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Araştırma Makalesi

Establishing a collection and exhibition garden with some endangered plants in Ankara (Türkiye)

Ankara'da (Türkiye) nesli tehlike altındaki bazı bitkiler ile koleksiyon ve sergileme bahçesi kurulması

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Abstract
Within the scope of this study, activities were carried out to ensure *ex-situ* conservation of 12 taxa, distributed Ayaş, Beypazarı and Nallıhan districts in Ankara province, in the collection garden established by the National Botanical Garden of Türkiye and to raise awareness. In previous studies on *Achillea ketenoglui* H. Duman, *Aethionema dumanii* Vural & Adigüzel, *Aethionema turcica* H.Duman & Aytaç, *Astragalus densifolius* subsp. *ayashensis* Aytaç & Ekim, *Astragalus beypazaricus* Podlech & Aytaç, *Astragalus yildirimlii* Aytaç & Ekici, *Asyneuma linifolium* subsp. *nallihanicum* Kit Tan & Yıldız, *Campanula damboldtiana* P.H.Davis & Sorger, *Cytisus acutangulus* Jaub. & Spach, *Salsola grandis* Vural & Adıgüzel, *Salvia aytachii* Vural & Adigüzel, *Verbascum gypsicola* Vural & Aydoğdu, general characteristics such as life forms and habitat requirements were determined through field observations. In this study, analyzes were carried out through Geographic Information Systems using the characteristics of these taxa. In line with the analyses, the most suitable place to establish an Endemic Plants Collection Garden within the borders of the National Botanical Garden of Türkiye was selected. Among the taxa studied, 7 propagated species were adapted and protected in the collection garden created with habitat soils. Thus, an important example study has been presented for the conservation of endangered taxa, which is one of the missions of botanical gardens. Meetings were organised in the districts of Ayaş, Beypazarı and Nallıhan to raise awareness of *ex-situ* conservation activities.

Keywords: Awareness, collection garden, endemic plant, GIS.

Özet
Bu çalışma kapsamında Ankara ili, Ayaş, Beypazarı ve Nallıhan ilçelerinde yayılış gösteren 12 taksonun Türkiye Milli Botanik Bahçesi Müdürlüğü'nde kurulan koleksiyon bahçesinde *ex-situ* korumanın sağlanması ve farkındalığın arttırılması faaliyetleri yürütülmüştür. *Achillea ketenoglui* H. Duman, *Aethionema dumanii* Vural & Adigüzel, *Aethionema turcica* H.Duman & Aytaç, *Astragalus densifolius* subsp. *ayashensis* Aytaç & Ekim, *Astragalus beypazaricus* Podlech & Aytaç, *Astragalus yildirimlii* Aytaç & Ekici, *Asyneuma linifolium* subsp. *nallihanicum* Kit Tan & Yıldız, *Campanula damboldtiana* P.H.Davis & Sorger, *Cytisus acutangulus* Jaub. & Spach, *Salsola grandis* Vural & Adıgüzel, *Salvia aytachii* Vural & Adigüzel, *Verbascum gypsicola* Vural & Aydoğdutaksonları üzerinde daha önce yapılan çalışmalarda, arazi gözlemleri ile yaşam formları ve habitat istekleri gibi genel özellikleri tespit edilmiştir. Bu çalışmada ise taksonlara ait özellikler kullanılarak, Coğrafi Bilgi Sistemleri aracılığıyla analizler gerçekleştirilmiştir. Yapılan bu analizler doğrultusunda Türkiye Milli Botanik Bahçesi Müdürlüğü sınırlarında Endemik Bitkiler Koleksiyon Bahçesi kurulması için en uygun yer seçilmiştir. Çalışılan taksonlardan çoğaltımı sağlanan 7 taksonun adaptasyonu sağlanmış ve habitat toprakları ile oluşturulan koleksiyon bahçesinde koruma altına alınmıştır. Böylece botanik bahçelerinin misyonlarından biri olan nesli tehlike altındaki taksonların korunması faaliyetleri adına önemli bir örnek çalışma ortaya konulmuştur. Ayaş, Beypazarı ve Nallıhan ilçelerinde toplantılar düzenlenerek *ex-situ* koruma faaliyetleri konusunda farkındalık oluşturulmasına katkı sağlanmıştır.

Anahtar Kelimeler: Farkındalık, koleksiyon bahçesi, endemik bitki, CBS.

1. Introduction

In conditions where species losses are high, only *in-situ* conservation methods are inadequate. For some species whose original habitat or areas are under threat, only *in-situ* conservation efforts may cause greater species losses. In this case, a sustainable conservation plan can be created with *ex-situ* conservation methods (Primack, 2012). In this context, it is seen as a supporting tool for national decision-making and policy-making actions towards biodiversity conservation, using both *in-situ* and *ex-situ* approaches (Hurdu et al., 2022). In botanical gardens, which are one of the *ex-situ* conservation areas, plants can be kept alive under controlled conditions and population areas can be created with seed and cutting techniques (Primack, 2012). In addition, by making habitat observations of endemic taxa (Yılmaz and Mavi İdman, 2024); It is important to determine the slope, aspect, elevation, soil and climate characteristics where the plants grow and to create suitable conditions in the *ex-situ* conservation area. There are many *ex-situ* conservation and conservation biology studies conducted in this context. Bayraktar et al. (1980), one of the

first examples of these studies, stated that the destruction in the natural landscape should be repaired and reintroduced to nature, and carried out field and laboratory studies to realize this action by using natural plant species. In the study, plant species that could be tried for production were selected from areas with different ecological characteristics in the Aegean region, and production trials were carried out in the form of seeds, cuttings and rooted plants. At the same time, climate, geology, soil, slope, aspect topography and land use situations were also analyzed in the field studies (Bayraktar et al., 1980).

Another study within the scope of *ex-situ* conservation of endemic plants was conducted by Vural et al. (2007) is related to *Centaurea tchihatcheffii* Fisch. & C.A.Mey., whose danger category is CR. In his studies, he carried out field studies by determining the development characteristics of the species and developed *in-situ* and *ex-situ* conservation strategies. In this context, seed collection studies were carried out and they were planted in trial plots created on the land of Middle East Technical University (METU) and successful results were obtained. In the same study (Vural et al., 2007), by increasing the population of the species by increasing its seeds in the growing environment, the CR, The International Union for Conservation of Nature's Red List category was increased to the EN category and the seeds of the species were protected in the National Seed Gene Bank and the Turkish Seed Gene Bank. Seçmen et al. (2007), determined the red list category of the narrowly distributed *Linum aretioides* Boiss. and revealed the reasons for its narrow distribution and endangerment by investigating the life history of the plant. In this context, findings regarding the boundaries of the plant's living environment, soil, climate, vegetation characteristics and phenological observations were obtained, the lower and upper elevations were determined using the Global Positioning System (GPS) device to determine the distribution area of the species, and the distribution map was created with the Geographic Information Systems (GIS) program. Reproductive success was examined with morphological observations and seed germination tests, and *ex-situ* conservation was provided in the cold greenhouse of the Ege University Botanical Garden by using 2 types of growth regulators (indole butyric acid, indole acetic acid) in cutting production, but success was not achieved due to climatic factors. Şenol et al. (2012) selected 4 of the 12 local endemics growing in Bozdağlar in the Aegean Region and obtained findings regarding the life stories of these species, the boundaries of the places where they live, soil, climate, vegetation characteristics and phenological observations. In addition, the lower limits for each of the four taxa in the areas where the plants were observed were determined by GPS records, a distribution map for the species was created by organizing these records, and the surface areas of the areas where they spread were determined. As part of the seed trial studies, the germinating seeds were transplanted into plastic vials, and the seedlings obtained from the vials in pots were transferred to the Ege University Botanical Garden to create an *ex-situ* conservation area. In their study evaluating China's conservation approaches, Sun et al. (2019) stated that *ex-situ* conservation is important for ensuring the future of living plant specimens in a safe area, research, public access and creating educational programs at all levels. They also emphasized that botanical gardens are one of the ideal places where *ex-situ* conservation studies can be carried out in this context. In another study, Thomas et al. (2022) developed models to predict the climatic suitability of different species for propagation studies at the Missouri Botanical Garden. As a result of their study, they observed that the survival performance and reproduction studies of species can be reproduced in the climate of the place where the species is located, rather than in the climate distribution. They also emphasized the importance of the role of botanical gardens in *ex-situ* conservation and increasing the capacity of living collections to represent protected species. Hurdu et al. (2022) stated that despite the extensive protected area network in Romania, many taxa are still threatened with extinction in the region, mainly due to anthropogenic pressure. They emphasized the importance of *ex-situ* conservation for comprehensive and adequate conservation strategies and to provide a more significant buffer against plant extinction in nature, supported by a multitude of tools to re-plant taxa to their natural habitat.

When the literature is examined, it is seen that a holistic approach should be adopted in order to achieve success in *ex-situ* conservation studies. In addition to field studies on taxa, increasing public awareness is among the most important tasks of botanical gardens. In order to carry out conservation activities without losing biological richness, developing the conservation awareness of societies is of great importance for future generations. Creating and developing awareness in society about biodiversity and encouraging biodiversity conservation is an important step for sustainable conservation-use balance (Özbebek et al., 2013). The conservation of biodiversity and natural ecosystems necessarily demonstrates the progress of humanity and the interrelationship between society and nature. As a result of advances in technology, new agricultural production techniques enable food production and new medicines for humanity (Alho, 2012). In this context, creating conservation programs and providing training on this subject becomes important. It is important to raise local awareness for conservation activities to be successful. In particular, rural communities whose livelihoods depend on biodiversity need to be informed and made aware of biodiversity conservation (Soni, 2010).

With this study, it was aimed to carry out the *ex-situ* conservation of endangered endemic plants growing in Ayaş, Beypazarı and Nallıhan regions at the National Botanical Garden of Türkiye, to establish a collection garden and to raise awareness about the taxa among the local people. For this purpose, in the light of previously obtained data (Yılmaz and Mavi İdman, 2024) on the living environments of the taxa were analyzed and studies were carried out to establish a collection garden.

2. Material and Method

Within the scope of the study, information on the living conditions of taxa was recorded in the field and analyzed in the *ex-situ* conservation step (Bayraktar et al., 1980; Vural et al., 2007; Seçmen et al., 2007; Şenol et al., 2012). In line with these data, elevation, slope and aspect maps of both the districts (Ayaş, Nallıhan and Beypazarı) and the National Botanical Garden of Türkiye were made. These maps were created

based on topographic maps and using ARC GIS 10.4 software. For raster data layers, 3D Analyst Tool-Raster Surface was used. The analyses were sampled on 10x10 grids in the GCS-WGS-1984 projection system.

Seeds of all taxa were collected. However, due to low seed yields, 20 seeds from each taxon were used in propagation studies. Based on this, the propagation of the taxa *Aethionema dumanii*(4 individuals), *Aethionema turcica* (4 individuals), *Achillea ketenoglui* (4 individuals), *Salvia aytachii* (4 individuals) and *Salsola grandis* (4 individuals) was achieved. Additionally, propagation with steel was tried on *Salvia aytachii* and 16 individuals were obtained. The plants were transferred in 2021 and 2022 and are monitored every year.

Soil samples were taken from each region to better explain the living conditions of the taxa. Samples were taken from a depth of 30 cm and from different points using a shovel and stored separately, bagged and labeled. (Güçdemir and Kalınbacak, 2009). The samples were sent to be analyzed at the Soil, Fertilizer and Water Resources Central Research Institute and the texture analysis results were obtained. Other soil analyzes (pH, organic matter, lime, salinity, etc.) were completed within the scope of the Cooperation Protocol for the Protection of Endangered Endemic Plant Species in Ankara Province.Climate data were taken from Çankaya, Ayaş, Nallıhan and Beypazarı stations of the General Directorate of Meteorology (Ankara) and expressed with graphics.

After determining the habitat characteristics of the plants in years 2020 and 2021, the area, where Endemic Plants Collection Garden in the National Botanical Garden was going to be established, was determined by performing suitability analyzes in the ARC GIS 10.4 software. Necessary soil conditions are provided for the taxa to continue their vital activities in the *ex-situ* conservation area. In this context, soils brought from the taxa's own habitats were laid in the Endemic Plants Collection Garden, with habitat boundaries determined by plastic dividers. As a result of the propagation studies, the pot-adapted seedlings were transferred to the established Endemic Plants Collection Garden. Moreover, for a holistic *ex-situ* conservation approach, seeds collected from the plants were forwarded to the Turkish Seed Gene Bank in Ankara.

3. Results and Discussion

In field studies carried out on taxa; slope, aspect and elevation features were recorded. Geographic Information Systems technology was used to determine the most suitable place for the Endemic Plants Collection Garden within the National Botanical Garden of Türkiye area. Elevation (Figure 1), slope (Figure 2) and aspect (Figure 3) analyzes were carried out with vector topography data provided by Ankara Soil Fertilizer and Water Resources Central Research Institute. The results obtained in this direction are shown in the Table 1 as the elevation, slope and aspect values of the taxa from their own habitats.

Table 1. Elevation, slope and aspect characteristics of the taxa's habitat.

Taxa	Number	Elevation	Slope	Aspect
**Aethionema turcica*, **Aethionema dumanii Astragalus densifolius* subsp. *ayashensis Campanula damboldtiana*	034	1150 m	6-12	West
**Achillea ketenoglui*	035	620 m	0-4	Northwest
**Astragalus beypazaricus*, **Salvia aytachii*	038	645 m	0-4	Northeast
**Verbascum gypsicola*	041	582 m	6-12	South
Cytisus acutangulus	046	490 m	6-12	Northwest
**Salsola grandis*	046	470 m	6-12	East
Astragalus yildirimlii	049	965 m	12-24	Northeast
Asyneuma linifolium subsp. *nallihanicum*	058	623 m	12-24	Southwest

*****: Taxa that are adapted by propagation

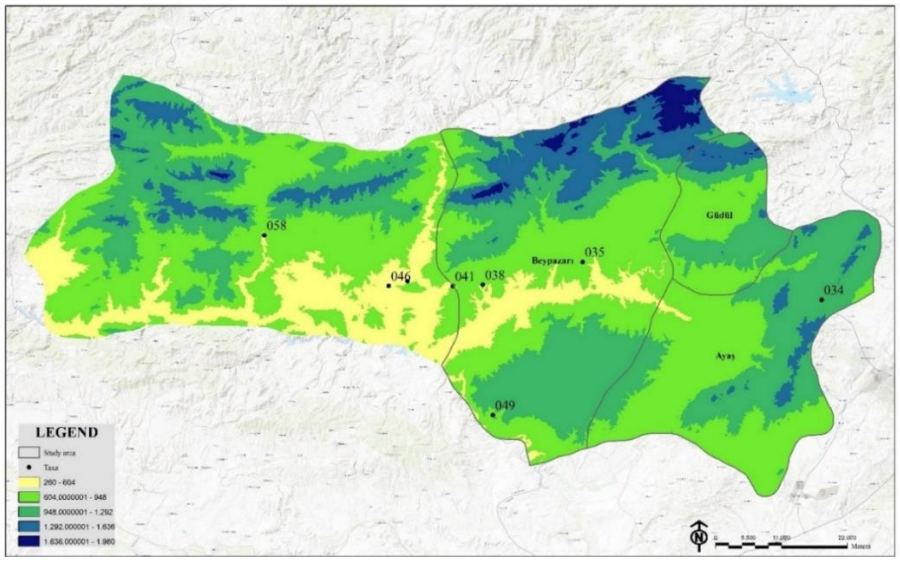


Figure 1. The elevation map of Ayaş, Beypazarı and Nallıhan districts.

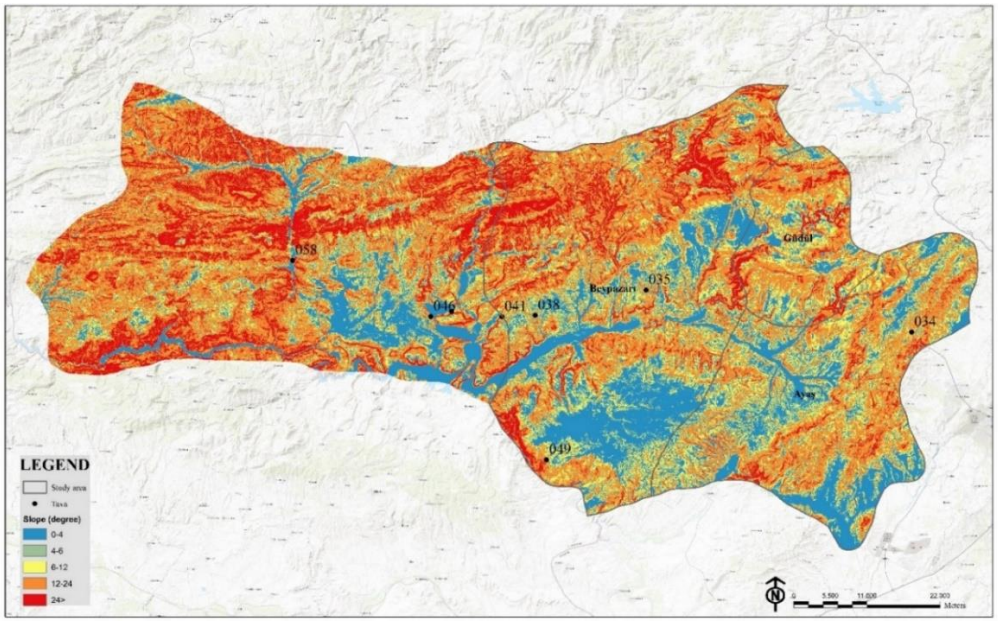


Figure 2. Slope maps of Ayaş, Beypazarı and Nallıhan districts.

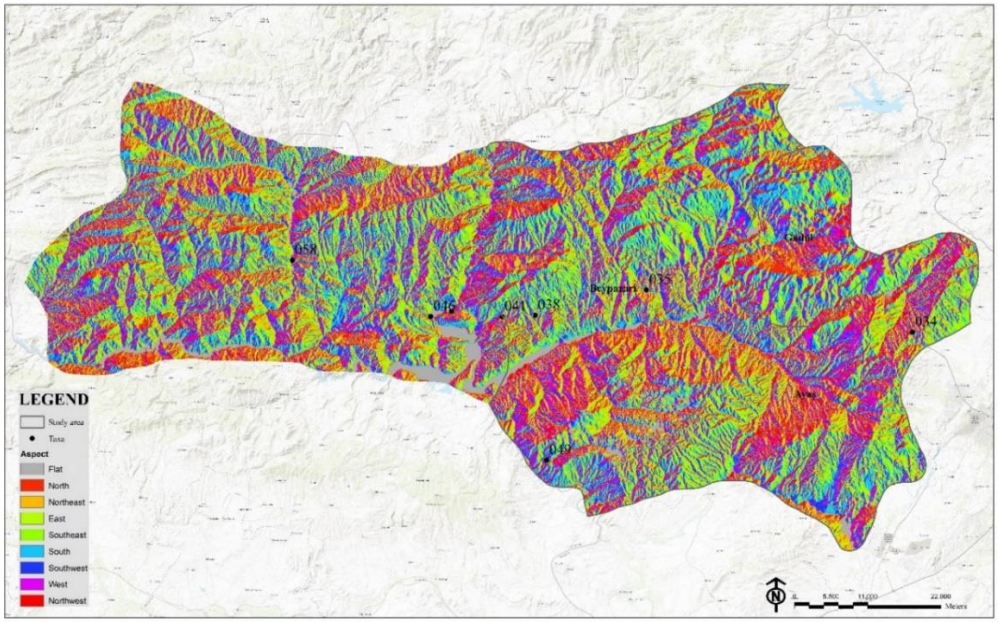
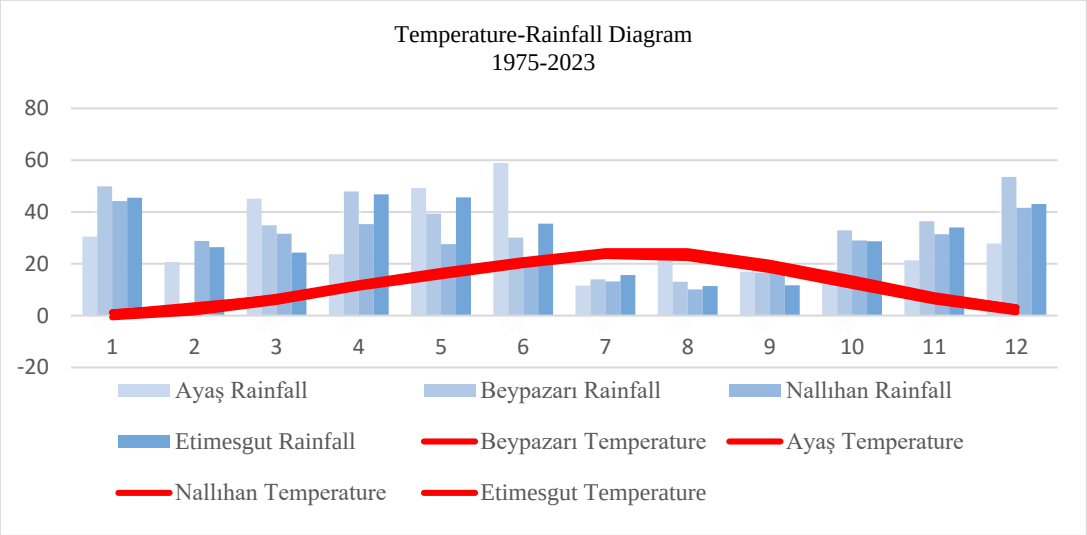


Figure 3. Aspect map of Ayaş, Beypazarı and Nallıhan districts.

The altitude of the study area varies between 260-1190 m. The highest location in the study area is Ayaş Aysantı waist, followed by the location where the *Astragalus yildirimlii* is found with 965 m. *Salsola grandis* located near Nallıhan Bird Sanctuary and *Cytisus acutangulus* located near Davutoğlan Village, are at the lowest altitude. Most of the study area has a slope of 24>. *Astragalus yildirimlii* and *Asyneuma linifolium* subsp. *nallihanicum* which are within the scope of the study, continue to exist in locations with the highest slope degree. When looking at the aspect levels of the area, it can be seen that there is diversity. Taxa are mostly located in northwestern facing areas.

Evaluation of climate data in *ex-situ* conservation studies is especially important for taxa that are endemic and adapted to a certain region. Within the scope of the study, the 1975-2023 climate data of Ayaş, Beypazarı and Nallıhan districts, where the taxa are distributed, and the district Etimesgut where the Botanical Garden is located, were examined. The highest temperature and average temperature values of the districts are close to each other. It is seen that Beypazarı district is milder at the lowest temperature values (Table 2).

Table 2. Temperature-Rainfall data of all districts between 1975-2023.



Within the scope of the study, the rainfall amounts of the districts were also evaluated. For example, it has been determined that the *Astragalus beypazaricus* area blooms depending on rainfall and deteriorates in years when rainfall is low ((Yılmaz and Mavi İdman, 2024; Anonim, 2015). It was observed that the taxon received sufficient rainfall in 2020-2021 and flowering occurred. When districts are evaluated, rainfall amounts vary according to months. The values of Etimesgut district are at average values in terms of temperature and precipitation. It was not evaluated among the criteria in the suitability analysis for the Endemic Plants Collection Garden on the grounds that there was no significant difference.

It was determined as the most suitable place for the Endemic Plants Collection Garden within the Botanical Garden is the areas with slopes of 0-4, 6-12, 12-24 in the altitude range (470 m; 1190 m), facing the South, East, West, Northeast, Northwest and Southwest. Overlay analysis was performed in ARC GIS 10.4 software, raster data was overlapped and the place where the garden would be established was determined (Figure 4). As a result of these analysis, it is seen that zones A, B C and D in Botanical Garden are suitable areas for the establishment of the Endemic Plants Collection Garden. It was decided to establish the said collection garden in Zone B, on the Hacettepe Exit Road route, due to its ownership status, convenience in terms of public travel routes, accessibility and site preparation.

In order to ensure *ex-situ* conservation of the taxa in the Botanical Garden, it has great importance to create environments close to natural living conditions. It is known that especially the rare endemic taxa evaluated within the scope of the study can survive in certain soil conditions. In this regard, soil structure analysis of the soil samples sent to the Ankara Soil Fertilizer and Water Resources Central Research Institute Directorate for analysis in 2020 was completed. Other analyzes were completed within the scope of the Cooperation Protocol for the Protection of Endangered Endemic Plant Species in Ankara Province and the results are shown in Table 3.

Figure 4. The suitable areas for the collection in the Botanical Garden.

The soil analysis results are listed below by taxa;

Cytisus acutangulus: Sand 56.97%; Silt 21.26%; Clay 21.76% and structure class (SCL) sandy, clayey, loamy soils, very difficult to process, high water retention capacity,

Astragalus beypazaricus, *Salvia aytachii*: Sand 28.05%; Silt 20.19%; Clay is 51.76% and structure class (C), low water permeability, heavy clay soils are difficult to process, high water retention capacity,

Verbascum gypsicola, Achillea ketenoglui: Sand 83.70%; Silt 9.60%; Clay 6.70% and texture class (LS), coarse loamy sand soils, low water retention capacity, easy to process were recorded. It is seen that all taxa prefer alkaline soils that are poor in organic matter. It is seen that, *Campanula damboldtiana, Aethionema turcica, Aethionama dumanii ve Astragalus densifolius* subsp. *ayashensis* grow in soils with very high lime content.

Table 3. Soil analysis for the taxa (Anonim 2023).

Taxon	***Salsola grandis***	***Verbascum gypsicola***	***Cytisus acutangulus***	***Campanula damboldtiana, Aethionema turcica, Aethionema dumanii, Astragalus densifolius subsp. ayashensis***	***Salvia aytachii, Astragalus beypazaricus***
Sample No	22-TP-01712	22-TP-02152	22-TP-02153	22-TP-02154	22-TP-02155
District	Nallıhan	Nallıhan	Nallıhan	Ayaş	Beypazarı
Location	Davutoğlan	Çayırhan	Davutoğlan	Aysantıbeli	-
Texture	Clay loam	Loam	Clay loam	Clay loam	Clay
Saturation with Water (%)	71	44	55	55	83
pH (In Soil Saturated with Water)	8,76	7,77	7,83	7,37	7,86
EC (dS/m) (Electrical Conductivity)	2,6	0,91	0,84	0,34	0.40
Lime ($CaCO_3$) (%)	9,2	10,8	5,97	38,97	12,8
Organic substance (%)	0,2	0,67	0,81	1,25	0,26
Available Phosphorus (P_2O_5) (kg/da)	1,6	0,5	0,6	0,4	0,9
Available Potassium (K_2O) (kg/da)	167,7	50,5	136,3	28,7	234,4

Moreover, some soil analysis results were given in other scientific studies on taxa. For example, Ayyıldız (2019) stated that *Aethionema turcica* grows in clayey loam, slightly alkaline, unsalted and very calcareous soils, while *Campanula damboldtiana* soil samples numbered 3, 4 and 5 taken from Ayaş, Sincan and Kahramankazan localities are different from each other; reported to show clayey, clayey loam and loamy characteristics, respectively. He stated that this species prefers slightly alkaline, unsalted and very calcareous soils. He also stated that *Astragalus beypazaricus* prefers clayey, slightly alkaline, unsalted and very calcareous soils (Ayyıldız, 2019). In summary, it is seen that the mentioned taxa develop in marl soils.

Keser (2020) stated that *Verbascum gypsicola* prefers loamy, slightly alkaline, slightly salty and unsalted medium and high calcareous soils. In general, gypsum rates were low in the distribution environments. Also according to Anonim (2019) and Bozdoğan (2019) *Salsola grandis* prefers clayey, salty and alkaline (pH 9.59) soils. The local distribution of the taxa shows that they need extreme soil conditions. In this context, it becomes important to create a garden with habitat soils in order to transfer the taxa to the *ex-situ* conservation area in the Botanical Garden. In this regard, a collection garden was established with soil taken from the habitats of each taxon.

In the landscaping project of the Endemic Plants Collection Garden, taxa were placed in accordance with their habitats. Habitat separations were made using plastic grass dividers. The soil taken from the taxa's own habitats was filled into the planting pits, and in 2021, the taxa *Aethionema dumanii* (4 individuals), *Aethionema turcica* (4 individuals), *Achillea ketenoglui* (4 individuals) and *Salvia aytachii* (4 individuals) were transferred from the pot to the garden. In addition, *Cytisus acutangulus* (2 individuals), *Aethionema dumanii* (1 individual), *Verbascum gypsicola* (2 individuals) and *Astragalus beypazaricus* (1 individual) taxa brought in 2020 were also planted in the garden. After planting, the plants were watered with fertilized water and labeled. There were losses in *Aethionema turcica*, *Aethionema* dumanii, and *Salvia aytachii* taxa during the winter months. The taxa were negatively affected by winter cold due to their herbaceous perennial life forms. Among the seed propagation studies carried out for the sustainability of the collection garden, *Aethionema dumanii* and *Aethionema turcica*, *Astragalus beypazaricus*, *Salsola grandis* and *Verbascum gypsicola* were propagated by cuttings; *Salvia aytachii* was transferred to the garden in June. All taxa in the plantation made in June have adapted. Land adaptations of all taxa planted in the Endemic Plants Collection Garden were achieved, flowering and fruit and seed formation were observed. The seeds of *Verbascum gypsicola* germinated again where they fell and the number of individuals (8 individuals in total) increased. In addition, the seeds of *Salsola grandis*, an annual taxon, germinate again

every year and the taxon continues its existence in the endemic garden. In other planted taxa *Aethionema dumanii, Aethionema turcica, Achillea ketenoglui, Salvia aytachii ve Astragalus beypazaricus* the fallen seeds do not germinate, but their life cycle in the garden continues.

Scope of work; It is of great importance to introduce endangered endemic taxa in Ayaş, Beypazarı and Nallıhan regions and to raise awareness among the local people. Because only if the taxa are embraced by the local people, conservation activities can achieve sustainable goals. In this context, meetings were held to introduce the taxa in Beypazarı, Nallıhan and Ayaş regions. The meetings were held in the District Governorship Meeting Hall in Beypazarı district, in Ayhan Sümer Cultural Center and Ayaş District Directorate of Agriculture and Forestry in Nallıhan district. Two separate information leaflets and posters were prepared for the taxa growing in Beypazarı and Nallıhan districts and distributed to the participants. At the meeting, general information about biodiversity, information about Botanical Garden and taxa were presented. At the end of the meeting, it was observed that the participants had increased awareness about these plants. Participants gave examples of the need to protect plants growing in their own regions.

4. Conclusion

Landscaping in botanical gardens plays an increasingly important role in *ex-situ* conservation. Thomas et al. (2022) developed a model to predict the climatic suitability of different species for propagation studies at the Missouri Botanical Garden. As a result of their study, they observed that the survival performance and reproduction studies of species can be reproduced in the climate of the place where the species is located, rather than in the climate distribution. In the success of the *ex-situ* conservation carried out within the scope of this study; Having areas with similar climatic factors, determining the appropriate place for the Endemic Plants Collection Garden using GIS, and carrying out the landscape work with the taxa's own habitat soils are among the effective factors.

Awareness and training activities constitute the most important steps of conservation activities. For example, General Directorate of Nature Conservation and National Parks Türkiye (DKMP) has awareness activities on *Campanula damboldtiana*. In this way, a solution mining company has initiated conservation activities for the taxon. Within the scope of these protection activities, the company's activity report (Anonim, 2021) states that, the 'Endemic Plant Protection Area' has been created to protect the endemic plant species spreading around the activity area, and the habitats and species within the area are also naturally protected and also locally distributed species (*Campanula damboldtiana, Aethionema dumanii, Aethionema turcica, Scutellaria yildirimlii, Sideritis galatica, Salvia tchihatcheffii*) are also moved to this area and population strengthening efforts are being carried out. In addition to increasing the awareness of different sectors operating in the immediate vicinity of such taxa, one of the important steps is to raise awareness among the local people.

In addition to the work carried out by DKMP regarding local people's training, awareness activities were also organized within the scope of the study. In the awareness studies carried out in Ayaş, Beypazarı and Nallıhan districts, it was observed that the participants were interested and willing to participate in conservation activities. In addition, the Endemic Plants Collection Garden established in the Botanical Garden will help provide information about taxa to visitors of all age groups and raise awareness to large audiences (Sun et al., 2019).

As a result, it is very important that the conservation conditions of endangered taxa are primarily met *in-situ* and reinforced with *ex-situ* conservation. In this context, this study carried out in the National Botanical Garden of Türkiye contributed to the fulfillment of the duties of botanical gardens in protecting plant biological diversity, creating collections and disseminating them. In addition, *ex-situ* protection of some endangered taxa was carried out and a data infrastructure was created for other scientific research on these taxa.

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N/A.

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