

## **CONTRIBUTIONS TO VASCULAR FLORA OF KARAAĞAÇ (GEDİZ-KÜTAHYA-TURKEY) VILLAGE AND ITS ENVIRONS**


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**ABSTRACT.** 11 field studies were conducted in the research area between 2020-2021. According to the grid system used in the flora of Turkey, the research area is located in the B2 square. As a result of the diagnosis of the herbarium samples collected as a result of the field studies and literature review, 604 species and subspecies taxa were determined in and around Karaağaç Village, Gediz District of Kütahya Province. 48 of the detected plant taxa are endemic and the endemism rate of the region is 7.95%. The distribution of the species in the floristic regions is as follows; 63 taxa are Mediterranean (10,43%), 51 are Irano-Turanian (8.43%) and 43 are European Siberian (7.12%). The remaining 447 taxa (74.01%) plant group on the other hand, plant groups that can be found in more than one phytogeographic region or whose phytogeographic region is not certain.

**Keywords:** *Flora, Biodiversity, Endemism, Karaağaç, Kütahya*

### **INTRODUCTION**

Variability is a situation that is frequently encountered in nature, as in many areas of life. The environmental conditions that vary in different parts of the world bring about diversity. Diversity is a dynamic feature of a system. This dynamic feature brings resistance and stability, strength and vitality to the system it is in. Biodiversity, or "biodiversity" for short, is the variability observed in all sources, including terrestrial, marine and other aquatic ecosystems, and in living organisms within the ecological network of which they are a part. Biological richness or biological diversity refers to the diversity and variability of living things, their mutual interactions with each other and with their environment, with the complex ecological structures they are in. In other words, biodiversity includes the differences between the living environments of species (habitats, ecosystems in a wider sense) in terms of various biotic and abiotic factors, the differences between living things in ecosystems, between living things and non-living things, according to place and time, and the differences between genes, species, ecosystems and represents all functions [1-6].

Biological diversity consists of three important elements: genetic diversity, species diversity and ecosystem diversity. Genetic Diversity expresses the diversity within a species while it is measured by the genetic difference within the population. Genetic diversity is the sum of genetic information determined by the genes possessed by an individual. The number of species in a region (species richness) is one of the most frequently used criteria in this regard. Thus, ecosystem diversity emerges. Communities and their relations with their environment are included in the scope of Ecosystem

Diversity, which is the basis of vitality and life due to the functional relations that continue every second in nature and are of vital importance. An ecosystem consists of living things and nonliving things such as soil, water, minerals. Each ecosystem differs more or less from other ecosystems in terms of its climate, soil edaphic, topographic and biotic characteristics. In this context, it is necessary to realize the value of biological diversity on its own and the ecological, genetic, social, economic and scientific values of biological diversity and its elements, and to protect them within international conventions [7-12].

The aim of this study is to ensure the continuity of the mutual interaction between the sensitive ecosystem elements existing in the region and to transfer the ecological values of the surroundings of Karaağaç Village, Gediz District of Kütahya, to future generations.

## **MATERIALS AND METHODS**

For the mining activities planned to be carried out in the area; The relevant botanical literature, especially the floristic studies carried out in the project area and its immediate surroundings, has been scanned. A total of 11 field studies were carried out, with at least 1 field work per month during the vegetation periods in and around the project site, and the seed plant flora of the project site and its surroundings was tried to be determined. Diagnoses and evaluations were made using the relevant literature.

## **RESULTS AND DISCUSSION**

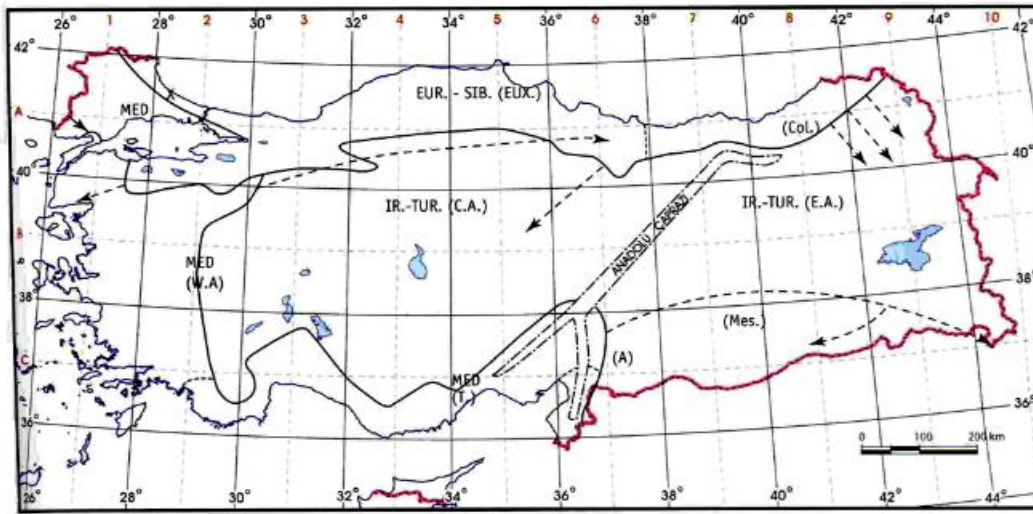
### ***Floristic Findings***

According to the grid system used in the flora of Turkey, the research area is located in the B2 square. In order to determine the floristic diversity of the region, field studies were carried out to coincide with the spring, summer and autumn vegetation periods, and the floristic structure of the research area and its surroundings was tried to be determined exactly. As a result of the diagnosis of the herbarium samples collected as a result of the field studies and literature review, 604 species and subspecies taxa were determined in and around Karaağaç Village, Gediz District of Kütahya Province. 48 of the detected plant taxa are endemic and the endemism rate of the region is 7.95%. The distribution of the species in the floristic regions is as follows; 63 taxa are Mediterranean (10,43%), 51 are Irano-Turanian (8.43%) and 43 are European Siberian (7.12%). The remaining 447 taxa (74.01%) plant group on the other hand, plant groups that can be found in more than one phytogeographic region or whose phytogeographic region is not certain. While preparing the floristic list in this report, it was tried to include not only the project activity area but also the flora elements in the nearby regions.

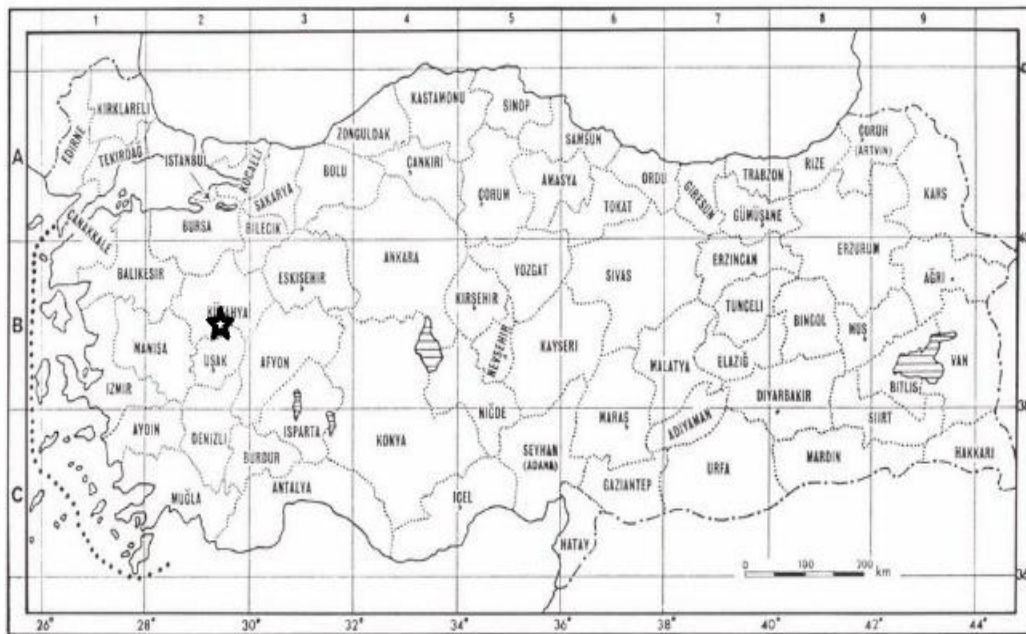
### ***Ecological Structure and Phytogeographical Region***

Vegetation is divided into flora realms based on their floristic structures, and flora area are divided into floristic zones within themselves. Our country is under the influence of 3 floristic regions due to the differences in topographic structure and climatic characteristics within the Holoarctic flora realm. These; Mediterranean, Irano-Turanian and European Siberian regions. The research area is within the B2 square and is located on the border of the Mediterranean phytogeographical region and the Iranian Turan

phytogeographical region. Therefore, a floristic composition containing its elements is observed in two phytogeographic regions (Figures 1 and 2).



*Fig. 1. Phytogeographical Regions of Turkey*



*Fig. 2. Location of the Study Area in the Grid System*

The study area is located on the skirts of Murat Mountain within the borders of Karaağaç village in Gediz district of Kütahya province. The area has an altitude varying between 1100m and 1600m. Karaağaç village is a settlement located in the entrance area of Murat Mountain from Gediz district, on the skirts of Murat Mountain. Murat Mountain, on the other hand, is in an important position in terms of biodiversity of our country, as it is the highest point of Kütahya and moreover, it is one of the areas with the highest endemism rate within the borders of Kütahya province. According to current literature information, Murat Mountain is the region with the highest number of endemic taxa in

Kütahya with 114 endemic species. According to the literature data, it is understood that there is no conservation work or any protected area around the study area [13-31].

The places where plant species are found more or less are called the distribution area of that species. These distribution areas show certain geographical features. Two factors that play a primary role in the separation of the flora realms; temperature and precipitation. According to these climatic characteristics, the world is divided into 6 large floristic realms. Our country is located in the Holarctic flora, which is the largest of these flora realms, and it is under the influence of 3 flora regions (Mediterranean, Euro-Siberian and Iran-Turanian) that are essentially under this flora realm. The vegetation type and flora elements of these regions are unique to them. However, especially at the borders of these regions, the vegetation can contain the elements of these regions in a mixed way, due to the transition effect [32-33].

The research area is located in the transitional part of the Mediterranean and Iran-Turanian phytogeographic regions. However, the region is generally very close to the borders of the Mediterranean and Euro-Siberian phytogeographic regions. Although Kütahya is within the borders of Iran-Turan plant geography, the taxon specific to the Mediterranean phytogeographic region is also over-represented; It can be explained by the fact that the mountains in the Aegean region extend perpendicular to the sea and the effect of the sea reaches the inner regions. In fact, the area within the project area can be considered as the intersection point of 3 phytogeographic regions. As it is known, especially at the border of phytogeographic regions, species diversity is higher due to the border effect. This border effect is evident in the region as well. However, the project site was not sufficiently affected by this situation due to the dominant uniform vegetation structure and soil characteristics. It has been observed that there are widespread plant taxa with wide ecological tolerance and low risk endemic taxa in the LC category according to IUCN criteria in the project area and its immediate surroundings. In the field studies carried out, it is seen that the dominant vegetation type of the region is forest vegetation consisting of coniferous trees. However, there is also the presence of a riparian vegetation formed by a seasonally flowing stream and several water currents in the area. Again, some riparian vegetation elements were determined by me around these streams and stream beds. In addition, riparian elements are found in and around small artificially created ponds. In addition, small vegetation formations of steppe character can be seen from place to place in forest clearings.

### ***Vegetation Types in and Around the Research Area***

As a result of the researches, it has been determined that Black Pine and Red Pine Forest Vegetation is dominant in the project area and its surroundings.

In the project area and its immediate surroundings;

1- Forest Vegetation

2- Step Vegetation (Forest Clearings)

3- It has been determined that there are 3 different vegetation types, namely Stream Vegetation (Riparian).

### ***Forest Vegetation***

Although forest vegetation is perceived in people's minds as the vegetation type formed by broad-leaved trees that are frequently encountered in the Euro-Siberian region, the coniferous forest vegetation formed by *Pinus nigra* and *P. brutia* trees, which have

adapted to the edaphic and climatic conditions in the Marmara region, is observed in the study area and its surroundings. In the forest areas of *P. nigra* and *P. brutia* study area and its immediate surroundings, the vegetation formed by these taxa is also the dominant vegetation. It is also observed in open areas in forest vegetation or in combination with plant taxa such as *Juniperus oxycedrus*, *J. foetidissima*, *Quercus cerris*, *Q. pubescens*, *Cistus laurifolius*, *Oysris alba*, *Populus alba* *Phillyrea latifolia*.

### **Step Vegetation**

The study area has adapted to the dry and hot periods, which are characteristic of the Euro-Siberian and Irano-Turanian phytogeographic regions. It includes steppe vegetation formed by these plant groups. In the forest clearings in the project area, vegetation type showing steppe character can be seen from place to place. *Anchusa azurea*, *Astragalus oxytropifolius*, *Astragalus angustifolius*, *Alyssum desertorum*, *Bellis perennis*, *Centaurea iberica*, *Centaurea urvillei*, *Cichorium intybus*, *Cota altissima*, *Crepis sancta*, *Crupina crupinasum desertorum*, *Filaurea iberica*, *Scabiosa columbaria subsp. columbaria*, *Muscari comosum*, *Silene italica*, *Silene conoidea*, *Alyssum desertorum*, *Alyssum sibiricum*, *Alyssum murale*, *Minuartia hamata*, *Verbascum georgicum*, *Verbascum lasianthum*, *Verbascum cheiranthifolium*, and *Xanthium spinosum* some of the plant taxa belonging to the steppe vegetation found in the research area and its surroundings.

### **Stream Vegetation (Riparian)**

This vegetation type, which is observed in moist areas and dry and wet stream beds in the project area and its immediate surroundings, shows natural distribution both in water beds and wet habitats. These hydrophyte, hygrophYTE and mesophyte species; They are generally found in 4 different ecological environments to spread in or near water beds. The creeks and creek beds, which are wet in spring and winter and dry in summer and autumn, are the places where this type of vegetation is seen, especially the Gerdimelik Stream in the project area. Some of the taxa found in the tree, bush and grass layer of these life forms are as follows; *Salix alba*, *Platanus orientalis*, *Rumex acetocella*, *Rumex crispus*, *Clematis cirrhosa*, *Phylleria latifolia*, *Tamarix parviflora*, *Agrimonia eupatoria*, *Rubus canescens*, *Rubus sanctus*, *Lycopus europaeus*, *Rosa canina*, *Lythrum salicaria*, *Epilobium palustre*, *Epilobium angustifolium*, *Bellis perennis*, *Geum urbanum*, *Chenopodium album*, *Ranunculus ficaria*, *Mentha longifolia*, *Trifolium arvense*, *Medicago lupulina*, *Hypericum perforatum*, *Althaea cannabina*, *Plantago major*, *Papaver rhoeas*, *Tripleurospermum tenuifolium*, *Echium vulgare*, *Carex divisia*, *Phragmites australis*, *Juncus inflexus*, *Juncus minutulus* ve *Veronica anagallis-aquatica*.

One of the most important factors on the species diversity of a region is the habitat diversity of the area. Because the diversity of habitat brings with it the diversity of species and ecosystems. As a result of the field studies carried out in the study area, it is seen that the evergreen coniferous forest formations dominate the region in general. When this type of forest formations are examined in terms of floristic structure, it is seen that there is a partial homogeneity in the distribution of plant taxa within the boundaries of the area. Considering that the study area has a uniform structure in terms of edaphic and topography, this situation is quite natural.

Moreover, this is also the case in the forest formations around the study area, and the region does not have a very high importance in terms of species, habitat and ecosystem diversity. Habitats with similar characteristics are encountered throughout our country,

within the boundaries of Kütahya province and in the immediate vicinity of the study area.



*Fig. 3. Rocky Formation in the Project Area*



*Fig. 4. Stream Vegetation in the Project Area*

*Table 1. Distribution of Collected Plants by Major Plant Groups*

	Family	Genus	Taxa
<b>Gymnospermae</b>	2	2	6
<b>Angiospermae</b>	<b>Dicotyledonae</b>	289	515
	<b>Monocotyledonae</b>	47	83
<b>Total</b>	<b>69</b>	<b>338</b>	<b>604</b>

*Table 2. Distribution of Plants by Phytogeographic Regions*

Phytogeographic Region	Number of Taxa	% Rate
Mediterranean	63	10,43
Iran-Turan	51	8,44
Europe-Siberian	43	7,12
Unknown	447	74,01
Total	604	100

## CONCLUSION

### Rare Endemic Plants Known to Exist on Murat Mountain (Kütahya)

Rare endemic plant taxa and their reported localities, which were reported in different localities in Murat Mountain in previous studies, but whose presence could not be determined in the field studies carried out within the scope of this project, within the project activity area and in the immediate surroundings that are likely to be affected during the mining activities planned to be carried out, are given below [1-31].

1- *Dianthus erinaceus* Boiss. there is. alpinus boiss. Kütahya; Murat Mountain. 1900 meters Category: VU

2- *Sedum hispanicum* L. var. planifolium Chamberlain Kütahya; Murat Mountain. 1900-2100 m over cut willow. Category: TR

3- *Alyssum davisianum* Dudley Kütahya; Murat Mountain. Between Kesiksöğüt and Hamam, 1400 m. Category: CR

4- *Crenosciadium siifolium* Boiss. & Held. Kütahya; Murat Mountain. Kesiksöğüt location, 1400 m. Category: TR

5- *Allium kurtzianum* [Ascherson & Sint. ex] Kollmann Kütahya: Murat Dagigi, Category: EN

6- *Allium flavum* L. subsp. I have flavum. minus Boiss. Kütahya; Murat Mountain. Aegean, Marmara regions. Category: VU

7- *Arum balansnum* R.Mill. Kütahya; Şaphane Mountain, above Ayvacık village, Satik Hill, 900-1050 m, Yellice Mountain 1300-1600 m. Aegean Region. Mediterranean Element. Category: VU

8- *Astragalus gaeobotrys* Boiss.et.Bal. Kütahya; Murat Mountain. Servant. Category: TR

9- *Bolanthus spergulifolius* (Jaub. & spach) Hub.-Purple. Kütahya; 5 km south of Tavşanlı, 800 m. Category: VU

10- *Centaurea amasiensis* Bornm Kütahya; Murat Mountain. Aegean region, Central Anatolia region and Mediterranean Category: LC

11- *Centaurea aphrodisea* Boiss. Kütahya; Murat Mountain. Aegean region. Mediterranean Element. Category: VU

12- *Centaurea drabifolia* subsp. *austro-occidentalis* Wagenitz Kütahya; Murat Dagi, Isparta, Denizli, Mugla, Antalya. Category: LR (lc)

13- *Crocus flavus* Weston subsp. *dissectus* T. Baytop & Methew Kütahya; Murat Mountain. 1200 m, Aegean region. Category: VU

14- *Iris purpleoractea* B. Mathew & T. Baytop Kütahya; Murat Mountain. Above Gürlek, Aktaş, 1600 m, Mount Simav Aegean region, Marmara region, Mediterranean region. Mediterranean Element. Category: LR (nt)

15- *Papaver strictum* Boiss. & Ball. Kütahya; Murat Mountain. 1400 m above Gediz bath, Okluk Mountain Ovacık Area 1050-1100 m, Eğrigöz Mountain Aegean region. Category: LR (nt)

16- *Prometheum muratdaghense* (Kit Tan) 't Hart Syn: *Rosularia muratdaghensis* Kit Tan Kütahya; Murat Mountain is 2100 m above Kesik Söğüt. Mediterranean Element. Category: TR

17- *Pyrus anatolica* Browicz Kütahya; Murat Mountain. Aegean region. Category: TR

18- *Rumex olympicus* Boiss. Kütahya; Murat Mountain. Bursa Uludag. Category: DD

19- *Saponaria pamphylica* Boiss. et Heldr. Kütahya; Murat Mountain. Konya, Nigde, Antalya. Category: LR (lc)

20- *Senecio cilicius* Boiss. Kütahya; Murat Mountain. Aegean region, Eastern Anatolia region. Ir.-Tur. Element. Category: LR (lc)

21- *Senecio olympicus* Boiss. Kütahya; Murat Mountain. Aegean region. Av.-Sib. Element. Category: LR (cd)

22- *Sideritis tmolea* P. H. Davis Kütahya; Murat Mountain., Okluk Mountain Peak 1340 m. Aegean region. Category: LR

23- *Stefanoffia macrocarpa* Freyn. & Sint. Kütahya; Murat Mountain. Aegean region, Black Sea region and Central Anatolia region. Category: -?

24- *Verbascum coronopifolium* (Boiss & Ball) O. Kuntze. Kütahya; Murat Mountain. Kesiksöğüt location 1800 m. Ir.-Tur.Element. Category: TR

25- *Verbascum phrygium* Boiss. Kütahya; Gümüş Mountain Radar location, 1800-1900 m. Aegean region, Central Anatolia region. Ir.-Tur. Element. Category: LR (cd)

26- *Zingeria verticillata* (Boiss. & Balansa) Chrtek Kütahya; Murat Mountain. Category: TR

According to the detailed literature surveys, 26 of the endemic taxa whose presence was reported in the whole of Murat Mountain could not be identified in the project activity area during the field studies carried out in the region within the scope of this project. As can be understood from the detailed localities reported for a significant part of the taxa in question, it is understood that there is a distance between the project activity area and the localities of the taxa, and that these taxa spread naturally outside the project area.

### **Rare Endemic Taxa in and Around the Project Area of Activity and IUCN Risk Categories**

According to both the literature data and the data obtained from field studies, the presence of 48 endemic and rare vascular plant taxa was determined in and around the project activity area. Of these taxa, 2 are in the NT (Near Treated-May be endangered in the near future) category, and 46 of them are in the LC (Low Concern-Low Risk) category.

#### **Taxa in NT (Near Treated-May be Endangered in the Near Future) Category:**

*Verbascum stenostachium*

*Cyclamen cilicium* var. *cilicium*

#### **Taxa in LC (Low Concern- Low Risk) Category:**

*Allium huber-morathii*

*Allium sibthorpiatum*

*Bifora radians*

*Eryngium bithynicum*



*Ferulago macrosciadia*  
*Hyacinthella lineata*  
*Centaurea iberica*  
*Centaurea olympica*  
*Cirsium leucopsis*  
*Jurinea pontica*  
*Ptilostemon afer*  
*Senecio castagneanus*  
*Taraxacum farinosum*  
*Taraxacum minium*  
*Nonea caspida*  
*Onosma isaurica*  
*Alyssum huetii*  
*Erysimum kotschyanum*  
*Hesperis kotschy*  
*Campanula lyrata*  
*Scabiosa reuteriana*  
*Valerianella glomerata*  
*Bolanthus spergulifolius*  
*Dianthus leucophaeus*  
*Prometheum chrysanthum* subsp. *chrysanthum*  
*Carex cilicica*  
*Euphorbia anacampseros*  
*Astragalus condensatus*  
*Astragalus sibthorpianus*  
*Colutea melanocalyx* subsp. *davisian*  
*Trifolium caudatum*  
*Trifolium elongatum*  
*Hypericum adenotrichum*  
*Hypericum aviculariifolium*  
*Iris kerneriana*  
*Juncus sparganiifolius*  
*Origanum sipyleum*  
*Phlomis armeniaca*  
*Salvia dichroantha*  
*Scutellaria albida* subsp. *albida*  
*Linum corymbulosum*  
*Chaenorhinum litorale*  
*Linaria corifolia*  
*Consolida raveyi*  
*Delphinium venulosum*  
*Asperula lilaciflora* subsp. *phrygia*

The most important step in the determination of susceptible plant taxa in a region is to determine the flora of that region. When the region where the study area is located is evaluated from this point of view, it is located in an area with a very low endemism rate compared to other parts of our country. The floristic data obtained as a result of the studies carried out confirm this situation. Almost all of the plant taxa determined from the area

are plant taxa that have a wide distribution area within the borders of our country and are not endangered. In addition, none of these taxa are included in the BERN or CITES contract annexes. All of the endemic plants determined to be distributed in and around the project activity area are classified according to IUCN categories, 2 of these plants are in the NT category and 46 are in the LC category. It is understood that the endemic rate of the project activity area and its immediate surroundings is approximately 7.95%. It is understood that more than half of the listed endemic taxa are outside or on the border of the project activity area. *Verbascum stenostachyum* and *Cyclamen cilicium* were detected in the project area. *cilicium* taxa are in the category of NT (may be endangered in the near future) according to IUCN criteria [32,33].

I believe that this study will contribute to the recognition and protection of the biological diversity of the research area.

## REFERENCES

- [1] Anonim (2015). Biyolojik Çeşitliliği İzleme ve Değerlendirme Raporu, Orman ve Su İşleri Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, 2013-2014 Raporu, Ankara
- [2] Davis PH (1964-1988). Flora of Turkey and Aegean Islands, Vol. 1-10, Edinburgh University Press, Edinburgh, UK.
- [3] Güner, A., Özhatay, N., Ekim, T. and Başer, K. H. C., (2000) Flora of Turkey and the East Aegean Island (Supplement 2) Vol. 11. Edinburgh Univ. Press, Edinburgh.
- [4] Vural M, Ekim T, İlarslan R, Malyer H (1985) Afyon Başkomutan Tarihi Milli Parkı Vegetasyonu Doğa Bilim Dergisi, A2, 9(2): 363-387.
- [5] Yayıntaş A (1985). Simav Dağı Florası, Doğa Bilim Dergisi 9. 2, 388-418.
- [6] Yiğit, N., Çolak, E., Ketenoğlu, O, Kurt, L., Sözen, M., Hamzaoğlu, E., Karataş, A., Özkurt, Ş., (2002) ÇED, Ankara.
- [7] WWF (2008) Türkiye (Doğal Hayatı Koruma Vakfı) Türkiye'deki Ramsar alanları değerlendirme raporu.
- [8] Türkiye'nin Önemli Doğa Alanları Kitabı, <https://www.dogadernegi.org/wp-content/uploads/2018/11/ege029-murat-dagi-onemli-doga-alanlari-kitabi.pdf>
- [9] Keser N. (2013) Murat Dağı'nda Endemizme Etki Eden Topografik Faktörler (İç Batı Anadolu), Turkish Studies-International Periodical For The Languages, Literature and History of Turkish or Turki Volume 8/12 Fall 2013, p. 711-736, Ankara-Turkey.
- [10] Ekim T, Koyuncu M, Duman H, Aytaç Z, Adıgüzel N (2000) Türkiye Bitkileri Kırmızı Kitabı, Türkiye Tabiatını Koruma Derneği Yayını, Yayın No: 18, Ankara
- [11] Akman, Y. (1995) Türkiye Orman Vegetasyonu, Ankara
- [12] Anonim (1999) Türkiye'nin Çevre Sorunları, Türkiye Çevre Vakfı Yayını, Yayın No: 131, Ankara.
- [13] Çırpıcı A (1988) Murat Dağı (Kütahya-Uşak)'nın Florası, Doğa Türk Botanik Dergisi 13, 2, 157-222.
- [14] Görk G (1982) Eğrigöz Dağı (Emet) Flora ve Vegetasyonu, E.Ü. Fen fak. Doktora Tezi, 119 s. İzmir
- [15] Hamzaoğlu E, Koç M, Aksoy A (2014) A new pricking Carnation (Caryophyllaceae) grows on tuff from Turkey: *Dianthus aculeatus* sp. nov. Biological Diversity and Conservation, 7/2 159-162.
- [16] Koçan N. (2011) Murat Dağı'nın Ekoturizm Potansiyelinin Belirlenmesi, Iğdır Univ. J. Inst. Sci. & Tech. 1(3): 69-75.
- [17] Madenci, H., (2004) Elmalı Dağı (Kütahya) Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 80 s.
- [18] Memiş, R., (1999) Budağan dağı (Kütahya) florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 103 s.

- [19] Tel A Z (1995) Şaphane Dağı (Kütahya) Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 119 s.
- [20] Tel A Z (2011) Şaphane Dağı (Kütahya/Türkiye) Flora ve Genel Vejetasyon Yapısına Katkıları. *Biyoloji Bilimleri Araştırma Dergisi* 4 (2):63-72.
- [21] Tel, A. Z., (2012). Bazı endemik bitkilerin Kütahya'daki (Türkiye) yayılış alanları ve yeni IUCN tehlike kategorilerine göre yeniden değerlendirilmesi. *Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi*, 13(1):88-108.
- [22] Yakut E (1995). Okluk Dağı Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi.
- [23] Kaya A, Saltan Nagehan (2020) Morpho-Anatomical And Palynological Studies On Endemic *Crenosciadium sınıfolium* Boiss. & Heldr. From Turkey, *Eskişehir Teknik Üniversitesi Bilim ve Teknoloji Dergisi C- Yaşam Bilimleri ve Biyoteknoloji*, 9(1), pp. 35-45.
- [24] Sağıroğlu M, Aslan S, Vural M, Yılcı M S (2019) Nadir Endemik Bir Tür Üzerine Notlar: *Rhaponticoides pythiae* (Azn. & Bornm.) M.V.Agab. & Greuter/Yitiktülüşah, *Bağbahçe Bilim Dergisi*, 6(2): 37-41.
- [25] Güler B, Kesim İ, Uğurlu E. (2013) Flora of Dervişli (Eşme, Uşak/Turkey) and its surroundings, *Biological Diversity and Conservation*, 6/1 169-177.
- [26] Akçiçek E (2002) Demirlik ve Kulaksız dağları (Kütahya) florası. *OT Sistemik Botanik Dergisi*, 9, 2, 19-46.
- [27] Erdem, M., Cin Dağı (Kütahya)'nın Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 89 s., 2004.
- [28] Emre, S., Dumlupınar Üniversitesi merkez kampüsü (Kütahya) florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 61 s., 2001.
- [29] Erzincanlıoğlu, A., Porsuk Vadisi (Kütahya) Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi, 94 s., 2001.
- [30] Akan H (1995). Gümüş ve Yellice Dağları (Kütahya) Florası, Dumlupınar Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans tezi.
- [31] Akan H (1998) Gümüş ve Yellice Dağları bitkilerinin tehlike sınıflarında yapılan bazı değişiklikler, II. Kızılırmak Uluslararası Fen Bilimleri Kongresi (20-22 Mayıs), Kırıkkale Üniversitesi, Fen Edebiyat Fakültesi, *Biyoloji Bildiri Kitabı* 270-272.
- [32] <https://www.bizimbitkiler.org.tr/list.html>
- [33] IUCN (2001). IUCN Red List Categories, Verison 3.1., IUCN Species Survival Commision, Gland, Switzerland and Cambridge, UK.