

The Density Status of *Cyclotrichium niveum* (Boiss.) Manden. & Scheng. Species Showing Natural Distribution in Adiyaman Province and the Comparison of Different Locality Populations in terms of Essential Oil Contents

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ABSTRACT: *Cyclotrichium niveum* (Boiss.) Manden. & Scheng species which is a member of Lamiaceae family, being an endemic species to our country, is named as külotu (dağ nanesi) by locals in its natural habitats and it is consumed as a herbal tea for various health problems. For this reason, a need has arisen to make such a study in order to determine the natural distribution and status of the plant within Adiyaman province borders. It has been determined that the species has a distribution near the west (860-963 m), and North-west 1040-1617 m of Nemrut Mountain and Ulubaba Mountain (1650-1750 m). Sociability and covering status in populations are averagely on 2 and 2 (22), respectively. In samples representing the population the plant height has varied between 27- 48 cm. Besides, it has been determined that essential oil contents of dry leaf are between 1.6- 3.6 % in the samples taken during the flowering period according to the distribution status and density of the plants. Taxon's IUCN danger category is "VU".

Keywords: *Cyclotrichium niveum*, covering, sociability, essential oil.

Adiyaman İlinde Doğal Yayılış Gösteren *Cyclotrichium niveum* (Boiss.) Manden. & Scheng. Türünün Yoğunluk Durumu ve Farklı Lokalite Popülasyonlarının Uçucu Yağ Oranları Bakımından Karşılaştırılması

ÖZ: Lamiaceae familyasının bir üyesi olan *Cyclotrichium niveum* (Boiss.) Manden.&Scheng türü ülkemiz için endemik bir tür olup, doğal yetiştiği alanlarda yöre halkı tarafından külotu (dağ nanesi) olarak isimlendirilmekte ve çeşitli rahatsızlıklar için bütisel çay olarak tüketilmektedir. Bu nedenle, bitkinin Adiyaman ili sınırlarında doğal yayılış alanlarını ve bolluk- yoğunluk durumunu belirlemek ve farklı lokalitelerde bulunan popülasyonlarda uçucu yağ oranlarının karşılaştırılması amacıyla böyle bir çalışma yapma ihtiyacı doğmuştur. Türün Nemrut Dağı'nın Batısı (860-963 m), Kuzey Batısı 1040-1617 m) ve Ulubaba Dağı Batı yamaçlarında (1650-1750 m) yayılış gösterdiği belirlenmiştir. Lokalitelerdeki popülasyonlarda örtüş ve sosyabilite durumu ortalama sırasıyla 2 ve 2 (22) pozisyonundadır. Popülasyonu temsil eden örneklerde bitki boyu 27-48 cm arasında değişim göstermiştir. Bunun yanında bitkilerin yayılış durumları ve yoğunluğuna göre çiçeklenme döneminde alınan örneklerde kuru herbadaki uçucu yağ oranları % 1,6-3,6 arasında olduğu tespit edilmiştir. Taksonun IUCN tehlike sınıfı "VU" dur.

Anahtar Kelimeler: *Cyclotrichium niveum*, örtüş durumu, sosyabilite, uçucu yağ.

INTRODUCTION

Turkey is a country with sources rich in terms of plant diversity and endemic species. Medicinal and aromatic plants among these sources have currently been used in several areas. Especially in

recent years, the tendency towards these plants has increased due to various reasons, and has also continued to be increasing gradually. As in several countries in the world, unfortunately, in our country, most of the plants used as medicinal and

aromatic are picked from the nature. And this causes destruction of nature, and especially endemic plants face the danger of extinction.

Cyclotrichium genus is represented with 6 species in our country (*C. niveum*, *C. origanifolium*, *C. leucotrichum*, *C. stamineum*, *C. glabrescens*, and *C. longiflorum*). Two of them are endemic (*C. niveum* and *C. glabrescens*). One species is Mediterranean element (*C. origanifolium*), and the other five species are Iranian-Turan phyto-geographical region elements (Davis, 1965-1988). Whereas *C. origanifolium* has a wide spread area in Mediterranean and Eastern Mediterranean regions rather than the other species, the other 5 species are known with a narrower spread in eastern and southeastern regions of Turkey. When the vertical distribution of this six species has been analyzed in relevant resources, the lowest level is noticed to be 1000 meter. Namely, *Cyclotrichium* species prefer high-altitude areas, and IUCN level of the taxa is "VU" (Vulnerable) (Ekim *et al.*, 2000).

One of these species is *Cyclotrichium niveum* (Boiss.) Manden.&Scheng. *Cyclotrichium niveum* is a perennial, semi-brushy species endemic for Turkey as a member of Lamiaceae family growing up to 20- 50 cm on its natural area (Kaya and Baser, 1996). The plant is covered with dense white hair. Blooming period for the plant includes July and August. As the habitat, the plant prefers rocky and chalky slopes (step). It grows between 1200 and 1830 meter. The plant that is endemic for our country is Iranian-Turan phyto-geographical region element. Eastern Anatolia is the main spreading area for the plant, it does not grow out of our country, and the species' sample has been known from Turkey (B6 Malatya) (Davis, 1965-1988). The plant has a spread on C6 and C7 squares according to the Grid square system of Davis (1965-1988). It has an interrupted spread between approximately 1200 and 1830 meter within the provincial borders of Adiyaman, Malatya, Sivas and Erzincan.

The other localities the plant grows are 1400 m altitude on 40th km of Malatya-Gürün, 5 km

southeastern of Darende at 1200 m, 5th km on Gürün-Sivas highway at 1700 m altitude, and at 1830 m altitude on Akdağ within the provincial borders of Malatya/Adiyaman and between Kemaliye and Kolsan. This species has been used as a herbal tea for flu, nausea and muscle pain complaints by the local people in the areas this plant grows (Gulcin *et al.*, 2008; Alim *et al.*, 2009; Göze *et al.*, 2010; İnan *et al.*, 2014). Because the smell of the plant resembles to the smell of mint, it is also called as "mountain mint, dog mint" by the local people (Baser *et al.*, 1996).

While investigating Ulubaba Mountain vegetation within the provincial borders of Adiyaman, Simsek (2015) reported that this species had a 10% and 40% covering status, and had 1 to 3 densities out of 5 in terms of its sociability. The presence of the same rates was also reported in the studies carried out in populations in Nemrut Mountain (Tel, 2009; Tel *et al.*, 2010). In the studies carried out upon *C. niveum*, 1.54-5.60% essential oil was determined in the plant (Baser *et al.*, 1994; Cetinus *et al.*, 2007; Gulcin *et al.*, 2008; Alim *et al.*, 2009; Goze *et al.*, 2010; İnan *et al.*, 2014). İnan and Tel (2014) determined in their study that essential oil rate in the plants they picked from different altitudes in western slopes of Nemrut Mountain (Adiyaman) varied between 4.1- 5.5%, and essential oil rate was affected from altitude. Furthermore, it was mentioned by some researchers that several positive or negative internal and external environmental factors were efficient upon the rate for essential oil (Telci *et al.*, 2009; Shahat *et al.*, 2012; Kirpik and İnan, 2016). In the studies carried out upon determining the effects of *C. niveum* essential oil, the essential oil was specified to have antioxidant (Baser *et al.*, 1994; Cetinus *et al.*, 2007), antispasmodic (Cetinus *et al.*, 2007), antimicrobial (Alim *et al.*, 2009; GURSOY *et al.*, 2009), and antiangiogenic (Goze *et al.*, 2010) effects.

In this study that was carried out within the provincial borders of Adiyaman located phyto-geographically on Iranian-Turan region, spreading

area, density, sociability and covering of *Cyclotrichium niveum* (Boiss.) Manden. & Scheng species; and essential oil rate in populations in the localities were determined and compared.

MATERIALS AND METHODS

In the study, the species of *Cyclotrichium niveum* (Boiss.) Manden.&Scheng spreading naturally within the provincial borders of Adiyaman was discussed as the material. The field survey was carried out in 2015, and the coordinates and the altitudes for the plant were determined.

The plant spreads on brown forest soils over the limestone bedrock. During the investigation of the plant ecology, the soil was determined to have nearly neutral basic pH value according to the physical and chemical analysis results of the soil sample taken from the sample parcel, and the value was measured to be 7.45. The texture class of the soil was determined to be "clayey-loamy." The data specified for the chemical structure of the soil were presented in Table 1 (Simsek, 2015).

Covering status

Braun-Blanquet (1932) measured the covering degree of each taxon in a parcel using a sample parcel. It started with "+," and each number between 1 and 5 in the scale had a % equivalent. Projection of the each canopy of each individual in the sample parcel was considered, and area covering rate was calculated. Presentation of the values related to each taxon in the sample parcel included 2 digits, and covering status was represented by the first of these.

Sociability

Braun-Blanquet (1932) measured the degree for the unity of the same taxon in the parcel with each other using a sample parcel. Each number in the scale between 1 and 5 had a density equivalent. Presentation of the each individual within the sample parcel included 2 digits, and sociability was represented by the second of these.

Essential oil rate

The plants of the species were observed to start blooming period in July. For that reason, the samples were started to be picked from the localities of blooming as of the beginning of July. After drying the picked samples under room conditions, leaf and scape were separated, and essential oil rates in the leaves were determined. For that purpose, the samples were boiled for 3 hours using Clevenger type tools according to the water vapor distillation method, and the essential oil measured volumetrically was transformed into percentage (Inan *et al.*, 2014).

RESULTS AND DISCUSSION

Spreading of the plants

The coordinates related to the spreading area of the species within the provincial borders of Adiyaman were presented in Table 1. The average length of the plants picked from the south of Nemrut Mountain (L_1) was 48 cm, the length of the plants picked from the southwestern (L_2) was 28 cm, and the length of the plants picked from the west of Ulubaba Mountain (L_3) was measured as 32 cm.

Table 1. Some results related to the chemical structure of the soil taken from the natural habitat of *Cyclotrichium niveum* plant. Çizelge 1. *Cyclotrichium niveum* bitkisinin doğal yaşam alanlarından alınan toprağın kimyasal yapısına ilişkin bazı sonuçlar.

Name of the defined plant unity Tanımlanan bitki birliğinin adı	Fe (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)	N (%)	pH	EC (μS/cm)	K ₂ O (kg/da)	Texture Tekstür
<i>Cyclotrichido niveae</i> / <i>Pennisetetum orientalis</i>	19.70	0.48	12.21	0.98	0.61	7.45	566	208.43	Clayey-Loamy

The coordinates, altitudes related to the plants, and some properties of the plants were presented in Table 2. L₁ location was 5 km away from Kahta Castle (Değirmenbaşı locality) on Malatya road on west of Nemrut Mountain (860-963m). Direction of the sample parcel was west. The rest of this road went up to Malatya-Nemrut Mountain highway reaching to Nemrut Mountain. L₂ location represented the location at 1040-1617 altitude that was 6-8 km away from the summit and that was on the Northwest of Nemrut Mountain. Directions of the sample parcels were west, southwest, and east. The species was noticed to be spreading on the right of the road from L₁ location to L₂ location (throughout nearly 10-20 km).

This unity was noticed away from 5 km from the west of Ulubaba Ziyaret Hill on L₃ location (Çelikhan). Slope of the area including the parcels where the samples were taken varied between 25% and 60%, and elevation from the sea level varied between 1650 and 1750 m. directions of the sample parcels were west, northwest, southeast and east.

Sociability and covering status

Covering status in the sample parcels and sociability grades varied between +1 and 33, and the sociability and covering in all localities we

mentioned with their coordinates and we evaluated were the same and the value was 22 (20% and 40%). While calculating the density, population rate per square in the investigated localities was not calculated, and in subsequent studies, population rate in 1st, 3rd, 5th, 10th and further years would be followed.

Essential oil rate

There were differences between the essential oil rates of the samples taken from different localities. It was determined that there were decreases in essential oil rates as the altitude increased. The highest essential oil rate was determined as 3.6% in the plants in L₁ location, and the subsequent essential oil rates in the plants from the locations were 2.0% in L₂, and 1.6% in L₃ locations. Whereas the values determined in L₂ and L₃ localities were lower than the values of some researchers (Cetinus *et al.*, 2007; Alim *et al.*, 2009; Goze *et al.*, 2010; Inan and Tel, 2014), the essential oil rate we determined in L₁ location was between the values reported by the aforementioned researchers. It was reported by several researchers that various effects were efficient upon the essential oil rates in the plants (Telci *et al.*, 2009; Shahat *et al.*, 2012; İnan and Tel, 2014; Kirpik and İnan, 2016).

Table 2. Spreading and some properties of *Cyclotrichium niveum* (Boiss.) Manden. & Scheng. species within the provincial border of Adıyaman.

Çizelge 2. Adıyaman il sınırları içerisinde *Cyclotrichium niveum* (Boiss.) Manden. & Scheng. türünün yayılma durumu ve bazı özellikleri.

Localities Lokaliteler	Coordinate Koordinat	Altitude (m) Yükselti (m)	Plant Length (cm) Bitki Boyu (cm)	Essential Oil Rate (%) Uçucu Yağ Oranı (%)
West of Nemrut Mountain (L ₁ ; Kahta) Nemrut Dağı Batısı (L ₁ ; Kahta)	37°57'47" North 38°40'21" East	860 - 963	48	3.6
Northwest of Nemrut Mountain (L ₂ ; Kahta) Nemrut Dağı Kuzeybatısı (L ₂ ; Kahta)	38°00'16" North 38°45'22" East	1040 - 1617	28	2.0
West of Ulubaba Mountain (L ₃ ; Çelikhan) Ulubaba Dağı Batısı (L ₃ ; Çelikhan)	37°57'06" North 38°08'31" East	1650 - 1750	32	1.6

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