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Endemism in Istanbul Plants

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ABSTRACT

Objective: Istanbul has exceptional plant diversity with 2500 species, (many of) which are under threat due to rapid urbanization. The aim of this study is to update the endemic plants lists of Istanbul to show how many of these endemic plants are only found in Istanbul, which might be helpful in preparing development plans.

Materials and Methods: A list of Istanbul's endemic plants is created according to "Flora of Turkey and East Aegean Islands" and related articles, books, herbarium records.

Results: Ten of the 60 endemic plant species of Turkey's flora are endemic only to Istanbul. Half of the remaining species are endemic to Istanbul and its surrounding areas (neighboring cities) and the other half have other distribution areas throughout Anatolia.

Conclusion: Not only the ten species endemic only to Istanbul, but also the other 50 species found in the area, should be conserved because of their high biological value stemming from their limited distributions.

Keywords: Istanbul, endemism, endemic, rare

INTRODUCTION

Istanbul, the most populated city in Turkey, with a population of over 15 million in a provincial land area of 5461 km^2, is the largest urban agglomeration in Europe. Its rapid urbanization, a 10 times increase in population in six decades, creates pressure on biodiversity, which is under threat worldwide due to global change (1,2). Istanbul has an exceptional plant diversity with 2500 species due to its diversity of soil, geographical position between two seas and two continents, climate, topography and land use, and its long history as a major city (3). There are seven important plant areas in Istanbul, which are natural areas with extraordinary richness in Flora and have been determined by international criteria that includes endemic, rare or threatened plants and rare habitats (Figure 1); Terkos-Kasatura Coastline (Terkos-Kasatur Kıyıları), Ağaçlı Dunes (Ağaçlı Kumulları), Kilyos Dunes (Kilyos Kumulları), Western Istanbul Heathlands (Batı Istanbul Meraları), Northern Bosphorus (Kuzey Boğaziçi), Sahilköy-Şile Coastline (Sahilköy-Şile Kıyıları), Ömerli Basin (Ömerli Havzası) (4). The aim of this study is to update the current list of endemic plants in Istanbul, which is necessary to prepare conservation plan and increase awareness among the general public and policy makers because endemic plants, especially those with narrower distribution, should be conserved in their native lands.

MATERIALS AND METHODS

Firstly, a list of Istanbul's endemic plants is created according to "Flora of Turkey and East Aegean Islands" and related articles, books (5-9). The list is then compared with previously created lists (3,10-12). The Herbarium of the Faculty of Pharmacy of Istanbul University (ISTE) records and literature are searched to determine the localities of endemic plants other than Istanbul. The plants collected from outside of Istanbul are identified so that a list of plants found only in Istanbul can be created.

Endemic plants of Istanbul are classified into three zones: The core zone represents the Istanbul Province, the second zone is composed of Istanbul and the surrounding areas (neighboring cities), and the third zone represents Turkey's endemic plants that are also found in Istanbul (Figure 2).

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RESULTS AND DISCUSSION

The ISTE herbarium is a rich resource for this study in terms of the number of species it contains. There are 10, 459 specimens of 1,988 species collected in Istanbul in the ISTE herbarium, which holds samples of about 80% of all species recorded in Istanbul.

Some species that have been mentioned in earlier literature as endemic only to Istanbul have since been found to be endemic to other areas of Turkey, in addition to Istanbul. These records and their sources are as follows:

Allium rhodopeum subsp. *turcicum, Cirsium polycephalum, Galanthus plicatus* subsp. *byzantinus, Lathyrus undulatus, Taraxacum aznavourii, Taraxacum pseudobrachyglossum, Isatis areneria, Linum tauricum* subsp. *bosphori, Thymus aznavouri, Onosma proponticum, Silene sangaria, Hypericum trachphyllum* (Source: ISTE Herbarium).

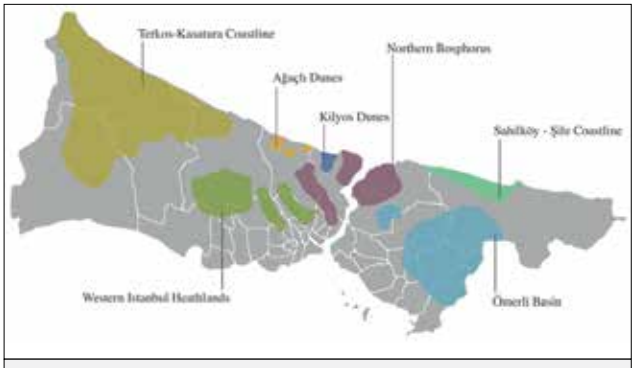

Figure 1. Seven important plant areas of Istanbul (3).

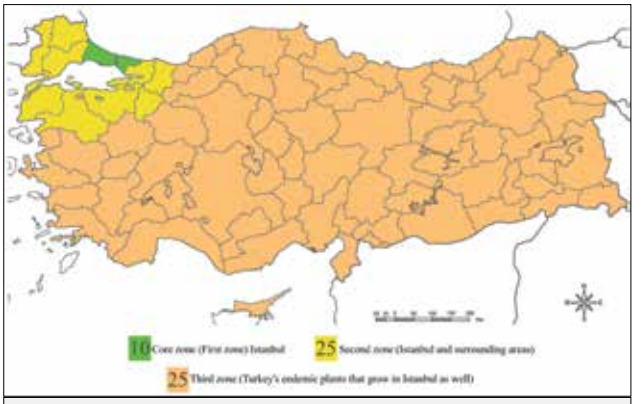

Figure 2. Endemic plants in Istanbul with distribution zones

Table 1. Endemic plants only found in the Istanbul Province and the IUCN Red List categories of these plants

Plant Species	IUCN Red List Category
Allium istanbulense Özhatay, Koçyigit, Brullo & Salmeri	-
Atriplex tatarica L. var. *constantinopolitana* Aellen	Critically Endangered (CR)
Cephalaria tuteliana S.Kuş & Göktürk	-
Colchicum micranthum Boiss.	Endangered (EN)
Crocus olivieri Gay subsp. *istanbulensis* Mathew	Endangered (EN)
Erysimum aznavourii Polatschek	-
Erysimum sorgerae Polatschek	-
Euphorbia belgradica Forssk.*	-
Polygonum istanbulicum M.Keskin	-
Trifolium pachycalyx Zohary	Data Deficient (DD)

*The existence of *Euphorbia belgradica* is doubtful.

Table 2. Endemic plants recorded in Istanbul and surrounding areas (neighboring cities)

Allium rhodopeum Velen. subsp. *turcicum* Brullo, Guglıelmo & Terrası	*Jurinea kilaea* Azn.
Ballota nigra L. subsp. *anatolica* P. H. Davis	*Lamium purpureum* L. var. *aznavourii* Gand. Ex Aznav.
Bupleurum pendikum Snogerup	*Lathyrus undulatus* Boıss.
Centaurea hermannii F. Hermann	*Linum tauricum* Willd. subsp. *bosphori* Davis
Centaurea kilaea Boiss.	*Onosma proponticum* Aznav.
Cirsium byzantinum Steud.	*Ophrys sphegodes* subsp. *catalcana Kreutz*
Crocus pestalozzae Boiss.	*Silene sangaria* Coode & Cullen
Dianthus cibrarius Clem.	*Symphytum pseudobulbosum* Aznav.
Erysimum degenianum Aznav.	*Taraxacum aznavourii* Van Soest
Euphorbia amygdaloides subsp. *robbiae (Turrill)* Stace	*Taraxacum pseudobrachyglossum* Van Soest
Galanthus plicatus Bieb. subsp. *byzantinus (Baker) D. A.* Webb	*Thymus aznavouri* Velen.
Hieracium noeanum Zahn.	*Verbascum degenii* Hal.
Hypericum avicullariifolium subsp. *byzantinum* (Azn.) N.Robson	

Table 3. Endemic plants found in Istanbul and Anatolia	
Allium peroninianum Aznav.	*Onopordum anatolicum* (Boiss.) Boiss. & Heldr. ex Eig
Anthemis aciphylla Boiss. var. *discoidea* Boiss.	*Onosma bornmuelleri* Hausskn.
Asperula littoralis SM.	*Onosma bracteosum* Hausskn. Et Bornm.
Astragalus vulnerariae DC.	*Pilosella hoppeana* (Schultes) C. H. & F. W. *Schultz* subsp. *lydia* (Bornm. & Zahn.) Sell & West
Bellevalia clusiana Griseb.	*Scrophularia cryptophila* Boiss. & Heldr.
Campanula lyrata Lam. subsp. *lyrata* Lam.	*Senecio castagneanus* DC.
Carduus nutans L. subsp. *falcato-incurvus* P. H. Davis	*Taraxacum turcicum* Van Soest
Carduus nutans L. subsp. *trojanus* P. H. Davis	*Trifolium apertum* Bobrov var. *kilaeum* Zoh. & Lern.
Centaurea consanguinea DC.	*Trifolium pannonicum* Jacq. subsp. *elongatom* (Wılld.) Zoh.
Ferulago thirkeana Boiss.	*Tripleurospermum conoclinium* (Boiss. & Bal.) Hayek
Isatis arenaria Azn.	*Verbascum bithynicum* Boiss.
Knautia byzantina Fritsch	*Vincetoxicum fuscatum* (Hornem.) Reichb. *FIL*. subsp. *boissieri* (Kusn.) Browicz
Knautia degenii Borbas Ex Formanek	

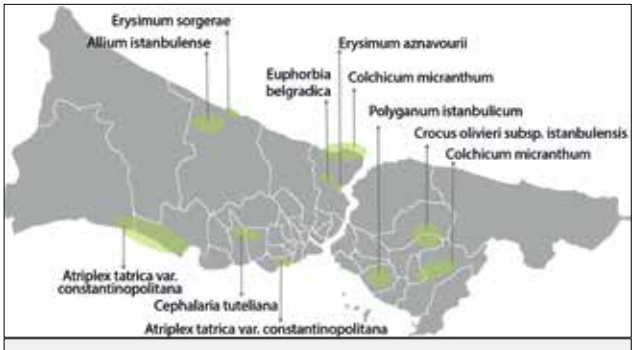

Figure 3. Distribution of Istanbul's endemic plants in Istanbul.

Lamium purpureum L. var. *aznavourii* (DUOF No:3185) from A3 Bolu (13) [Source: Düzce University Faculty of Forestry Herbarium (DUOF)].

Bupleurum pendikum, Euphorbia amygdaloides var. *robbiae* (5) (Source: Flora of Turkey and East Aegean Islands)

Figure 4. *Allium istanbulense* Özhatay, Koçyigit, Brullo & Salmeri. Photo taken by T.Avcı.

Figure 5. *Crocus olivieri* GAY subsp. *İstanbulensis* Mathew. Photo taken by S.Yüzbaşıoğlu.

Figure 6. *Cephalaria tuteliana* S.Kuş & Göktürk. Photo taken by S.Yüzbaşıoğlu.

As a result of these findings, 60 plants endemic to Turkey are found in Istanbul. Only 10 of these plants are endemic only to Istanbul (Table 1) (Figure 3). Half of the remaining 50 plants are found only in Istanbul and its surrounding areas (neighboring cities) (Table 2) and the remaining 25 are more commonly found in Anatolia (Table 3). The International Union for Conser-

vation of Nature (IUCN) Red List categories of endemic plants in Istanbul are shown in Table 1(14).

There have been doubts about the existence of some plants which are endemic to Istanbul. According to Boissier, *Euphorbia belgradica* from A2(E) Istanbul (Belgrad forest) is likely assignable to either *E. platyphyllos* or *E. pubescens* Vahl, but it is not possible to be sure because of the imperfect material (15). There is information on the distribution of *Trifolium pachycalyx* outside of Istanbul. However, information on its existence in Izmir could not be verified. In addition, there is a recently discovered endemic plant species: *Allium istanbulense*, a new species of *Allium* section *Codonoprasum*, in areas surrounding Istanbul (European Turkey) (Figure 4) (16).

There are some species of plants endemic to Istanbul's that carry the epithet "Istanbul" or various names of Istanbul: *Allium istanbulense, Crocus olivieri* subsp. *istanbulensis* (Figure 5), *Polygonum istanbulicum, Atriplex tatarica* L. var. *constantinopolitana, Euphorbia belgradica, Bupleurum pendikum, Centaurea kilaea, Cirsium byzantinum, Galanthus plicatus subsp. byzantinus, Hypericum aviculariifolium subsp. byzantinum, Jurinea kilaea, Linum tauricum subsp. bosphori, Ophrys sphegodes subsp. catalcana, Knautia byzantina, Trifolium apertum var. kilaeum*. Some of Istanbul's plants are named after botanists' to honour them: Georges Vincent Aznavour, Betül Tutel, Friederike Sorger, Arpád von Degen (17). For instance, *Cephalaria tuteliana* is named after Prof. Dr. Betül TUTEL, the Faculty of Science Botany Institute at Istanbul University.

CONCLUSION

This study shows that among the 60 Turkish endemic plants that are found in Istanbul, ten of them are endemic only to Istanbul. These 10 species are in danger because of their limited distribution area. Rapidly growing urbanization poses a risk to plants and many face the threat of extinction. New urbanization projects pose a particular threat to the Black Sea coast of European side of Istanbul and Çekmeköy on the Anatolian side (18). It is very important to identify endemic plants of Istanbul immediately and protect them from the harmful effects of urbanization. There is an ongoing conservation plan for *Cephalaria tuteliana* (Figure 6) by the Turkish Republic Ministry of Forestry and Water Affairs. The required work for the project has been completed and the report is now in its preparation stage. In addition, the IUCN Red List categories of endemic plants in Istanbul are shown in Table 1. However, the IUCN Red List categories of these plants need to be updated.

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Conflict of Interest: The authors have no conflict of interest to declare.

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