). The samples were collected in 3 different periods as pre-flowering term, flowering term and post-flowering term.

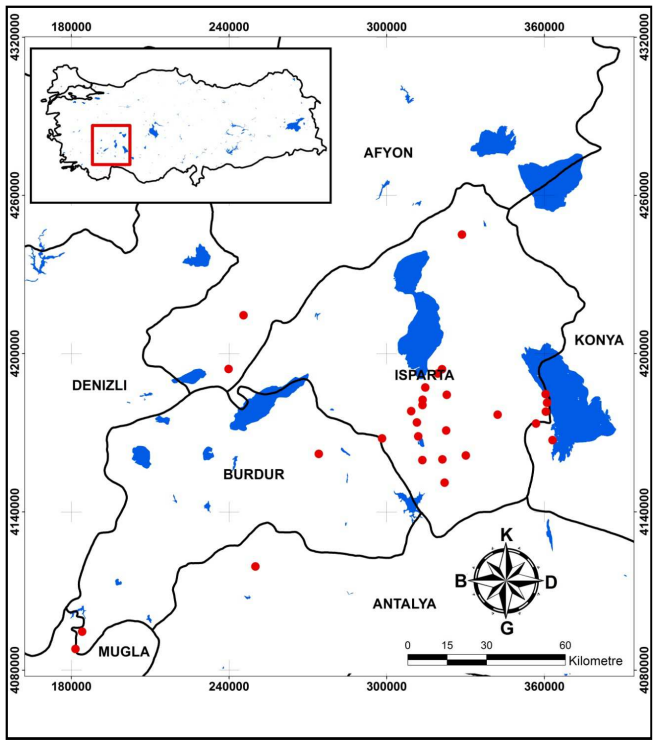

Figure 1. *Distribution areas of Phlomis grandiflora H. S. Thompson var. grandiflora.*

The leaves and flower samples that were collected were put into paper packages and transferred to the laboratory in the same day without kept waited and exposed to sunlight. Volatile components of leaves and flowers were determined by SPME analysis. For this aim, after the plant materials that were collected were dried at the room temperature (25°C), 2 gr was weighted out from each samples and out into bottles and then heated up at 60°C for 15 minutes. Then they were dipped into injector bottle that has appropriate fiber tip and absorbed for 30 minutes. The components inserted into fiber tip were injected into GC injection block and kept for 5 minutes for desorption. With the aim of detecting volatile components, Shimadzu QP 5050 branded GC-MS device was used.

3. Results and Discussion

As a result of the analysis, 60 volatile components were determined and the results belonging to these samples are given at Table 1. α-Pinene, α-Cedrene and α-Curcumene were determined as the main components of *Phlomis grandiflora* H. S. Thompson var. *grandiflora*. It was detected with the ratios of α-Pinene (25.97%), α-Cedrene (25.92%) and α-Curcumene (11.96%) at the pre-flowering period; α-Pinene (26.40%), α-Cedrene (28.15%) and α-Curcumene (13.92%) at the flowering period and α-Pinene (18.95%), α-Cedrene (19.14%) and α-Curcumene (13.24%) at the post-flowering period.

Table 1. *Volatile oil components of Phlomis grandiflora H. S. Thompson var. grandiflora according various vegetation periods.*

Components	R.T.	Pre-flowering period	Flowering period	Post-flowering period
Dimethyl sulfide	1.326	0,3	0,13	0,1
Isobutyl alcohol	1.442	0,6	-	-
Propanal. 2-methyl-	1.435	-	0,26	-
3-Methylbutanal	1.920	0,13	0,26	0,75
2-Methylbutanal	1.997	0,17	0,24	0,65
Ethyl vinly ketone	2.184	0,11	-	-
Furan, 2-ethyl-	2.344	0,51	0,36	0,12
n-Hexanal	4.090	0,39	0,11	0,2
2-Hexenal	5.515	4,34	0,51	1,02
α-Thujene	7.835	1,64	1,43	1,22
α.-Pinene, (-)-	8.060	25,97	26,4	18,95
Benzaldehyde	9.042	0,88	0,3	0,11
β.-Phellandrene	9.599	0,44	0,41	0,39
β-Pinene	9.508	0,79	0,13	0,66
Amyl Vinly Carbinol	9.869	0,18	0,09	0,15
6-Methyl-5-hepten-2-one	10.013	0,38	0,31	0,17
β.-Myrcene	10.206	0,47	0,98	0,87
Octanal	10.708	0,12	-	-
α-Phellandrene	10.760	0,14	-	-
p-Dichlorobenzene	11.087	0,26	0,11	0,18
p-Cymene	11.469	0,42	0,34	0,4
Limonene	11.693	3,36	2,62	2,29
cis-Ocimene	12.084	1,47	0,82	2,03
Benzeneacetaldehyde	12.224	0,26	-	-
β. Ocimene	12.368	0,18	0,15	0,14
Linalool	14.410	-	-	0,23
n-Nonanal	14.609	0,3	0,15	0,6
α.-Campholene aldehyde	15.459	-	0,12	0,09
Trans-Allocimene	15.607	0,1	0,08	0,2
D-Carvone	16.195	-	-	0,11
Pinocarvone	16.786	-	0,09	0,09
α.-Copaene	24.468	0,18	0,16	0,54
β. Bourbonene	24.734	0,34	1,05	1,06
β.-Cubebene	24.897	-	0,11	-
Sesquithujene <7-epi->	25.463	0,19	0,2	0,18
.α.-Cedrene	25.795	25,92	28,15	19,14
β-Caryophyllene	26.000	7,78	6,4	3,91
β-Cedrene	26.279	0,25	-	-
α.-Bergamotene	26.439	0,94	1,43	2,03
α.-Cedrol	26.789	-	0,52	0,45
Alloaromadendrene	26.887	0,17	-	-
Cyclosativene	27.101	0,64	-	0,68
Farnesene <(E)-, β->	27.104	1,8	-	1,28
β.-Humulene	27.132	-	-	7,52
Farnesol	27.232	-	1,19	1,1
Germacrene D	27.956	4	5,17	5,4
Ionone	27.970	0,16	-	1,28
α-Curcumene	28.131	11,96	13,92	13,24
Eremophilene	28.438	-	-	3,04
Cedr-8-e	28.555	0,26	2	3,02
α.-selinene	28.603	-	-	1,68
δ-Cadinene	29.163	-	0,08	0,1
β-Sesquiphellandrene	29.362	0,21	0,21	0,15
Spathulenol	30.595	-	-	0,37
Isolongifolene. 4.5.9.10-dehydro-	31.015	-	0,18	-
(-)-Caryophyllene oxide	31.090	0,79	1,22	1,19
p-Menthane, 2,3-dibromo-8-phenyl-	33.075	0,29	1,21	0,7
α-Elemol	33.366	0,21	-	-
Ar-tumerone	33.615	-	0,11	-
Androstan-17-one. 3-ethyl-3-hydroxy-.(5.alpha.)-	33.857	-	0,29	0,22

In our study, 60 volatile oil components of *Phlomis grandiflora* H. S. Thompson var. *grandiflora* were determined with SPME analysis and α-Pinene (26.40%), α-Cedrene (28.15%) and α-Curcumene (13.92%) were found as

the main components.

Çelik et. al [13] stated that Germakren-D (45,4%), β-karyofillen (22,8%) and bicyclogermakren (4,9%) as the main components of species. Demirci et. al (2008) mentioned that β-eudesmol (42%) and α-eudesmol (16%) belonging to the oxygenic sesquiterpene are the most important components. Özcan et. al. [14] detected that the oil obtained from the flowers included 32 componets represented with 92,1%. They detected that main components included β-eudesmol (61,48%), β-curcumene (5,81%), E-β-farnesene (2,35%), α-zingiberene (2,18%) and α-cedrene (1,94%). It was detected that the oil obtained from the leaves included 39 components represented with 87,7%. Main components were β-eudesmol (62,04%), β-curcumene (3,43%), α-Curcumene (2,20%) and linalool (2,03%). It was characterized that especially both of the oils include β-eudesmol at high ratio.

The results determined in our study show difference from the study done by Çelik et. al [13]. In the study done by Özcan et. al [14], α-Cedrene and α-Curcumene components were detected. This result supports our study. As different from the studies, α-Pinene component was detected among the dominant components as a result our study.

4. Conclusions

The results showed that *Phlomis grandiflora* H. S. Thompson var. *grandiflora* has many volatile oil components. Due to this reason, it is though that these components could be assessable in drug and cosmetics industries. For this reason, more detailed studies should be conducted about the most suitable harvesting period of plant according to components. It is though that merchants and local people will be awareness and also economic losses which are arising from promiscuous collecting, will be prevented.

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References

[1] Durmuşkahya, C., 2005. Aşağı Gediz Havzası Vejetasyon Ekolojisi. Celal Bayar Üniversitesi, Fen Bilimleri Enstitüsü, Biyoloji Anabilim Dalı, Doktora Tezi, 169 s.

[2] Baydar, H., 2007. Tıbbi, Aromatik ve Keyf Bitkileri Bilimi ve Teknolojisi. Süleyman Demirel Üniversitesi Ziraat Fakültesi, (Genişletilmiş 2. Baskı) Yayın No: 51, 216 s.

[3] Baydar, H., 2009. Tıbbi ve Aromatik Bitkileri Bilimi ve Teknolojisi. Süleyman Demirel Üniversitesi Ziraat Fakültesi, (Genişletilmiş 3. Baskı) Yayın No: 51, 348 s.

[4] Weiss, E.A., 1997. Essential Oil Crops. The Journal of Agricultural Science, 129 No:121-123.

[5] Özçelik, H., Serdaroğlu, H., 2000. Isparta Florasına Ön Hazırlık. SDÜ Fen Bilimleri Enstitüsü Dergisi, 4, 1: 135-154.

[6] Mathiesen, C.,Scheen, A. C., Lindqvist, C., 2011. Phylogeny and biogeography of the lamioid genus *Phlomis* (Lamiaceae). The Board of Trustees of the Royal Botanic Gardens, Kew, Vol: 66: 83-89.

[7] Dadandı, M.Y., 2002. Türkiye'nin *Phlomis* L. (Lamiaceae) Cinsi Revizyonu, Doktora Tezi, Gazi Üniversitesi, Ankara.

[8] Baytop, T. 1997, Türkçe Bitki Adları Sözlüğü, TDK. Yayınları, Ankara, 512 s.

[9] Demirci, B., Dadandı, M.Y., Paper, D.H., Franz, G., Başer, K.H.C. 2003. Chemical composition of the essential oil of *Phlomis linearis* Boiss. & Bal. andbiological effects on the CAM-Assay: A safety evaluation. *Verlag der Zeitschriftfür Naturforschung*, 58c: 826-829.

[10] Harput, Ü. Ş., Çalış İ., Saraçoğlu, İ., Dönmez, A. A., Nagatsu, A., 2006. "Secondary Metabolites from *Phlomis syriaca* and Their Antioxidant Activities", Turk. J. Biol., 30: 383-390.

[11] Limem-Ben Amor, I., Skandrani, I., Boubaker, J., Ben Sghaier, M., Neffati, A., Bhouri, W., Bouhlel, I., Chouchane, N., Soumaya Kilani, S., Guedon, E., Ghoul, M., Ghedira,K., Chekir-Ghedira, L., 2009. "Phytochemistry and activities of *Phlomis* species", Journal of Ethnopharmacology, 125, 183-202.

[12] Davis, P.H., Edmondson, J.R., Mill, R.R., Tan, K. 1982. In: P.H. Davis (Editor), Flora of Turkey and East Aegean Islands 7, Edinburg Univ. Press., pp.36, Edinburg.

[13] Çelik S, Göktürk RS, Flamini G, Cioni PL, Morelli I., 2005. Essential oils of *Phlomis leucophracta*, *Phlomis chimerae* and *Phlomis grandiflora* var. *grandiflora* from Turkey. Biochem Syst Echo 2005; 33: 617-623.

[14] Özcan, M.M., Tzakou, O., Couladis, M., 2009. Essential oil composition of the turpentine tree (*Pistacia terebinthus* L.) fruits growing wild in Turkey. Food Chemistry, 114(1), 282-285.