

Investigation of the Components of Lavender Plant Grown in Konya-Turkey Region

Konya Bölgesinde Yetiştirilen Lavanta Bitkisinin Organik Bileşiklerinin Araştırılması

Hayriye ALP^a, Muammer ŞEN^b

^aKonya Necmettin Erbakan University, GETAT Education Center, Department of Phytotherapy, Konya, TURKEY

^bTemmuz Organic Farm, Konya, TURKEY

ABSTRACT Objective: *Lavandula intermedia* is an aromatic subshrub native to the low mountains (800-1800 meters) of the Mediterranean basin, cultivated in France, Bulgaria, Italy, Spain, the former Yugoslavia, the Netherlands, The United States and Australia. We aimed to present the analysis of the Turkey lavender *intermedia* flowers grown in Konya in this study. **Material and Methods:** Analyses were carried out in the Laboratory of the Central Medical and Aromatic Plants of the Western Mediterranean Agricultural Research Institute (Antalya). The amount of essential oil of lavender plant grown in Konya region was measured by hydrodistillation method. Essential oil components were measured by GC-MS/FID method. **Results:** Total essential oil content of lavender plant grown in Konya region was found to be 2.9%. It is seen that the total amount of essential oil of lavender plant grown in Konya region is quite high. The major components and proportions of the essential oils were linalol (43.13%), linalyl acetate (26.12%) and camphor (6.16%), respectively. **Conclusion:** Lavender *intermedia* is an aromatic plant that needs to be worked on with plenty of flowers and highly essential oil components.

Keywords: *Lavender intermedia*; Konya region; essential oil content; phytochemical analyses

ÖZET Amaç: Lavanta (*Lavandula intermedia*) aromatik bir bitki olup 800-1800m yükseklikte genellikle Akdeniz bölgelerinde yetiştirilir. Fransa, Bulgaristan, İtalya, İspanya, eski Yugoslavya, Hollanda, Birleşik Devletler ve Avustralya gibi ülkelerde yetiştirilmektedir. Biz bu çalışmada Konya bölgesinde yetişen *Lavanta intermedia* çiçeğinin analiz sonuçlarını sunmayı amaçladık. **Gereç ve Yöntemler:** Analizler Antalya'da Batı Akdeniz Tarımsal Araştırma Enstitüsü Müdürlüğü Tıbbi ve Aromatik Bitkiler Merkezi Laboratuvarı'nda yapıldı. Esansiyel yağ oranının ölçülmesinde hidrodistilasyon yöntemi kullanıldı. Bileşiklerin ölçümünde ise GC-MS/FID yöntemi kullanıldı. **Bulgular:** Konya bölgesinde yetişen *L. intermedia* bitkisinin total uçucu yağ oranı %2,9 bulundu. Konya bölgesinde yetişen bu bitkinin total uçucu yağ oranı oldukça yüksek olduğu gösterildi. Temel olarak sırasıyla linalool %43,13, linalyl asetat %26,12, kafur ise %6,16 ile bileşenler ölçüldü. **Sonuç:** Lavanta *intermedia* çiçeği yüksek oranda esansiyel yağ bileşimine sahip aromatik bir bitkidir.

Anahtar Kelimeler: *Lavandula intermedia*; Konya bölgesi; uçucu yağ miktarı; fitokimyasal analiz

Lavender (*Lavandula* spp.) is a very valuable essential oil plant from the family Lamiaceae.¹ There are about 39 types of lavender (*Lavandula* spp.), most of them of Mediterranean origin. There are three important types of lavender in the world with high commercial value. These include lavender (*Lavandula angustifolia* Mill. = *L. officinalis* L. = *L. vera* DC), la-

vandin (*Lavandula intermedia* Emeric ex Loisel. = *L. hybrida* L.) and spike lavender (*Lavandula spica* = *L. latifolia* Medik.). The variety used in our study is *L. intermedia*. The essential oil quality of lavender varieties called British lavender is higher than the lavender varieties called hybrid lavender.² Apart from these three important species, *L. dentata* (French

Correspondence: Hayriye ALP

Konya Necmettin Erbakan University, GETAT Education Center, Department of Phytotherapy, Konya, TURKEY/TÜRKİYE

E-mail: hayriyebalp@yahoo.com



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lavender), *L. stoechas* L. (Spanish lavender), *L. latifolia* medik. (broadleaved lavender), *L. multifida* (fern leaved lavender), *L. canariensis* (Canary islands lavender), *L. lanata* (wool lavender), *L. heterophylla* and *Lx allardii* (*L. dentata* x *L. latifolia* Medik.) are also available. There are also many species grown as ornamental plants and cut flowers.³ Lavender is a perennial, semi-bushy Mediterranean plant. The roots can be as deep as 80-100 cm depending on soil and climate conditions. The four-pointed stalk is bare or feathery. The plant gives numerous lateral branches. Leaves are mutually located in the knuckles and are 2-6 cm long. At the end of the flower stem is 15-20 cm long flower spike-cluster axis. There are 4-6 flower clusters on the spike axis. Each flower cluster has a number of flora (6-14) depending on some factors. The color of the fruit varies from dark brown to black. 1000 grain weight is less than 1g.⁴ The most important substance of lavender flower is colorless or light yellow colored essential oil. The quality of the essential oil is evaluated in particular according to the ratio of linalyl acetate and linalool in the oil. In addition, the flavonoids of the luteoline type in the content of the essential oil have bacteriostatic and spasmotic effect. It also carries compounds such as β -pinene, linalol, camphor, terpineol, borneol, and cineol.⁵

MATERIAL AND METHODS

L. intermedia was harvested from Konya -Turkey Organic Temmuz farm. The analyzes were carried out in the laboratory of Antalya West Mediterranean Agriculture and Forestry Directorate.

Determination of Essential Oil: The amount of essential oil is all substances expressed in milliliters per 100 g of dry matter, which are steamed under the conditions specified in this standard.

The principle of this method is to distill the aqueous suspension of the sample, collect it in a fractionated tube containing a certain volume of xylene used to hold the volatile oil in the distilled portion, wait for the separation of the organic and aqueous phases, read the total volume of the organic phase and calculate the volatile oil after removal of the xylene volume.

Preparation of sample: Approximately 20 g of dried plant material is prepared for analysis. The weighed sample is placed in a glass clevenger flask and added about 10 times (200 ml) of purified water to the sample. Hydrodistillation was done for approximately 2 hours. The volatile oil sample, which accumulates in the graduated part and forms a phase difference with water, is read and the result is recorded in ml. Then, based on the weighing amount, the amount of essential oil is calculated as a percentage.

Determination of volumetric humidity: About 10 gr of sample is placed it in the flask. Xylene which is saturated with water is added to cover the plant material. The appliance is switched on for about 1 hour after boiling. The xylene and water are then separated in the graduated phase. The amount of water is read and recorded in ml. The result is calculated as a percentage by using the agricultural quantity of dry plant material.⁶

Determination of Essential Oil Component with Gas Chromatography Mass Spectrometry Analysis: Samples were diluted 1: 100 with hexane for analysis. Essential oil component analysis of the samples was performed by GC / GC-MS (Gas chromatography (Agilent 7890A) -mass detector (Agilent 5975C)) using a capillary column (HP InnowaxCapillary; 60.0 m x 0.25 mm x 0.25 μ m). In the analysis, helium was used as a carrier gas at a flow rate of 0.8 ml / min. The injector temperature was maintained at 250°C, and the column temperature program was set to 60°C (10 minutes), 60°C to 220°C, 4°C / minute, and 220 ° C (10 minutes). The total analysis time for this temperature program was 60 minutes. The scanning range (m / z) 35-450 atomic mass units and electron bombardment ionization 70 eV were used for the mass detector, and the identification of the components of the essential oil was based on data from the WILEY and OIL ADAMS libraries. Component percentages of the results were made using FID detector and components were identified using MS detector (Table 1).⁷

DISCUSSION

In this study, we investigated the organic oil components of *L. intermedia* plant grown in region. Wichtl (1971) and Wagner (1980) reported lavender essen-

TABLE 1: Essential oil component % in *L.intermedia*.

No	Component name	Component quantity (%)	Number	Component name	Component quantity (%)
1	Myrcene	0,92	11	Linalyl acetate	26,12
2	Limonene	0,55	12	Lavandulyl acetate	1,94
3	1,8 - cineole	3,18	13	β caryophyllene	0,71
4	Cis- β -ocimene	1,21	14	α -terpineol	3,51
5	Trans- β -ocimene	1,42	15	borneol	2,27
6	3-octanone	0,63	16	Neryl cetate	0,95
7	Hexyl acetate	0,58	17	Geranyl acetate	1,96
8	Hexyl butanoate	0,61	18	nerol	0,72
9	Camphor	6,16	19	geraniol	1,98
10	Linalool	43,13	20	α -bisabolol	1,50

Total amount of essential oil (%):2,9.

tial oil ratio of 1.5%, Ceylan (1996) at least 1%, Baytop (1999) reported that it should be between 0.5-1.0%.⁸⁻¹¹ Ceylan et al. (1988) reported that *L. officinalis*'s essential oil content varies between 1.26-3.14%, Renaud et al. (2001) reported that lavender contains 7.1-9.9% of dry flower buds and 2.8-5.0% of essential oil of lavender varieties.^{12,13} Baydar (2007) stated that the ratio of essential oil of Super lavandin cultivars grown in Isparta varies between 1.0-1.5% in fresh stalked flowers and 5-6% in dry stalkless flowers, and lavender (*Lx intermedia*).¹⁴ Atalay (2008) reported that *L. angustifolia*'s essential oil content is 2.1-2.6% in the same lavender species (*Atalay AT. [Effects of organic and inorganic nitrogenous fertilizers applied in different doses on lavender (*Lavandula angustifolia* Mill.) grown in Konya ecological conditions on yield and quality characteristics]. Selçuk University, Institute of Science and Technology, Field Crops Department. Master Thesis. 2008*). Arabacı and Bayram (2005) reported that fat ratio is between 1.54-2.34%, Kara (2011) reported that it varies between 2.1-9.62%. Compounds found in leaves and immature flowers (Group 1 monoterpenes: 3 - carene, limonene, myrsen, bornyl acetate, borneol, camphor, 1.8-cineol and trans-oximene) are protective against insecticides.¹⁵ Group 2 contains monoterpene acetates and sesquiterpenes: linalyl acetate, lavandulyl acetate, germacren D, - β caryophyllene, trans - β nes farnes. These compounds are formed during flowering and are attractive for pollination. Group 3 monoterpenes, linalool and terpinene - 4 - are insecticidal properties.^{16,17}

Aromatic plants affect the sense of smell. Odor has been suggested to have an effect that activates odor receptors or neurons in the vomeronasal organ and activates limbic areas such as amygdala.¹⁸⁻²¹ In a study conducted in anosmic mice, even intraperitoneal or oral administration of aromatic compounds has been shown to reach the central nervous system.^{22,23}

L. intermedia (lavandin) (Lamiaceae) is mainly planted for essential oils (EO), which contain a rich mixture of mono and sesquiterpenes. *L. intermedia* is used in perfumery, cosmetics and therapeutics. The relative concentration of organic compounds of these essential oils is of great importance for the biological activity of lavender essential oils. The composition and content of the essential oil have been shown to be exposed to changes pending the ontogenic improving of some of the whole herb or some of its members.^{24,25} The range of mono- and sesquiterpene carbon frames linked to the catalytic bustle of members of the terpene synthase (TPS) enzyme relations.²⁶

The expression profile of several TPS members was characterized and demonstrated to follow complex spatial and temporal patterns during plant growth and in response to biotic and abiotic stresses.²⁷ In lavender species, volatile organic compounds are produced and accumulated in special trichomes scattered on the surface of all green tissues such as leaves, calyces, stems and supports. Lavender flowers are

abundant in the amount of essential oil is a plant suitable for research because of the high rate.²⁸ Since flowering time may affect terpene synthesis, suitable conditions for organic compounds at harvest time should be provided.

CONCLUSION

Lavender intermedia is an aromatic plant that needs to be worked on with plenty of flowers and highly essential oil components. It can be used both in the treatment of anxiety and insecticide control as a plant with high added value that can obtain abundant organic compounds with suitable harvest conditions.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Hayriye Alp; **Design:** Hayriye Alp; **Control/Supervision:** Hayriye Alp; **Data Collection and/or Processing:** Muammer Şen; **Analysis and/or Interpretation:** Muammer Şen; **Literature Review:** Hayriye Alp; **Writing the Article:** Hayriye Alp; **Critical Review:** Hayriye Alp; **References and Fundings:** Hayriye Alp; **Materials:** Muammer Şen.

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