Plant species microendemism, rarity and conservation of pseudo-alpine zone of Kazdağ (Mt. Ida) national park - Turkey

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Abstract

Kazdag (Mt. Ida) forms a natural border between the Provinces of Canakkale and Balikesir in the north-western part of Turkey. It was declared as National Park in 1993 because of its rich plant cover, a restricted zone of Abies nordmanniana ssp. equi-trojanii forest, natural beauty and mythology. The pseudo-alpine zone consists of 189 specific and infraspecific taxa of vascular plants. A total of 55 endemic taxa (29.10%) were recorded from this area. Out of these 22 (40%) taxa are restricted only to this area, and 5 taxa are non-endemic but rare in Turkey. In this paper, habitat characteristics, conservation strategies and management of these taxa are given. Our investigations revealed that, out of 55 taxa, 12 are critically endangered (CR), 10 endangered (EN), 11 vulnerable (VU), 9 not threatened (NT) and 18 with lower risk (LC). Although Hieracium idae, Dianthus arpadianus var. trojanus, Minuartia garckeana and Paronychia sintenisii are recorded as data deficient (DD) category in IUCN criteria, these taxa are transferred to CR category.

1. Introduction

All floristic studies undertaken in Turkey depict that biodiversity hotspots are of global priority for conservation due to their species richness and ratio of endemism. WWF has published the report which includes 122 important plant areas (OBA) whereas nature association (DD) has identified 305 key biodiversity areas (KB) on the basis of endemism in Turkey [6, 37] Kazdağ (Mt. Ida) situated in north-west Anatolian part of Turkey is one among these important nature areas. It lies between 39° 42’ N latitudes and 26° 51’ E longitudes. The highest peaks are Karatas hill (1774 m), Cilbak (1765 m) and Sarikiz (1720 m) [49] (Fig.1). The mountain forms a natural border between the Marmara and Aegean Regions, but phytogeographically it occupies the transition zone between Euro-Siberian and Mediterranean, with Irano-Turanian impacts in some areas. The summit of this mountain is called Karatas peak, which experiences a Mediterranean climate with an average temperature of 14.88 °C, the highest average temperature
being 30.9 °C and the lowest -6.7 °C, and annual precipitation is 1500 mm m⁻² [33]. The precipitation regime is
typical Mediterranean type with rainy winters. The aridity period is between June and September.

![Map showing the location of Kazdağ]. Kazdağ is a doubly plunging, NE-SW trending
anticlinorium as a geological and geomorphological
entity. Geologically it is composed of mainly high
degree metamorphosed basement and sedimentary
cover rocks. The metamorphic basement rocks are
represented by gneiss, amphibolites, schist, marble,
metaophiolite, migmaitite and metagranites. The
metamorphic rocks here are in the tectonic contact
with Permian to Miocene sedimentary rocks and are
intruded by the Oligo-Miocene granitoids. Pliocene
and younger sedimentary rocks cover all these units
with an unconformity. The mountain has attained its
present morphology after Miocene time, which got uplifted as metamorphic core complex by detachment faults (Fig.
2) [30].

The summit is windswept and bare with a relatively low tree-line due to exposure, but the slopes are at the edge of
mild Mediterranean and colder continental climate zones, which hold a wealth of endemic flora, marooned here after
the Ice Age. The climate at lower altitudes is hot and dry in the deforested landscape. The forests on the upper slopes
consist mainly of Turkish Fir (Abies nordmanniana ssp. equi-trojani), which is mentioned as a distinct species Abies
equi-trojani by some workers. The wood used for making Trojan horse is said to have been cut from these firs, but
real evidence is lacking [49]. The presence of these unique fir forests has been the main reason for the declaration of
south side of Kazdağ as a national park in 1993 [32]. From 1998 onwards much work has been done in the area. One
of these studies is related to the project entitled “In Situ Conservation of Genetic Diversity in Turkey and in situ
Gene Management Zones (GMZS)” supported by World Bank Global Environment Facility (GEF) [52].

The mountain is floristically included in the grid-square B1 [10]. Many investigators starting from the year 1779
have collected plants from this area [13]. The ecology and vegetation of the area too has attracted the attention of
many workers [1,2,3,7, 14,15,16,17, 18, 23,24,31,35,36,48,51,54,55,57,59,60].

2. Ethnology of Kazdağ

There are actually two mountains with the same name in the Mediterranean, first one on the Island of Crete
(Greece) known as “Mount Ida” the legendary birthplace of the king of the ancient gods and sacred to the goddess
Rhea, with a cave in which Zeus was reared. The second one is Kazdağ (Mount Ida-Mount of Goddess) the
mountain, in the environs of ancient TROY-northwest Anatolia and both are recorded as sacred. The mountain is
known as one of the oldest settlements from antique period, a cradle of rich and poetic myths, with 1001 springs
amidst the lush green plant cover. Famous legendary person Paris was brought up here, fell in love with the nym
Oione here. First beauty competition in the world was held here and Aphrodite was declared as the most beautiful
woman. Mythologically after the decision of Zeus three goddesses Hera, Athena and Aphrodite were led by Hermes
to Mount Ida (near Troy) in order to be judged by Paris. It is the place where the marriage ceremony of beautiful sea
mermaid Thetis and Peleus took place and here Aphrodite won the apple of Eris, Paris the hand of Helen and
World the Trojan Wa r [9].

The mountain in Turkey was inhabited by nomadic Turkmen and Yoruk tribes who immigrated to Anatolia after
1071. The Turkmen tribes also consider it as a sacred mountain. Some stories are narrated regarding the Turkmen
shepherd Baba Cilbak, his daughter Sarikiz (Golden Maiden) and the goose, who were living in the village of Gure
near Edremit. The summit Sarikiz Peak is named after the daughter and the place where her father died is called Baba
Dagi. Every year in the third week of August a special ceremony is organized here by the nomadic Turkmen tribes.
The visitors come to the open tomb, light candles, write in the tomb’s notebook or collect small wish stones around
the tomb [8].
3. Methods

The pseudo-alpine zone was visited on seasonal basis between 2003-2009 and specimens were collected. These were dried and are deposited at the Canakkale Onsekiz Mart University Herbarium of Biology Department. The specimens were identified with the help of Flora of Turkey and the East Aegean Islands [11,12] and Flora Europaea [53]. For re-evaluation of threat status of taxa ecological and geographical data was collected and compared with the Red List criteria [20, 28]. The author abbreviations were scanned in the International Plant Names Index (http://www.ipni.org) and Authors of Plant Names [5].

4. Results

Phytogeographically Turkey occupies an important position in the world from the viewpoint of plant genetic resources and genetic diversity. It is a meeting place for the two Centres of Diversity and Origin; the Near East and the Mediterranean which overlap here. This location together with a great variety of geomorphologic, topographical and climatic features is responsible for its large diversity of habitats and richness of plants vis-à-vis their endemism. The number of taxa lies around 8745, with 3300 endemics [19,40,41]. Very recently about 1.000 new taxa have been listed by Guner et al. [27]. According to the “In-Situ Protection of Genetic Resources Project” which aims at the protection of wild relatives of cultivated plants as important sources from the point of view of global dimension the forest areas have received a special attention. One of these areas is Kazdağ due to its rich plant diversity and endemism [56]. This mountain is the gene centre of West Anatolian region. The endemic and rare taxa have been preserved on different geological massifs and especially in the pseudo alpine zone. Our observations and the papers published on this mountain reveal that nearly 800 vascular plant taxa belonging to 101 families show distribution on this mountain. The high mountain vegetation comprises of four plant communities depending on rock types. The pseudo-alpine zone of this mountain is a composite of high-altitude enclaves.
In all 189 specific and infraspecific taxa of vascular plants belonging to 132 genera and 52 families were collected from the pseudo-alpine zone. The number of endemics in this zone is 55 with a ratio of 29.10 percent and 22 of these (40 %) are completely restricted to this area. Our plant collection trips in the area since 1988 revealed that these taxa are spread over different habitats like rocky slopes, calcareous grassland, sub-alpine grassland, calcareous peaks, calcareous slopes, calcareous rocks, mountain rocks, mountain grassland, mountain step, mountain slopes, moss covered areas, forest clearings, alpine grasslands, gravels, rocky scrubs, under forest, coppices, watersides, siliceous rocks, rocky grassland, pastures, scrubby slopes, and siliceous slopes. A major number of taxa is found on schist and calcareous rocks covered by non-calcareous brown forest soil [31]. Although ratio of endemism is found on schist and calcareous rocks covered by non-calcareous brown forest soil [31]. Although ratio of endemism is lower than general flora of Turkey (34%), it is higher than overall floral endemism in West Anatolia. The red list categories of the endemic and non-endemic rare species according to IUCN [28] are given in table 1. The table shows that out of 55 taxa 12 are critically endangered (CR), 10 endangered (EN), 11 vulnerable (VU), 9 not threatened (NT) and 18 with lower risk (LC). Although Hieracium idae, Dianthus arpadianus var. trojanus, Minuartia garckeana and Paronychia sintenisii are recorded as data deficient (DD) category in IUCN criteria, these taxa are transferred to CR category (Table 2).
Table 1. Endemic and rare plant list pseudo-alpine zone in Kazdağı Mountain (asterisk (*) is given as non-endemic but rare taxa)

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Family</th>
<th>Pattern</th>
<th>IUC</th>
<th>Habitat and substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abies nordmanniana (Stev.) Spach subsp. equi-trojani</td>
<td>Pinaceae</td>
<td>Tree</td>
<td>NT</td>
<td>Forest</td>
</tr>
<tr>
<td>Acer hyrcanum Fisch. &amp; Mey. subsp. keckianum (Pax.)</td>
<td>Aceraceae</td>
<td>Tree</td>
<td>NT</td>
<td>Coppices</td>
</tr>
<tr>
<td>Achillea fraasii Sch.Bip. var. trojana Heimerl</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Achillea nobilis L. subsp. sipylea (O.Schwarz) Bässler</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>NT</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Alchemilla hirsutiflora (Buser) Rothm.</td>
<td>Rosaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Forest and waterside</td>
</tr>
<tr>
<td>Allium kurzianum Asch. &amp; Sint. ex Kollmann</td>
<td>Alliaceae</td>
<td>Bulbous</td>
<td>EN</td>
<td>Mountain slopes</td>
</tr>
<tr>
<td>Allium phrygium Boiss.</td>
<td>Alliaceae</td>
<td>Bulbous</td>
<td>LC</td>
<td>Mountain steppe</td>
</tr>
<tr>
<td>Allium sibthorpium Schult.f.</td>
<td>Alliaceae</td>
<td>Bulbous</td>
<td>LC</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Armeria trojana Bokhari &amp; Quêzel</td>
<td>Plumbaginaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Siliceous rocks</td>
</tr>
<tr>
<td>Asperula sintenisii Asch. ex Bornm.</td>
<td>Rubiaceae</td>
<td>Sub-scrub</td>
<td>EN</td>
<td>Siliceous rocks</td>
</tr>
<tr>
<td>Astragalus heldreichii Boiss.</td>
<td>Fabaceae</td>
<td>Scrub</td>
<td>VU</td>
<td>Rocky grassland</td>
</tr>
<tr>
<td>Astragalus idae Sirjaev</td>
<td>Fabaceae</td>
<td>Scrub</td>
<td>VU</td>
<td>Alpine grassland, rocks</td>
</tr>
<tr>
<td>Asyneuma rigidum (Willd.) Grossh. subsp.</td>
<td>Campanulaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Rocky slopes, pastures</td>
</tr>
<tr>
<td>Asyneuma virgatum (Labill.) Bornm. subsp.</td>
<td>Campanulaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Rocks</td>
</tr>
<tr>
<td>Bromus sipyleus Boiss.</td>
<td>Poaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Scrubby slopes</td>
</tr>
<tr>
<td>Carduus nutans L. subsp. falcato-incurus P.H.Davis</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>NT</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Carduus nutans L. subsp. troj anus P.H.Davis</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>NT</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Carex distachya Desf. subsp. phyllostachioidea</td>
<td>Cyperaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Pastures</td>
</tr>
<tr>
<td>*Centaurea athoa DC.</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Siliceous slopes</td>
</tr>
<tr>
<td>Centaurea odyssei Wagenitz</td>
<td>Asteraceae</td>
<td>Scrub</td>
<td>CR</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Cirsium steirolepis Petrak</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Mountain forest</td>
</tr>
<tr>
<td>Crocus gargaricus Herb. subsp. gargaricus</td>
<td>Iridaceae</td>
<td>Bulbous</td>
<td>NT</td>
<td>Grassland, forest</td>
</tr>
<tr>
<td>Dianthus anatolicus Boiss.</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Rocky slopes and pastures</td>
</tr>
<tr>
<td>Dianthus arpadanus Ade &amp; Bornm. var. troj anus</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>*Dianthus erineaus Boiss. var. alpinus Boiss.</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>*Doronicum austriacum Jacq.</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Rocky grassland</td>
</tr>
<tr>
<td>Euphorbia anacampseros Boiss. var. anacampseros</td>
<td>Euphorbiaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Mountain slopes</td>
</tr>
<tr>
<td>Ferulago idaea Ozhaty &amp; E.Akalin</td>
<td>Apiaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Siliceous rocks</td>
</tr>
<tr>
<td>Festuca istulata ( Hack. ex St.Yves ) Markgr.-Dann.</td>
<td>Poaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Sub-alpine pastures</td>
</tr>
<tr>
<td>Hieracium idae (Zahn) Sell &amp; C.West</td>
<td>Asteraceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Rocks</td>
</tr>
<tr>
<td>Hypericum kazaghense Y.Gemici &amp; E. Leblebici</td>
<td>Clusiaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Siliceous rocks and pastures</td>
</tr>
<tr>
<td>Jasione ideae Stoj.</td>
<td>Campanulaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>Linum boissieri Asch. &amp; Sint. ex Boiss.</td>
<td>Linaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Matthiola trojana Dirmenci, Satl &amp; Tümen</td>
<td>Brassicaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Calcareous rocks</td>
</tr>
<tr>
<td>Minuartia anatolica (Boiss.) Woron var. anatolica</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Mountain rocks</td>
</tr>
<tr>
<td>*Minuartia garekeana (Asch. &amp; Sint. Ex Boiss.) Mattf.</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Micaceous gravel</td>
</tr>
<tr>
<td>Minuartia jareesi subsp. asiatica</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>Muscari bourgaei Baker</td>
<td>Hyacinthaceae</td>
<td>Bulbous</td>
<td>LC</td>
<td>Calcareous rocks and mountain pas</td>
</tr>
<tr>
<td>Nepeta sibthorpii Benth. Subsp. tumeniana Dirmenci</td>
<td>Lamiaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>Papaver strictum Boiss. &amp; Bal.</td>
<td>Papaccaceae</td>
<td>Herbaceous</td>
<td>NT</td>
<td>Limestone rocks</td>
</tr>
<tr>
<td>Paronychia chionaea Boiss. subsp. chionaea var.</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>EN</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>*Paronychia sintenisii Chaudhri</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>Picris olympica Boiss.</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>CR</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>Pterocephalus pinardii Boiss.</td>
<td>Dipsacaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Calcareous mountain slopes</td>
</tr>
<tr>
<td>Ranunculus dissectus M.Bieb. subsp. sibthorpii</td>
<td>Ranunculaceae</td>
<td>Rhizomatous</td>
<td>LC</td>
<td>Alpine pastures, limestone rocks</td>
</tr>
<tr>
<td>*Saponaria chlorofolia Kunze</td>
<td>Caryophyllaceae</td>
<td>Herbaceous</td>
<td>LC</td>
<td>Rocky slopes</td>
</tr>
<tr>
<td>*Saxifraga sancta Gris.</td>
<td>Saxifragaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Calcareous peaks</td>
</tr>
<tr>
<td>Secale cereale L. var. ancestrale ( Zhuk. ) Kit Tan</td>
<td>Poaceae</td>
<td>Herbaceous</td>
<td>VU</td>
<td>Calcareous pastures</td>
</tr>
</tbody>
</table>
Sedum lydium Boiss.  
Crassulaceae  
Succulent  
LC  
Rock with covered moss

Senecio castagneanus DC.  
Asteraceae  
Herbaceous  
LC  
Rocky slopes, forest clearing

Sideritis trojana Bornm.  
Lamiaceae  
Herbaceous  
CR  
Calcareaous slopes

Silene bolanthoides Quézel , Contandr. & AP k l  
Caryophyllaceae  
Herbaceous  
EN  
Alpine grassland

Silene sypylea O.Schwarz  
Caryophyllaceae  
Herbaceous  
VU  
Calcareous slopes

Stachys cretica L. subsp. smyrnaea Rech.f.  
Lamiaceae  
Herbaceous  
LC  
Calcareous rocks

Thymus cherlerioides Vis. var. cherlerioides  
Lamiaceae  
Scrub  
NT  
Gravels and rocks

Thymus pulvinatus Celak.  
Lamiaceae  
Scrub  
CR  
Calcareous rocks

Thymus sypyleus Boiss. var. sypyleus var. sipyleus  
Lamiaceae  
Scrub  
LC  
Rocky slopes

Verbascum scamandri Murb.  
Scrophulariaceae  
Herbaceous  
EN  
Mountain slopes

Veronica caespitosa Boiss. var. caespitosa  
Scrophulariaceae  
Woody herb  
LC  
Calcareous rocks

Veronica elmaliensis M.Fischer  
Scrophulariaceae  
Herbaceous  
NT  
Rocky scrubs

Table 2. The number of taxa on the basis of data published in the red list

<table>
<thead>
<tr>
<th>Red list categories</th>
<th>CR</th>
<th>EN</th>
<th>VU</th>
<th>NT</th>
<th>LC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endemic</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Non-endemics</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Many endemics show a restricted distribution flourishing only on this mountain, notable among these are Allium kurtzianum, Armeria trojana, Asperula sintensis, Astragalus idae, Festuca ustulata, Hieracium idea, Hypericum kazdaghense, Jasione idaea, Sideritis trojana, Ferulago idaea, Centaurea odysseu, Matthiola trojana, and Nepeta sibthorpii ssp. tumeniana. Some rare but non endemic taxa too are found to grow only here in Turkey for example; Centaurea athoa and Saxifraga sancta (Fig. 3). The economically important medicinal, aromatic and ornamental plants growing around the summit area of Kazdağı are Armeria trojana, Dianthus erinaceus ssp. alpina, Sideritis trojana, Micromeria juliana, Salvia tomentosa, Stachys cretica ssp. smyrnaea, and Thymus species [50].

The critically endangered (CR) taxa like Achillea fraasii var. troiana, Centaurea odysseu, Ferulago idaea, Hieracium idae, Matthiola trojana, Nepeta sibthorpii ssp. tumeniana, Sideritis trojana and Thymus pulvinatus are found on narrow fields and restricted habitats (Table 1). Out of these, Sideritis trojana (Sarikiz Sage) and Thymus pulvinatus (Kazdağı thyme) are overexploited by the public as herbal teas [2,58]. Sideritis trojana is widely used by the locals for the treatment of throat-ache and cold. Likewise, Thymus pulvinatus “curative thyme” is used as medicinal plant and populations are destroyed by severe collections [4].

Fig. 4. The plant forms in the study area and their status in the red data book.

The number of plant forms and their risk categories are presented in Fig. 4. Most of the plants (nearly 72 %) collected from the study area are herbaceous. In general one tenth are shrubs, 8 percent bulbous, 3 percent trees and 1.7 percent semi-shrubs, 1.7 percent rhizomatous, 1.7 percent succulents and 1.7 percent woody herbs. Nearly two thirds of herbaceous taxa prefer calcareaous rocks, slopes, peaks, pastures, mountain and rocky slopes, forest clearings, and scrub areas. There are 4 CR, 3 NT, 3 VU, 2 LC and 1 EN taxa found on calcareaous habitats and 6 LC, 3 CR, 3 VU, 1 EN, and 1 NT on other ones (total 14). Bulbous plants differ from herbaceous, shrubs and semi-shrubs in terms of their places on the red list regardless of their habitat. Although 10 plants are under CR and 9 under VU categories, 11
plants under LC category are among herbaceous plants and 2 under CR and 2 under VU categories are under shrubs and semi-shrubs (Table 1). No bulbous plants were recorded under VU and CR categories, possibly indicating that bulbous plants have more successful adaptive strategies and are more successful against the biotic pressures as well as changing environments on this mountain. Rhizomatous, woody herbs, succulent plants and trees examined were all found to be either not threatened (NT) or come under lower risk (LC).

5. Conclusions

Many papers have been published on the sustainable use of our plant diversity in Turkey [21, 22, 25, 26, 34, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 61]. Kazdag, with its historical past, botanical and ethnobotanical richness is a strong candidate for ecotourism. The mountain is recorded as “Important Plant Area (IPA)” by Planta Europa and WWF. However, several factors are threatening the area such as; summer houses, tourism, expansion of agricultural areas, excessive grazing, collection of wild plants for export, afforestation, fire. Every year in August large number of people come to this mountain during Turkmen Ceremony and most of them collect medicinal, endemic and rare species unconsciously which has adverse affects on the plant diversity [8].

As stressed by Satl et al as [51] well; in order to protect the existing biodiversity there is a need for in-situ protection methods, attempts should be made to bring down the grazing pressures in the area, local people should be involved in this process, voluntary cooperation of the civilian community is very important for success, there is an immediate need for educating residents living close to the in situ preservation area, although this area has been designated as a pilot region, it still requires special protection and support through ex-situ conservation methods. In order to protect the critically endangered (CR) taxa found on narrow fields and restricted habitats, together with the medicinal plants and populations which are destroyed by severe collections, most important step is zonation of Park area and clearcut demarcation of protection zones encircled by buffer zones. Ther is great need for studies like population ecology of species facing threat and preparation of a computerised data base with regular updating programme. For eco-tourism and celebration of Turkmen festival in an eco-friendly manner footpaths should be constructed for visitors and signs hanged depicting caution measures. The information should be given to the visitors coming to this region and locals educated about the value of rich plant diversity of this area. All this will be successful only if an active participation from local communities and NGO representatives is achieved in this protection programme. For eco-tourism and celebration of Turkmen festival in an eco-friendly manner footpaths should be constructed for visitors and signs hanged depicting caution measures. The information should be given to the visitors coming to this region and locals educated about the value of rich plant diversity of this area. All this will be successful only if an active participation from local communities and NGO representatives is achieved in this protection programme. The conservation approaches must coincide with changing cultural attitudes that value native species and landscapes as a source of identity and spiritual significance. In the past native landscapes and species were mostly confined to remote situations, but recent decades have seen people protecting native species in their own communities [29]. For this reason, some of the endemic and rare plant species have been transferred for ex-situ conservation to Canakkale Onsekiz Mart University, Rock Garden of Biology Department. Seed bank is being established by making seasonal collections from the wild. There is also a need for the establishment of two centres around siliceous and limestone rocks for in-situ conservation in the area in order to protect their essential floral elements.

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References
