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Evaluation of Local Wild Plants, Including Recently Discovered Endemics, as Ornamentals: the EXPO-2021 Hatay, Türkiye Example

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ABSTRACT: *This study was carried out in order to determine the potential of wild plants in an Eastern Mediterranean province, Hatay (Türkiye), as ornamentals. In the light of floristic field studies that the authors have been carrying out in the region for more than ten years, plants that may have ornamental features were identified. Most of these plants were evaluated as ornamental plants within the scope of horticulture EXPO-2021 Hatay. Local endemic plants discovered by the authors in recent years have also been successfully cultivated as ornamental plants and one of them,* ***Scorzonera pacis****, was even chosen as the emblem of the event. The preference for exotic, showy species in landscape design is a common trend that is still prevalent around the world and that we witness both in Hatay and throughout Türkiye. However, due to global climate changes and the freshwater crisis, it is now necessary to use local species that are compatible with the existing habitat so they can be cultivated more easily. In addition to the advantage of easy cultivation, choosing local wild plant species for landscape design will contribute to the diversification of agricultural products and to the local economy, as well as to the conservation of endangered species and the local ecological balance. Even very rare local endemic plants can be cultivated and successfully used as ornamentals in foreign habitats, as in the examples of the Turkish endemics* ***Origanum amanum*** *and* ***Tulipa sprengeri****. Both species are extremely rare in nature. The former is currently almost only available in European botanical gardens ex situ. The second is a very popular and widespread ornamental plant and, after years of extinction in nature, it was replanted in its natural habitat in Türkiye where it was discovered. Moreover, the economic and ecological advantages of using native flora species instead of foreign ones will give parks and gardens unique identities. Hatay was the province that suffered the greatest destruction in the February 23, 2023 earthquake. We hope that this article, prepared before the earthquake, will guide the reconstruction of the city by suggesting alternative agricultural and economic products.*

Keywords: *Flora, ornamentals, cultivation, alternative agriculture, Hatay, EXPO.*

Yakın zamanda keşfedilen endemikler de dahil olmak üzere yerel yabani bitkilerin süs bitkisi olarak değerlendirilmesi: EXPO-2021 Hatay, Türkiye örneği

ÖZ: *Bu çalışma, bir Doğu Akdeniz ili olan Hatay'da (Türkiye) bulunan yabani bitkilerin süs bitkisi olarak potansiyelini belirlemek amacıyla yapılmıştır. Yazarlar, on yılı aşkın bir süredir bölgede yürüttükleri floristik alan çalışmalarının ışığında süs özelliği taşıyabilecek bitkileri belirlemişlerdir. Bu bitkilerin çoğu, bahçecilik EXPO-2021 Hatay kapsamında süs bitkisi olarak değerlendirilmiştir. Yazarlar tarafından son yıllarda keşfedilen yerel endemik bitkiler de süs bitkisi olarak başarıyla yetiştirilmiştir, bunlardan biri olan* ***Scorzonera pacis****, etkinliğin amblemi olarak seçilmiştir. Peyzaj tasarımında egzotik, gösterişli türlerin tercih edilmesi, hem Hatay'da hem de Türkiye'de şahit olduğumuz, tüm dünyada halen geçerli olan yaygın bir eğilimdir. Ancak küresel iklim değişiklikleri ve tatlı su krizi nedeniyle artık daha kolay yetiştirilebilmeleri için mevcut habitatla uyumlu yerel türlerin kullanılması gerekmektedir. Kolay ekim avantajının yanı sıra peyzaj tasarımlarında yerel yabani bitki türlerinin seçilmesi, tarımsal ürünlerin çeşitlendirilmesine, yerel ekonomiye, nesli tükenmekte olan türlerin korunmasına ve yerel ekolojik dengeye katkı sağlayacaktır.Türkiye'ye endemik* ***Origanum amanum*** *veya* ***Tulipa sprengeri*** *örneklerinde olduğu gibi çok nadir yerel endemik bitkiler bile yabancı habitatlarda yetiştirilip süs bitkisi olarak başarıyla kullanılabilmektedirler. Her iki tür de doğada son derece nadirdir. İlki şu anda neredeyse yalnızca ex situ olarak Avrupa botanik bahçelerinde mevcuttur. İkincisi ise oldukça popüler ve yaygın bir süs bitkisidir ve doğada nesli tükendikten yıllar sonra keşfedildiği Türkiye'de doğal ortamına yeniden dikilmiştir. Yabancı flora türleri yerine yerli flora türlerinin kullanılmasının sağlayacağı ekonomik ve ekolojik*

avantajların yanı sıra bu tercih, park ve bahçelere özgün kimlikler kazandıracaktır. Hatay, 23 Şubat 2023 depreminde en büyük yıkıma uğrayan il olmuştur. Deprem öncesinde hazırlanan bu makalenin kentin yeniden inşasında, alternatif tarımsal, ekonomik ürünler önermek yoluyla yol gösterici olacağını umuyoruz.

Anahtar Kelimeler: *Flora, süs bitkileri, yetiştiricilik, alternatif tarım, Hatay, EXPO.*

INTRODUCTION

Ornamental plants constitute an important economic sector on a global scale. The worldwide production value of ornamental plants is above €34 billion (Anonymous, 2022). In 2020, worldwide production areas of flowers and ornamental plants (cut flowers, cut foliage, pot plants, bedding plants, and perennials) reached 734,000 ha (AIPH, 2021).

According to 2021 data, 27,916,289,000 USD worth of ornamental plants were exported worldwide. The Netherlands has the largest share in the world's ornamental plant exports, with 14,234,277,000 USD worth of exports. The Netherlands is followed by Colombia, with 1,756,097,000 USD, and Italy, with 1,357,224,000 USD. Türkiye is 34th, with 148,890,000 USD export value of ornamental plants (Anonymous, 2022).

According to 2021 data, 25,135,668,000 USD worth of ornamental plants were imported. Germany ranks 1st, with an import value of 3,969,730,000 USD. Germany is followed by the USA, with 3,562,678,000 USD. Türkiye is 59th, with 53,222,000 USD worth of imports of ornamental plants (Anonymous, 2022).

Exotic tropical species are preferred as ornamental plants in many countries around the world due to their showy appearance. However, these species bring with them two different problems in habitats in which they do not belong. The first is the need for excessive irrigation and maintenance when species that do not have an invasive character are planted in parks and gardens in arid regions. The second is the risk of threatening native vegetation when competitive, invasive species escaping from culture and act as invasive weeds in habitats to which they can adapt easily (Reichard and White, 2001; Hulme, 2011). For example, *Ailanthus altissima* (Mill.) Swingle, which originated in Southeast Asia, became one of the most common invasive weeds in the world after its first use as an ornamental plant (Fotiadis *et al*., 2011).

The first problem, that is, the need for irrigation and care of foreign plants, has become especially important today, as we have started to experience water scarcity in the Mediterranean basin due to global climate changes. Climate changes are already stressing local vegetation and reducing their competitiveness with invasive species. The use of local species as ornamental plants instead of exotic species eliminates these disadvantages. Therefore, regions with rich species diversity are of important potential value as sources of species that can be used in landscaping in Mediterranean countries.

With nearly 12,000 vascular plant species, Türkiye is an excellent example. The country is rich in flora and potentially valuable geographies. In Türkiye, the Mediterranean Region, in particular stands, out due to its species diversity. The Mediterranean Region of Türkiye has special value within the Turkish flora, with species richness and endemism. There are more than 750 endemic taxa in the region (Ekim *et al*., 2000). Hatay (Antakya), the easternmost province of the Mediterranean Region, is an important biological diversity region in Türkiye with its sandy coastal, marine, freshwater, mountain, plain, forest, and maquis habitats. It is like a compendium of the Flora of the Eastern Mediterranean as it includes most of the Lebanese, Israeli, and Western Syrian species. There are more than 2400 plant taxa, of which 252 are endemic (Davis *et al*., 1965-1985; Düzenli *et al*., 1996; Türkmen and Düzenli, 1998; Yolcu, 1998; Duman and Sağıroğlu, 2005; Kayıkçı, 2006; Eker and Koyuncu, 2008; Yıldız, 2008; Güzel and Kayıkçı, 2014; Kayıkçı, 2014; Kayıkçı *et al*., 2014; Ocak *et al*., 2014; Güzel *et al*., 2018; Eker and Yıldırım, 2021; Güzel, 2021).

Hatay is also a unique province because of its being the type locality of 182 taxa (143 species and 39 subspecies or variety). There are many taxa taking their names from Antakya or from its mountains such as from the Amanos (30 taxa) or Cassius Mountains (20 taxa). There are many very locally restricted endemic taxa that are found only in Hatay. There are 157 threatened taxa in Hatay (126 species and 31 subspecies or variety) (IUCN, 2022). While 89 of them (73 species and 16 subspecies or variety) are endemic, 68 (53 species and 15 subspecies or variety) of them are nonendemic. Of the endemic ones, 5 are in the critically endangered (CR) threat category, 36 are in the endangered (EN) category, 21 are in the vulnerable (VU) category, and 27 are in the data deficient (DD) category. All these taxa need urgent protection.

The Amanos Mountains, which are approximately 175 km in length and pass through the whole of Hatay, have special importance due to their endangered species and various endangered habitats with rich species diversity (Özhatay *et al*., 2003). The Amanos Mountains host 1580 plant species, of which 251 are endemic. Approximately 160 of these species are in danger of extinction. Some 4.5 % of the Amanos Mountains flora is composed of endemic species such as *Salvia tigrina*, *Centaurea arifolia*, *Verbascum amanum*, and *Ferulago antiochia* (Özhatay *et al*., 2003).

Despite the abovementioned species richness and despite having wide agricultural areas and suitable climatic conditions, Türkiye's ranking 34th in ornamental plant exports shows that the existing potential of ornamental plant value in this country has not been adequately assessed. As indicated in the final report of the 5th National ***Ornamental Plants Congress*** held between 06 and 09 May 2013 by ***Yalova Atatürk Central Horticultural Research Institute*** and Yalova University, the main reasons for this problem are as follows (Erken and Pezikoğlu, 2013):

1. The product variety of both outdoor and cut ornamental plants in Türkiye is insufficient. Encouraging the production of indigenous ornamental plant species and conducting research on breeding should be adopted as a general policy. New varieties for the domestic and foreign market should be developed and brought into production. For the demonstration of indigenous species to producers and users, demonstration areas should be established and, if necessary, sample planting areas should be established by units of public institutions such as municipalities.
2. In general, there is a trend towards the use and trade of plants of foreign origin in the sector. However, utilizing Türkiye's rich gene sources and natural flora, the cultivation of native plants, and the use of these plants in foreign trade will provide a significant competitive advantage.
3. Priority should be given especially to cultivation, preparation, and storage techniques for bulbous plants.

Therefore, we scanned the plant diversity in Hatay Province in order to suggest alternative Mediterranean ornamental plants that could be a solution to the problems caused by the preference for tropical species as ornamental plants. We think that the species we evaluated here can be an example for other Mediterranean countries as well as being useful for the ornamental plant sector in Türkiye.

The International Association of Horticultural Producers (AIPH) and Flora Culture International supported horticultural activities, EXPO-2021/ Hatay (https://aiph.org/upcomingexpos/expo-2021-hatay/), which were planned to be held in Hatay in 2021 and postponed to 2022 due to the COVID-19 pandemic, started on 01 April 2022 and continued until 29 October 2022. The fair was a laboratory where we conducted cultivation trials on the plants we determined to have the potential to be used as ornamentals. The gardens of the EXPO-2021 fair remain as parks and gardens after the fair was over. Therefore, both the plants we are currently growing and the species we are still cultivating will continue to be exhibited in this area.

MATERIALS AND METHODS

Research Area

Hatay Province, which is situated in the south of Türkiye (Figure 1) and has a surface area of 5,524 km², is a region of rich habitat diversity with sand dunes, plains, valleys, wetlands, and mountains. Of this area, 46.1% is mountains, 33.5% plains, and 20.4% plateaus. The elevation reaches 2240 m above sea level at Mığır Peak/Amanos Mountains. The Amanos Mountains, Mount Musa, Mount Keldağ, Mount Ziyaretdağı, and Mount Habib-I Neccar are the important elevations in the region. Amik Plain is the largest plain in the province. However, there are also the Arsuz, İskenderun, Dörtyol, Erzin, Payas, and Samandağ plains. Hatay has rich habitat diversity. Wetlands (Lake Gölbaşı, Milleyha Wetland, the Mediterranean, and River Asi), coastal sand dunes (Samandağ and Burnaz coastal dunes), maquis areas, red pine forests, black pine forests, and deciduous forests are important habitats. In addition, the slopes of the Amanos Mountains by the side of the Iskenderun Gulf contain residual forests with plant species belonging to the Euro-Siberian phytogeographical region, such as beech, linden, hazelnut, and dogwood trees.

Hatay has a characteristic Mediterranean climate with hot and dry summers and warm and rainy winters. The average annual temperature is 18.3 °C. The coldest month is January and the hottest month is August. The average annual rainfall is 1121.6 mm. The rainiest month is January and the driest month is August.

Method

The botanical and ornamental features of the wild plants were determined in field studies conducted in natural habitats in Hatay Province between 2010 and 2021. The field studies were carried out to cover all four seasons. The plant species were identified using the Flora of Türkiye and other helpful resources. Tree, shrub, geophyte, groundcover, climbing, and endemic species; plants habitats; and flowering periods were determined. All of the botanical and ornamental features are given herein in Appendix 1. Moreover, the cultivation conditions and, if cultivation was unsuccessful, the reasons for failure are given in the notes in Appendix 1. Trials of cultivation were conducted in the parks and gardens of Hatay Province and in the EXPO-2021 gardens between 2017 and 2022.

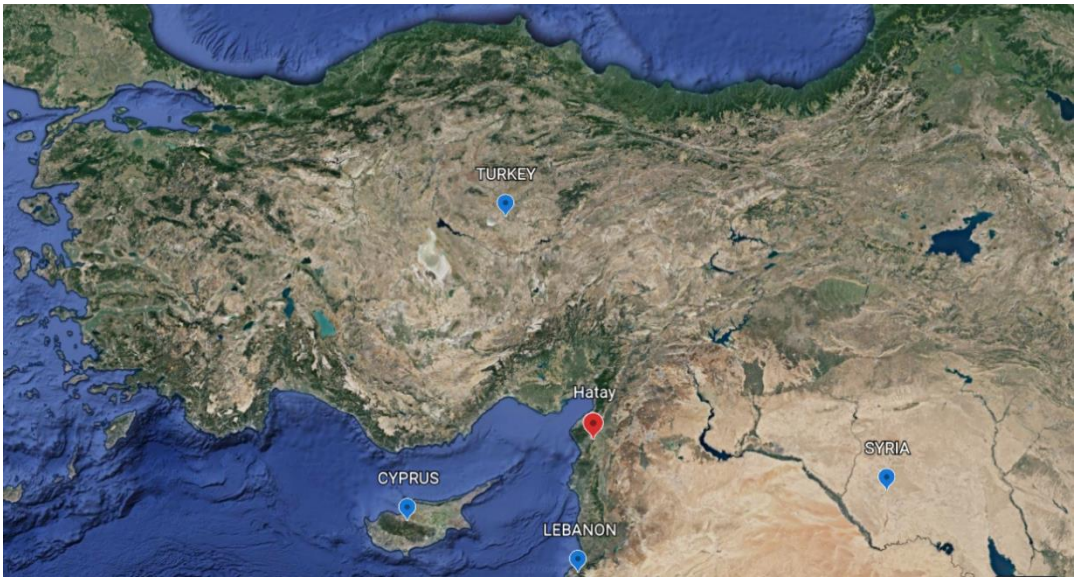

Figure 1. Map of Türkiye and the location of Hatay Province.

RESULTS AND DISCUSSION

It was decided that the 329 plant taxa belonging to 64 families that are given in Table 1 have the potential to be used as ornamental plants in terms of the characteristics specified in the same table, and that they can be used as ornamental plants in the parks and gardens of Mediterranean countries in particular. Cultivation trials of 101 of these plants were carried out within the scope of EXPO-2021. So far, 86 have been successfully grown for display in the garden. The successful and unsuccessful cultivation trials are specified in Table 1. Local endemic plants discovered by the authors in recent years such as *Scorzonera pacis* (Güzel *et al*., 2013) (Figure 2), *Dionysia zeynepiae* (Güzel, 2021) (Figure 3a) and *Noccaea ali-atahanii* (Güzel *et al*., 2018) (Figure 3b) have also been successfully cultivated.

Notably, *Scorzonera pacis* was chosen as the emblem of EXPO-2021 Hatay (Figure 2), *N. ali-atahanii* has also been successfully cultivated in the Nezahat Gokyigit Botanic Garden in İstanbul (Figure 3b). Cultivation studies on the remaining plants continue. The main difficulty we encountered in cultivation involved germinating seeds. All plants that were able to overcome the germination difficulty and become seedlings, as we expected, easily grew and were transferred from the nursery to the garden (Figure 4). They could even be used in interior arrangements (Figure 5).

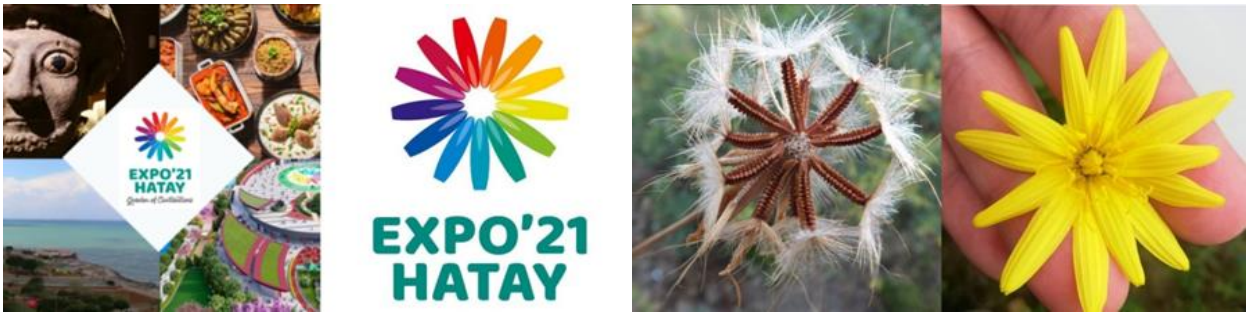

Figure 2. Discovered by the authors in 2013 and named "pacis=peace" after the atmosphere of peace and tolerance in the multicultural city Hatay, *Scorzonera pacis* was grown in the gardens of EXPO-2021 and became the emblem of the event. Some examples of promotional posters for the event; the achenes of the plant, which are unique to the genus; on the right, the capitulum embroidered in the emblem.

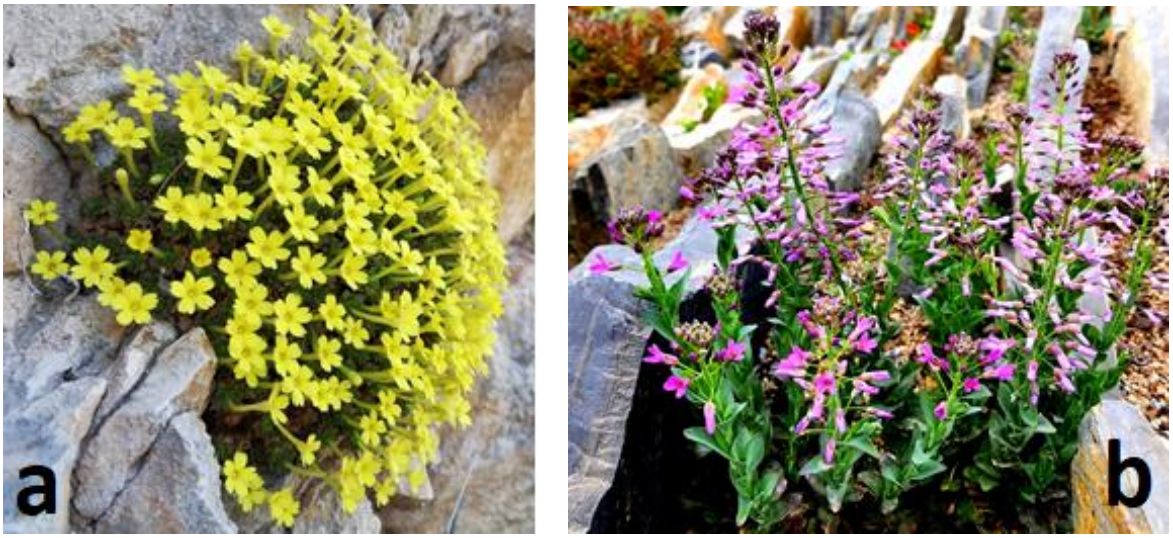

Figure 3. a. *Dionysia zeynepiae*, which was discovered last year in Hatay by the second author (Yelda Güzel), is a showy species that is an ideal ornamental for rock gardens. Cultivation studies on it are continuing. b. *Noccaea ali-atahanii*, discovered by the authors in Hatay in 2018, is in bloom at Nezahat Gokyigit Botanic Garden in İstanbul in March 2022.

Figure 4. Examples of some wild native plants grown as ornamental plants in EXPO-2021 gardens. A. *Thymus eigii* B. *Helichrysum sanguineum.*

Figure 5. Examples of some wild native plants grown as ornamental plants in EXPO-2021 in interior designs. a. *Salvia aramiensis* b. *Centaurea doddsii* c. *Phlomis longifolia* d. *Laurus nobilis*.

Table 1. Local wild plant species that have ornamental potential and their Turkish names, habitats, flowering times, elevations, life spans, forms, ornamental features, and phytogeographical regions.

Family	Species	Turkish name	Habitat	Flowering time	Elevation	Life Span	Form	Ornamental Features	Phyto-geographical region (empty cells: cosmopolitan or no information)	Other notes
Ranunculaceae	*Clematis cirrhosa*	Bahar Sarmaşığı	Maquis	October-December	150-700	P	C	Showy inflorescences	Med.	
Ranunculaceae	*Clematis flammula* [**bh]	Hamilmiskin	Maquis, field edges,	Mayı-August	10-600	P	C	Showy inflorescences	Med.	
Ranunculaceae	*Delphinium fissum subsp. anatolicum*	Özge Hazeran	Rocky places	June-August	800-1100	P	H	Showy inflorescences		Endemic
Ranunculaceae	*Helleborus vesicarius* [**cg]	Patlak Çiçeği	Rocky slopes, forests	January-March	500-1500	P	H	Showy flowers, leaves and fruits	E. Med.	Endemic
Ranunculaceae	*Nigella stellaris* [*agm]	Otçam	Fields	April-May	10-700	A	H	Showy flowers	E. Med.	Rare
Ranunculaceae	*Ranunculus asiaticus* [**cg]	Şakayıklalesi	Maquis, fields, Bu	April-May	20-900	P	G	Showy bright flowers		
Paeoniaceae	*Paeonia mascula*	Ayıgülü	Oak Bu, Rocky slopes	March-April	300-1500	P	G	Showy flowers		
Papaveraceae	*Corydalis tauricola*	Has Kazgagası	Oak Bu, slopes	March-May	500-1700	P	G	Showy inflorescences	E. Med.	Endemic
Brassicaceae	*Aethinema spicatum*	Gül Taşçantası	Rocky slopes	May-June	1000-1500	P	S	Tuft plant with many flowers		
Brassicaceae	*Aethionema schistosum*	Göksun Kayagülü	Rocky slopes	May-June	1000-1700	P	H	Low growing, Tuft plant with many flowers	Endemic	
Brassicaceae	*Noccaea ali-atahanii* [**ag]	Ali Dağarcığı	maquis	April-May	100-150	P	H	Showy flowers		Endemic
Cistaceae	*Fumana oligosperma*	Az Güneşotu	Highlands	May-June	1200-1700	P	S	Many flowers.	E. Med.	Rare
Caryophyllaceae	*Dianthus floribundus*	Kırk Karanfil	Rocky slopes, empty fields	May-June	300-1200	P	H	Showy flowers	Ir.-Tur.	
Caryophyllaceae	*Dianthus zonatus var. zonatus*	Kaya Karanfili	Rocky places	June-September	100-1500	P	H	Showy flowers		
Caryophyllaceae	*Silene swertiifolia*	Bozkır Nakılı	Slopes	May-July	800-1500	P	H	Showy big flowers	Ir.-Tur.	
Caryophyllaceae	*Thurya capitata* [**dg]	Gündegüzel	Rocky places	May-July	1100-1500	P	Ca	Showy flowers		Endemic
Phytolaccaceae	*Phytolacca pruinosa*	Toros Şekerciboyası	Rocky slopes	April-June	900-1400	P	S	Showy fruit clusters	E. Med.	
Hypericaceae	*Hypericum hircinum subsp. majus*	Büyük Tekeotu	Steam edges, damp places	May-July	10-700	P	S	Showy big flowers	Med.	
Hypericaceae	*Hypericum scabrum*	Karahasançayı	Rocky slopes	May-July	500-1500	P	H	Showy inflorescences	Ir.-Tur.	
Linaceae	*Linum pubescens subsp. pubescens*	Bezir	Maquis, fields	April-May	100-1200	A	H	Showy flowers	E. Med.	
Geraniaceae	*Erodium amanum*	Hatay İğneliği	Rocky slopes	May-July	1000-1600	P	H	Tuft formed	Ir.-Tur.	Endemic

Geraniaceae	*Geranium libani*	Belen Itırı	Bu, rocky places	April-May	900-1300	P	R	Showy leaves and flowers	E. Med.	Rare
Rutaceae	*Haplophyllum myrtifolium*	Murt Sedosu	Rocky slopes	April-May	700-1500	P	S	Showy inflorescences	Ir.-Tur.	Endemic
Sapindaceae	*Acer monspessulanum subsp. oksalianum*	Bey Akçaağacı	Mixed deciduous forests	April-May	1000-12000	P	T, S	Showy leaves and fruits	E. Med.	Endemic
Fabaceae	*Cytisus drepanolobus* *agl	Has Kuşçubuğu	Maquis, rocky slopes	April-May	100-1000	P	S	Showy inflorescences	E. Med.	Endemic
Fabaceae	*Cytisus hirsutus*	Keçi Tırfılı	Rocky places	April-May	800-1000	P	S	Showy big flowers		
Fabaceae	*Colutea halepica*** bh	Fışfiş	Rocky slopes	April-June	500-1100	P	S	Showy big flowers and showy fruits		
Fabaceae	*Dorycnium hirsutum*** agk	Kıllı Kaplanotu	Maquis	March-May	1-1000	P	S	Showy inflorescences	Med.	
Fabaceae	*Dorycnium pentaphyllum subsp. haussknechtii*** agk	Gervenük	Maquis, Pinus brutia forests	April-May	1-1200	P	S	Showy inflorescences		Endemic
Fabaceae	*Genista anatolica*	Kandaş Dikeni	Rocky slopes, forests	April-July	300-1600	P	S	Showy inflorescences	E. Med.	Ground cover
Fabaceae	*Genista jamuensis subsp. lydia*	Geyik Borçağı	Maquis, forest edges	March-May	10-1200	P	S	Showy inflorescences	E. Med.	Ground cover
Fabaceae	*Glycyrrhiza flavescens subsp. flavescens*** cg	Sarı Meyan	Maquis, Pinus brutia forest	March-May	5-600	P	H	Showy inflorescences		Endemic
Fabaceae	*Lathyrus laxiflorus subsp. angustifolius*	İnce Burçak	Forests and Bu	May -June	800-1400	P	H	Showy inflorescences	E. Med.	Endemic
Fabaceae	*Onobrychis galegifolia*	Darp Korungası	Bu, forests	March-May	300-700	P	H	Showy inflorescences	Ir.-Tur.	
Fabaceae	*Trifolium davisii*	Toros Üçgülü	Forest clearings, deciduous forests	April-May	500-1300	P	H	Showy inflorescences		Endemic
Rosaceae	*Crataegus meyeri** bhijn	Roğuk	Rocky slopes	May-June	900-1500	P	S, ST	Showy inflorescences and fruits		
Rosaceae	*Eriolobus trilobatus*	Atelması	Rocky slopes, forests	May-June	750-1100	P	T	Showy inflorescences, Showy leaves		
Rosaceae	*Pyrus syriaca var. syriaca*	Çakal Armudu	Arid rocky places	March-May	200-1300	P	T	Showy big flowers and fruits		
Crassulaceae	*Rosularia libanotica*	Arap Kayakoruğu	Rock cavities	May-June	100-1300	P	H	Leaf rosettes and showy flowers	E. Med.	Rock gardens
Crassulaceae	*Rosularia sempervivum subsp. amanensis*	Hatay Koruğu	Serpentine rocks	July-August	1200-1700	P	H	Leaf rosettes and showy flowers	E. Med.	Endemic, Rock gardens
Crassulaceae	*Sedum album*	Çobankavurgası	Rock cavities	June-August	1000-1500	P	H	Succulent leaves, Showy inflorescences		Rock gardens

Crassulaceae	*Sedum sediforme* ** b g	Yalı Koruğu	Limestone, forests	May-June	5-1000	P	H	Succulent leaves, Showy inflorescences	Med.	Rock gardens
Crassulaceae	*Prometheum sempervivoides*	Horozlelesi	Rocky slopes	June-September	1300-2000	B	H	Leaf rosettes Showy inflorescences		
Crassulaceae	*Umbilicus intermedius*	Kandilyaprağı	Limestone rocks, rock cavities	April-May	50-1000	P	H	Succulent leaves, Showy inflorescences		Rock gardens
Apiaceae	*Glaucosciadium cordifolium*	Sakarotu	Rocky river banks	August_September	50-1300	P	H	Cordate and glaucous leaflets		
Apiaceae	*Bilacunaria microcarpa*	Sarunotu	Rocky slopes	June-August	500-1500	P	H	Showy leaves and inflorescences		
Apiaceae	*Heracleum amanum*	Amanos Öğlekotu	Deciduous forest	May-June	100-1400	P	H	Showy leaves and inflorescences	E. Med.	Endemic, Rare
Apiaceae	*Pimpinella corymbosa*	Salkım Anason	Rocky slopes	April-May	350-1500	P	H	Showy inflorescences	Ir.-Tur.	
Apiaceae	*Smyrnium connatum*	Yabani Kereviz	Rocky slopes	March-May	700-1400	B	H	Showy leaves and inflorescences	Med.	
Asteraceae	*Artemisia arborescens* ** a b f g	Akpelin	Maquis, rocky slopes	May-July	1-200	P	S	Ashy leaves	Med.	Aromatic
Asteraceae	*Centaurea arifolia* ** a g	Düz Kavgalar	Maquis, Rocky slopes	April-May	200-1500	P	H	Showy inflorescences		Endemic
Asteraceae	*Centaurea doddsii* ** a g	Pek Kavgalaz	Maquis, empty fields	June-July	200-400	P	H	Showy inflorescences	E. Med.	Endemic
Asteraceae	*Centaurea haradjianii* ** a g	Kaputkulak	Pinus brutia forest	May-June	400-600	P	H	Showy inflorescences	E. Med.	Endemic
Asteraceae	*Centaurea lycopifolia*	Cerrahotu	Rocky slopes, forests	May-July	50-1500	P	H	Showy inflorescences	E. Med.	Endemic
Asteraceae	*Centaurea ptosimopappa* ** a b g	Oak Sarıbaşı	Maquis, forests	May-July	5-1500	P	S	Showy inflorescences	E. Med.	Endemic
Asteraceae	*Scorzonera pacis* ** a g	Barış Çiçeği	maquis	March-May	300-500	P	H	Showy inflorescences and achenes		Endemic
Asteraceae	*Helichrysum stoechas subsp. barrelieri* ** a g	Kudama	Maquis, limestone rocks	April-June	5-700	P	F	Showy inflorescences		Medicinal herb
Asteraceae	*Helichrysum sanguineum* ** a g	Kırmızı Guddeme	Olive groves, maquis	April-June	100-700	P	H	Ashy leaves and crimson flowers	E. Med.	Medicinal herb
Asteraceae	*Ptilostemon chamaepeuce*	Bozlanotu	Limestone rocks, maquis	April-May	1-900	P	S	Many flowered, branched stem	E. Med.	
Asteraceae	*Klasea cerinthifolia* ** a g	Topbaş	Pinus brutia forest, Bu	May-July	10-1100	P	S	Many flowered, branched stem		
Asteraceae	*Tanacetum argenteum subsp. argenteum*	Kaya Pireotu	Rocky places	July-August	1000-1200	P	Ca	Ashy leaves Showy inflorescences	E. Med.	Endemic
Asteraceae	*Tanacetum cilicicum*	Kaba pireotu	Forest clearings	July-August	500-1500	P	H	Showy inflorescences	E. Med.	

Campanulaceae	*Campanula peregrina*	Cennet Çanı	Damp places	April-July	50-1200	B	H	Showy flowers		
Campanulaceae	*Michauxia campanuloides* *agl	Keşir	Rocky slopes, rocky places, maquis	April-July	1-1500	B	H	Showy big flowers	E. Med.	
Ericaceae	*Erica manipuliflora* **adg	Püren	Maquis, empty places	April-November	1-1500	P	S	Many flowered, branched stem	E. Med.	
Primulaceae	*Dionysia zeynepiae*** a Discovered and published last year. Seeds have germinated, cultivation studies are continuing.	Zeynep Işıkçiçeği	calcareous rocks	January-February	190-400	P	Ca	Showy flowers		Endemic, rock gardens
Oleaceae	*Fraxinus ornus subsp. cilicica*	Toros Dişbudağı	Deciduous forests	April-May	500-1500	P	T	Showy inflorescences	E. Med.	Endemic
Convolvulaceae	*Convolvulus compactus*	Bodur Dolaşgan	Pinus nigra forest clearings	April-August	500-1500	P	Bu	Many Flowered stem	Med.	Ground cover
Boraginaceae	*Lithodora hispidula* *bin	Ebruli çalı	Maquis, rocky slopes	April-May	50-1000	P	S	Flowers of various colours	Med.	
Boraginaceae	*Onosma alborosea subsp. alborosea var. alborosea* *dgm	Kaya Emceği	Rocky places	March-May	100-1500	P	H	Showy inflorescences	Ir.-Tur.	Various flower colors
Boraginaceae	*Onosma cassia*	Hatay Emceği	Slopes	March-April	5-1000	P	H	Showy inflorescences	E. Med.	Rare
Boraginaceae	*Onosma gigantea*	Koca Emcek	Maquis, fields	May-July	100-1100	B	H	Showy inflorescences	E. Med.	
Plantaginaceae	*Wulfenia orientalis*	Kayagüzeli	Limestone rock cavities	February-May	200-1200	P	H	Showy inflorescences, shiny leaves	E. Med.	
Scrophulariaceae	*Verbascum antiochium* ** ag	Antakya Sığırkuyruğu	Limestone rocks	April-July	50-1000	P	H	Showy inflorescences, red stems	E. Med.	
Scrophulariaceae	*Verbascum caesareum*	Belen Sığırkuyruğu	Rocky slopes	February-May	1-1700	B	H	Showy inflorescences	E. Med.	
Acanthaceae	*Acanthus dioscoridis var. laciniatus*	Tosbağa kengeri	Olive groves	May-June	700-800	P	H	Showy inflorescences		Endemic
Lamiaceae	*Clinopodium betulifolium*	Kızıl fesleğen	Rocky slopes, limestone rocks	March-July	50-1300	P	H	Showy inflorescences	Med.	Aromatic
Lamiaceae	*Clinopodium grandiflorum*	Kaba fesleğen	Wet and damp places	May-October	400-1400	P	H	Showy inflorescences	Eu.-Sib.	Aromatic
Lamiaceae	*Lavandula stoechas subsp. stoechas* **bdg	Karabaş	Maquis	April-May	5-700	P	S	Many flewered, branched stems, aromatic	Med.	Aromatic
Lamiaceae	*Marrubium globosum subsp. globosum*	Bozcaboğum	Rocky slopes	April-July	800-1700	P	H	Showy inflorescences, ashy leaves	Ir.-Tur.	Endemic
Lamiaceae	*Nepeta cilicia*	Gök pisikotu	Rocky places, highlands	May-July	900-1700	P	H	Showy inflorescences	Med.	Aromatic
Lamiaceae	*Nepeta flavida*	Püskuyruğu	Rocky places, Bu	May-July	500-1100	P	H	Many flowered, branched stems	E. Med.	Aromatic

Lamiaceae	*Nepeta italica*	Eşekçayı	Slopes, empty fields	May-June	400-1100	P	H	Showy inflorescences	Med.	Aromatic
Lamiaceae	*Origanum amanum*	Büyük mercan	Limestone rocks	August-October	1500-2300	P	H	Showy inflorescences	E. Med.	Endemic
Lamiaceae	*Origanum syriacum subsp. bevanii* [**bg]	Halil ibrahim zateri	Maquis, Bu	May-September	5-1500	P	H	Showy inflorescences	E. Med.	Aromatic
Lamiaceae	*Phlomis amanica*	Arsuz çalbası	Maquis	May-June	5-100	P	H	Showy inflorescences	E. Med.	Endemic
Lamiaceae	*Phlomis kotschyana* [**dg]	Kaya çalbası	Maquis, Pinus brutia forest	April-June	300-1400	P	S	Showy inflorescences, cordate leaves	E. Med.	
Lamiaceae	*Phlomis longifolia* [**bh]	Amanos çalbası	Maquis	May-June	30-1200	P	S	Showy inflorescences, cordate leaves	E. Med.	
Lamiaceae	*Phlomis viscosa*	Yağlı çalba	Rocky slopes, maquis	May-July	300-1500	P	S	Showy inflorescences, cordate leaves	E. Med.	
Lamiaceae	*Salvia aramiensis* [**abg]	Bohur	Maquis, rocky slopes	April-June	150-1500	P	S	Showy inflorescences	E. Med.	Aromatic
Lamiaceae	*Salvia cassia*	Kel şalba	Maquis, rocky slopes	April-June	500-1400	P	H	Showy inflorescences	Med.	Aromatic
Lamiaceae	*Salvia sericeotomentosa* [**abg]	Nur şalbası	Maquis, rocky slopes	April-June	500-1400	P	S	Showy inflorescences	Med.	Aromatic, Endemic
Lamiaceae	*Salvia tigrina* [*aek]	Musa adaçayı	Slopes	May-June	300-900	P	H	Showy inflorescences	Med.	Aromati, Endemic
Lamiaceae	*Salvia multicaulis*	Küf reyhanı	Slopes	April-June	500-1600	P	H	Showy inflorescences	Ir.-Tur.	Aromatic, mat-forming
Lamiaceae	*Salvia viscosa* [**ag]	Kızılık	Rocky places, Bu	May-June	500-1300	P	H	Showy inflorescences	Ir.-Tur.	
Lamiaceae	*Scutellaria orientalis subsp. pinnatifida*	Kırbaç sırımı	Arid slopes	May-July	1000-1700	P	H	Showy inflorescences		Mat-forming
Lamiaceae	*Scutellaria salviifolia*	Has kaside	Rocky slopes	April-June	500-1200	P	H	Showy inflorescences		Endemic
Lamiaceae	*Thymus cilicicus*	Kılçık kekiği	Rocky places	April-July	70-1500	P	S	Many flowered branched stem	E. Med.	Ground cover
Plumbaginaceae	*Acantholimon laxiflorum* [**df]	Uzun Kirpiotu	Serpentine	May-August	200-1500	P	Sh	Showy flowers	Med.	Endemic
Aristolochiaceae	*Aristolochia billardieri*	Kargakavunu	Rocky places	April-May	250-1200	P	H	Showy flovers	Med.	R
Aristolochiaceae	*Aristolochia paecilantha*	Kundurcınık	Field edges	April-May	400-1000	P	H	Showy flovers	Med.	R
Euphorbiaceae	*Euphorbia rigida* [**ag]	Sütleğen	Slopes	February-April	50-1500	P	H	Showy inflorescences	Med.	
Euphorbiaceae	*Euphorbia kotschyana*	Sütlüce	Forest clearings	April-July	100-1500	P	H	Showy inflorescences	E. Med.	
Buxaceae	*Buxus balearica* [**bh]	Ada şimşiri	Limestone rocks	April-June	100-900	P	S	Shiny leaves	Med.	

Rubiaceae	*Galium tolosianum*	Arsuz iplikçiği	Rocky places	June-July	600-1500	P	Ca	Many flowered branched stem		Ground cover, Endemic
Iridaceae	*Iris kirkwoodiae* ** c g	Maraş Kurtkulağı	Rocky areas of limestone hills	April-May	610-1700	P	G	Showy flowers	E. Med.	
Iridaceae	*Iris histrio* ** c g	Sultan Navruzu	Rocky areas of limestone hills	January-March	500-1200	P	G	Showy flowers	Med.	
Iridaceae	*Gladiolus antakiensis* ** c g	Al Kılıçotu	Maquis	May-June	20-1300	P	G	Showy flowers	E. Med.	
Iridaceae	*Gladiolus kotschyanus*	Çayır Kılıçotu	Meadows, steam edges	January-March	500-1500	P	G	Showy flowers	Ir.-Tur.	
Amaryllidaceae	*Allium arsuzense* ** c e	Arsuz soğanı	Serpentine	May-June	1100-1600	P	G	Showy inflorescences	E. Med.	Endemic
Amaryllidaceae	*Allium cassium* ** c e	Keldağ aksoğanı	Mixed forestss, maquis, slopes	May-July	700-1700	P	G	Showy inflorescences		
Liliaceae	*Fritillaria hermonis subsp. amana*	Amanos lalesi	Rocky slopes, Deciduous forests	March-May	1000-1500	P	G	Showy flovers	E. Med.	
Liliaceae	*Muscari babachii* ** c g	Tekin sümbülü	Serpentine rocks, maquis	April-July	500-1600	P	G	Showy inflorescences	E. Med.	Endemic
Liliaceae	*Muscari inconstrictum* ** c g	İnce müşkürüm	Serpentine rocks	February-March	150-200	P	G	Showy inflorescences	Ir.-Tur.	
Orchidaceae	*Cephalanthera kurdica*	Kurtkuşçuğu	Maquis, coniferous forests	April-June	100-1500	P	G	Showy inflorescences	Ir.-Tur.	
Orchidaceae	*Cephalanthera longifolia*	Kuğu salebi	Forests	April-June	200-1500	P	G	Showy inflorescences	Eu.-Sib.	

***Successfully grown, *Cultivation failed, [a] cultivation from seed, [b] twigs, [c] rhizomes, bulbs, or tubers, [d] by transportation, [e] grown in peat soil, [f] local soil, [g] peat soil/local soil, [h] river sand, [i] river sand/local soil, [j] 35% IBA rooting hormone applied, [k] cultivation failed because of germination difficulties, [l] dried shortly after germination, [m] dried after transfer from the nursery to the soil, [n] rooting trials failed. Life spans:* P: Perennial, A: Annual, B: Biennial. Forms: H: Herbaceous, T: Tree, S: Suffruticose, R: Rhizomatous, S: Shrub, ST: Small tree, C: Climber, B:Biennial, F: Fruticose, Ca: Caespitose, Bu: Bushes, P: Prostrate, CS: Canescent suffrutescent, Sh: Shrublet, G: Geophyte, Su: Suffrutescent. Phytogeographical regions: Euro-Siberian: Eu.-Sib., Mediterranean: Med., Eastern Mediterranean: E. Med. Irano-Turanian: Ir.-Tur., Endemic: End.

CONCLUSIONS

Nature is the origin of all cultivated plants. The use of native plants for cultivation allows easy farming because they have already adapted to the climate of the region. Native plants can be easily grown with less water, less maintenance, and therefore less energy input. This is a very important advantage in today's global climate and energy crises. Another advantage is that they contribute to the local economy as an alternative agricultural product.

Even very rare local endemic plants can be cultivated successfully in foreign habitats. There are various examples of this. *Origanum amanum* is a showy endemic plant of high elevations (1500-2000 m) in the Adana and Hatay mountains. It is very unlikely to be encountered in nature because it is very rare and restricted. However, it can be easily seen at Kew Gardens in cultivation (http://t.co/rp1tXIoNV2). Another well-known example is *Tulipa sprengeri*. This tulip species was discovered in Amasya in the north of Türkiye in 1894 and shortly after was excessively collected from nature by an ornamental plants' firm. It was never collected again from the wild and is accepted as extinct in nature. However, today, it is a well-known ornamental that is widely available commercially. In recent years, this showy tulip species was replanted in its habitat in Amasya, which is the type locality, and returned to nature. Cultivation of species that have ornamental value, especially the cultivation of rare endemics, such as *Tulipa sprengeri*, will reduce the pressure on their populations in nature. Anthropogenic pressure, as well as global climatic changes, is causing serious damage to Mediterranean habitats, especially to habitats of endangered rare endemics. Propagating them through cultivation and supplying them to the ornamental plant sector legally will also ensure the continuation of their generations.

In addition to the abovementioned economical and ecological advantages, choosing and cultivating local species as ornamentals contribute to the prevention of foreign species' entering the ecosystem and to the preservation of the current ecological balance.

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