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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 Dadandu [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 (13.24%) at the post-flowering period.

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1 unobine 3[1], p = 1,20
βHumulene 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
αselinene 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
a-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

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

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%), βkaryofillen (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 βeudesmol (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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