

## THREAT CATEGORIES OF ENDEMIC PLANTS OF SAKARAT MOUNTAIN (AMASYA/TURKEY)

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**ABSTRACT.** This study aims to determine the threat categories of endemic plants in the vegetation of Sakarat Mountain (Amasya) on the basis of the vegetation field survey in 2004 and 2005 years. Plant samples were collected in their vegetation seasons. According to results, 78 families, 283 genera and 494 taxa are identified. As a result of field surveys, six different vegetation types forest (deciduous, mixed coniferous and deciduous), subalpine, steppe, rocky, wet grassland and segetal were determined. 40 plant taxa (8.09% of all taxa) were confirmed as endemic. The families with the highest rate of endemic taxa are Fabaceae (15%) and Lamiaceae (15%). Phytogeographic regions (Chorotypes) among endemic taxa were listed as Irano-Turanian 13 (32.5%), Euro-Siberian 9 (22.5%), Mediterranean 1 (2.5%), while phytogeographic origin of (17 taxa) 42.5% of endemic taxa were Unknown. The threat categories regarding the endemic species were determined and analysed according to “Red Data Book of Turkish Plants” adopted 2001 IUCN criteria. In the evaluation phase of the endemic taxa and their threat categories, it was found that 1 species (2.5%) is in Endangered, 3 species (7.5%) in Near Threatened and 36 species (90%) in Least Concern according to the criteria of 2001 IUCN. When the life forms of plant taxa were analysed, it was determined that Hemicryptophytes have the most number of plant taxa with 82.5%, Therophytes and Geophytes have the less than others 2.5%.

### 1. INTRODUCTION

Turkey is a floristically rich and interesting country. It has over 12000 taxa of plants, of which around 3800 being endemics [1, 2]. Almost all plants are grown in Turkey is under negative pressure and are faced with various challenges in maintaining its generation. As long as the pressures continue, the plant faces the risk of extinction.

Due to presence of the risk factors threatening the plant species in Turkey, monitoring and finding solutions to determined problems of plants have become a necessity. Accordingly, “International Union for Conservation of Nature and Natural Resources” [1] was established to determine threat categories of endangered plants. Based on these criteria, “List of Rare,

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Threatened and Endemic Plants in Turkey” was prepared [3] and updated according to “IUCN Red List Categories” version 2.3 [4] in 2000 [5].

Sakarat Mountain, located Northeast of Central Anatolia and southeast of Amasya province, is in the transitional zone of Central and Northern Anatolia. It is also between Irano-Turanian and Euro-Siberian phytogeographical regions. The study area, located between 40°-39° latitudes and 35°-50° longitudes, is at the A6 square according to Davis’s grid system. The areas between 500 m and 1956 m has a wide variety of habitats [6, 7] (Figure 1).

The data of the meteorological stations of Amasya, Tasova and Turhal (Tokat) in the work area [8] were analysed and summarized according to the method proposed by Akman and Daget [9]. The findings indicated that the region is under the influence of the Mediterranean climate [10-12]. The meteorological stations in the research area show the SWAS (Spring, Winter, Autumn, Summer) type of precipitation regime. This type of regime; The Eastern Mediterranean is characterized by the second type of precipitation regime. In addition, the least rainfall in the field of research in the Summer and Autumn seasons and all the stations in the upper cold Mediterranean climate is a common feature of the stations are seen.

In all of the Meteorology Stations, a minimum summer rainfall and a significant summer drought indicate that the region is under the influence of the Mediterranean climate.

January is the coldest month in the research area. Frost certainly occurs in Turhal in December, January and February, and in Amasya in January and February. Besides, frost is probable in Amasya in March, April, May, October, November and December, and in Tasova in November, December, January, February, March and April, and in Turhal in March, April, May, October and November. In addition, the presence of *Pinus sylvestris* forests, which are resistant to cold in these climatic conditions, is in full agreement with the climate. The vegetation in the research area shows an appropriate distribution for these climate types. The oak forests (especially *Quercus pubescens*) in the region indicate that the area is in the transition zone between Central Anatolia and Blacksea Region. Further, xerophil steppe formations are widespread in the western and southwestern parts of the region. There is a summer drought lasting for 4 or 5 months in the region. Similar studies by different researchers in different parts of Turkey were made [13-26].

In this study threat categories which apply to endemic plant species found in Sakarat Mountain (Amasya, Turkey) were determined and their assessments were made.

## 2. MATERIAL AND METHODS

The plant samples were collected at the different seasons of the years 2004 and 2005. The collected samples were deposited and saved in Herbarium of Biology Department, Faculty of Science, Ankara University (ANK). Identifications of the specimens were done according to flora studies [27-32].

The order of endemic taxa in Tables was given according to phylogenetical system used in Flora of Turkey. The books “2001 IUCN Red List Categories: version 3.1” [33, 34] and “Red Data Book of Turkish Plants” prepared by Ekim et al. [5] were utilized in determination of threat categories. In this study, in addition to the threat categories, phytogeographical regions/elements (chorotypes) [35, 36] and life forms [37] of the endemic plant taxa were also given.

### 3. RESULTS

In the result of study, totally 40 endemic taxa at the level of species, subspecies and variety, belonging to 16 families, were determined on the Sakarat Mountain. The number of endemic taxa in the families and their percentages were given in descending order in Table 1. The distribution of endemic taxa according to phytogeographic regions and their percentages were presented in Table 2, and a phylogenetic list of the endemic taxa distributing on Sakarat Mountain, threat categories, life forms and phytogeographical regions were given in Table 3. Also, the distributions of life forms of the taxa were shown in Table 4.

TABLE 1. The distribution of endemic plant taxa into families.

	Families	Number of Endemic Taxa	Percentage (%)
1	FABACEAE	6	15
2	LAMIACEAE	6	15
3	ASTERACEAE	4	10
4	BORAGINACEAE	4	10
5	PLANTAGINACEAE	4	10
6	CAMPANULACEAE	3	7.5
7	ROSACEAE	3	7.5
8	SCROPHULARIACEAE	2	5
9	BRASSICACEAE	1	2.5
10	CAPRIFOLIACEAE	1	2.5
11	CARYOPHYLLACEAE	1	2.5
12	CONVOLVULACEAE	1	2.5

13	FAGACEAE	1	2.5
14	GERANIACEAE	1	2.5
15	AMARYLLIDACEAE	1	2.5
16	IRIDACEAE	1	2.5
	Total	40	100

TABLE 2. The distribution of endemic plant taxa according to phytogeographical regions/elements (chorotypes) [35, 36].

	Phytogeographical Regions	Number of Endemic Taxa	Percentage (%)
1	Irano-Turanian (IT)	13	32.5
2	Euro-Siberian (ES)	9	22.5
3	Mediterranean (M)	1	2.5
4	Unknown (U)	17	42.5
	Total	40	100

TABLE 3. Threat categories, phytogeographical regions/elements (chorotypes) and life forms of endemic plant taxa [33, 34].

	Families	Endemic Taxon	Chorotype	Life Form	Threat Category
1	BRASSICACEAE	<i>Draba rigida</i> Willd. var. <i>rigida</i>	U	H	LC

2	CARYOPHYLLACEAE	<i>Arenaria ledebouriana</i> Fenzl var. <i>ledebouriana</i>	U	Th	LC
3	GERANIACEAE	<i>Geranium cinereum</i> Cav. subsp. <i>subcaulescens</i> (L'Hérit. ex DC.) Hayek var. <i>subacutum</i> (Boiss.) Davis & Roberts	IT	H	LC
4	FABACEAE	<i>Astragalus densifolius</i> Lam. subsp. <i>amasiensis</i> (Freyn) Aytaç & Ekim	IT	H	LC
5	FABACEAE	<i>Astragalus campylosema</i> Boiss. Subsp. <i>campylosema</i>	IT	H	LC
6	FABACEAE	<i>Lathyrus tukhtensis</i> Czecz.	U	H	LC
7	FABACEAE	<i>Trifolium pannonicum</i> Jacq. subsp. <i>elongatum</i> (Willd.) Zoh.	U	H	LC
8	FABACEAE	<i>Onobrychis bornmuelleri</i> Freyn	U	H	EN
9	FABACEAE	<i>Ebenus laguroides</i> Boiss. var. <i>laguroides</i>	IT	H	LC
10	ROSACEAE	<i>Potentilla cappadocica</i> Boiss.	ES	H	NT
11	ROSACEAE	<i>Alchemilla holocycla</i> Rothm.	IT	H	LC
12	ROSACEAE	<i>Crataegus tanacetifolia</i> (Lam.) Pers.	U	Ph	LC
13	CAPRIFOLIACEAE	<i>Lonicera caucasica</i> Pallas subsp. <i>orientalis</i> (Lam.) Chamb. & Long	U	Ph	LC
14	ASTERACEAE	<i>Helichrysum arenarium</i> (L.) Moench subsp. <i>aucheri</i> (Boiss.) Davis & Kupicha	IT	H	LC
15	ASTERACEAE	<i>Cirsium pseudopersonata</i> Boiss. & Bal. subsp. <i>pseudopersonata</i>	ES	H	LC
16	ASTERACEAE	<i>Jurinea pontica</i> Hausskn. & Freyn ex Hausskn.	IT	H	LC

17	ASTERACEAE	<i>Scorzonera eriophora</i> DC.	U	H	LC
18	CAMPANULACEAE	<i>Campanula lyrata</i> Lam. subsp. <i>lyrata</i>	U	H	LC
19	CAMPANULACEAE	<i>Campanula latiloba</i> A.DC. subsp. <i>latiloba</i>	ES	H	LC
20	CAMPANULACEAE	<i>Asyneuma limonifolium</i> (L.) Janchen subsp. <i>pestalozzae</i> (Boiss.) Damboldt	U	H	LC
21	CONVOLVULACEAE	<i>Convolvulus assyricus</i> Griseb.	IT	Ch	LC
22	BORAGINACEAE	<i>Onosma armenum</i> DC.	U	H	LC
23	BORAGINACEAE	<i>Symphytum bornmuelleri</i> Bucknall.	ES	H	LC
24	BORAGINACEAE	<i>Cynoglossis chetikiana</i> Vural & Kit Tan subsp. <i>paphlagonica</i> (Hauskn. ex Bornm.) Vural & Kit Tan	U	H	LC
25	BORAGINACEAE	<i>Anchusa leptophylla</i> subsp. <i>incana</i> Roemer & Schultes (Ledeb.) Chamb.	IT	H	LC
26	SCROPHULARIACEAE	<i>Verbascum ponticum</i> (Boiss.) O. Kuntze	ES	H	LC
27	SCROPHULARIACEAE	<i>Verbascum abieticum</i> Bornm.	ES	H	LC
28	LAMIACEAE	<i>Scutellaria salviifolia</i> Bentham	U	H	LC
29	LAMIACEAE	<i>Phlomis russeliana</i> (Sims) Bentham	ES	H	LC
30	LAMIACEAE	<i>Phlomis armeniaca</i> Willd.	IT	H	LC
31	LAMIACEAE	<i>Sideritis dichotoma</i> Huter	U	H	LC
32	LAMIACEAE	<i>Sideritis amasiaca</i> Bornm.	U	H	NT
33	LAMIACEAE	<i>Sideritis germanicopolitana</i> Bornm. subsp. <i>germanicopolitana</i>	U	H	LC
34	PLANTAGINACEAE	<i>Chaenorhinum litorale</i> (Bernh.) Fritch subsp. <i>pterosporum</i> (Fisch. & Mey.) Davis	M	Th	LC
35	PLANTAGINACEAE	<i>Linaria corifolia</i> Desf.	IT	H	LC

36	PLANTAGINACEAE	<i>Digitalis lamarckii</i> Ivan.	IT	H	LC
37	PLANTAGINACEAE	<i>Veronica multifida</i> L.	IT	H	LC
38	FAGACEAE	<i>Quercus macranthera</i> Fisch. et Mey. Ex Hohen. subsp. <i>syspirensis</i> (C. Koch) Menitsky	U	Ph	LC
39	AMARYLLIDACEAE	<i>Allium olympicum</i> Boiss.	ES	G	LC
40	IRIDACEAE	<i>Crocus speciosus</i> Bieb. subsp. <i>ilgazensis</i> Mathew	ES	G	NT

TABLE 4. The distribution of endemic plant taxa according to life form [37].

	Life Forms	Number of Endemic Taxa	Percentage (%)
1	Hemicryptophyte (H)	32	80
2	Phanerophyte (Ph)	3	7.5
3	Geophyte (G)	2	5
4	Therophyte (Th)	2	5
5	Chamaephyte (Ch)	1	2.5
	Total	40	100

#### 4. DISCUSSION AND CONCLUSION

There are 6 different vegetation types in Sakarat Mountain: Forest (deciduous, mixed coniferous and deciduous forest), subalpine, steppe, rocky, wet grassland and segetal vegetation. As a result of the evaluation of the samples collected from all of these vegetations, 283 genera and 494 taxa belonging to 78 families were determined. 40 of 494 taxa are endemic, and the rate of endemism is 8.09%. The number and percentage of endemic taxa according to risk categories were given in Table 5.

TABLE 5. Number of endemic plant taxa determined in Sakarat Mountain and their threat categories.

	Threat Categories	Number of Endemic Taxa	Percentage (%)
1	Endangered (EN)	1	2.5
2	Near Threatened (NT)	3	7.5
3	Least Concern (LC)	36	90
	Total	40	100

The highest number of the endemic species was seen in Fabaceae (15%) and Lamiaceae (15%) families. When the phytogeographical distributions of the endemic taxa were examined, it was seen that Irano-Turanian elements have a rate of 32.5%, European-Siberian elements have a rate of 22.5%, Mediterranean elements have a rate of 2.5% and endemics with no phytogeographical regions have a rate of 42.5% (Table 2).

Also, the plant taxa were classified and analysed according to Raunkiaer's life forms [37]. It was shown that Hemicryptophytes are the most common (80%), and it is followed by Phanerophytes (7.5%), Geophytes (5%) and Therophytes (5%). Chamaephytes have the least number with 1 species (2.5%) (Table 4). The analysis of threat categories showed that 1 taxon (2.5%) was in Endangered, 3 taxa (7.5%) were in Near Threatened according to 2001 IUCN criteria while remaining 36 taxa (90%) were found to qualify for Least Concern category (Table 5).

We hope that the present study will contribute to future researches on rare and endemic plants of Turkey.

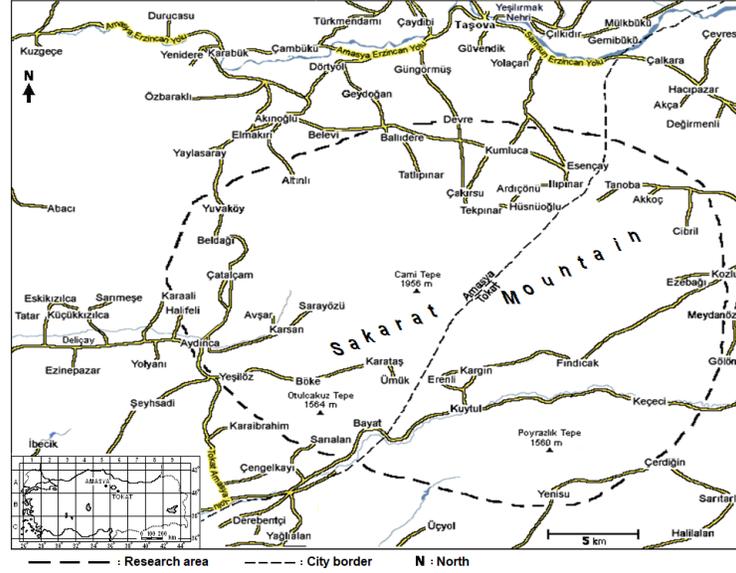


FIGURE 1. Map of the study area [6, 7, 26].

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