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Benefit From Natural Plants In Landscape Architecture: Example of Siirt Geophytes

Abstract

The use of natural plants in landscaping provides many advantages. The adaptation to the climate and soil conditions of the region where they grow increases the chances of living compared to other exotic species; the cost of maintenance is low compared to other types. Our country is extremely rich about natural plants. The aim of this study is to investigate the natural geophyte species that growing in Siirt province in southeastern Turkey about possibilities of using landscape designs. Firstly a literature review was made on the subject. Afterwards, the geophyte species growing in Siirt were investigated and their possibilities of using in different landscape design areas were utilized about their various characteristics. Accordingly, 27.7% of the 54 geofit species growing in Siirt are suitable for use as medicinal and aromatic plants, 40.8% are in flower parters, 9.3% are in refuges and 24% are in natural and artificial water sides. %63 of them are suitable for use for exhibition and demonstration purposes and 72.2% of them are suitable for use in rock gardens.

Keywords

Landscape architecture, endemic
plant, geophyte, natural plant, Siirt

INTRODUCTION

Plants, which are one of the indispensable elements of humankind and his environment, form a connection between the structural environments we live and nature. Plants have been used for food, fuel and medical purposes due to their many characteristics from past to present, and with their contribution to human life and comfort, they have been tried to be depicted from natural samples in the landscape. They have entered our daily life with planting design applications (Atik et al., 2013). Turkey, has a huge biodiversity potential from the point of cultural and natural diversity. This diversity is called plant genetic resources and so that Anatolia, Mediterranean and Near East are accepted as a gene center. Turkey is placed near the top in the location because of its natural plant diversity. The reasons for this richness include climate differences, topographic variations, geological and geomorphological variations, different water environment variations such as sea, lake, river, altitude differences ranging from 0-5000 m, and being located at the junction of three different geography regions (Ekim, 2005; Kılıçaslan and

Dönmez, 2016). According to Özhatay et. al. (2003) Turkey is home to up to about 12500 plant taxa (Duman, 2010). According to Güner et. al. (1991) approximately 800 of this number is composed of geophyte plants (Güner, 2006). Geofits are found in almost every part of the world but their origin is accepted as the Mediterranean basin (Ekim and Koyuncu, 1992; Seyidođlu, 2009; Kılıçaslan and Dönmez, 2016).

The aim of this study is to investigate the usage possibilities of the natural geophyte species that growing in Siirt province in landscape architecture.

MATERIAL and METHOD

The main material of the study is the geophyte species found in the natural landscape of Siirt province. Siirt province is one of the 9 provinces in the Southeastern Anatolia Region. It is a rich city in terms of natural and historical values like the other provinces of our country. As a result of the climatic and topographic characteristics of the geography it is located in, there are 54 geophyte species belonging to 6 families in the province and 7 of these species are endemic (Figure 1).



Figure 1. Endemic geophyte species growing in Siirt (Top row left to right: *Fritillaria armena* Boiss., *Ophrys cilicica*, *Hycantella siirtensis*; bottom row left to right: *Crocus biflorus* ssp. *pseudonubigena*, *Ophrys phrygia*, *Crocus karduchorum*, *Ophrys bornmullerie*)

The study was performed in three stages. In the first stage, natural plant species of Siirt province were examined and information about the geophytes which have a potential in terms of endemic species diversity was collected. In the second stage, the information related to these geophytes was evaluated and a table was created by considering the possibilities of using them in landscape design for 10 features (it is or not endemic, flower colour, blossoming time (from month to month), medical and aromatic use, shade and semi-shade resistance, use in flower beds, use at medians, use at natural and artificial water's

edge, use for exhibition and demonstration purposes, use in rock gardens) as in Kılıçaslan and Dönmez (2016). In the last stage, all available data were evaluated in terms of landscape architecture.

RESULTS AND DISCUSSION

Geophytes (bulb plants) and their use in landscape architecture works

The term geophyte, first used by Danish botanist Christian Raunkier (Ekim and Koyuncu, 1992), is found in Angiospermae from Spermatophyta. This group includes monocotyledonous and dicotyledonous species, which are divided into two groups as bulbous and tuberous plants. In addition,

geophytes divide into groups such as real onions, onions, tubers, corm (cormy tubers) and so on by many researchers (De Hertogh and Le Nard, 1993; Zencirkıran, 2002; Kılıçaslan and Dönmez, 2016).

The first salient features of the plants that used in a landscape design are size, form, texture and color. Among these, especially plant size and color are the first perceived features compared to other features. People firstly look at the appearance of the plants, so the size and color of the plants directly affects the interestingness and all the frame of the design. A person who feels a successful design in terms of color, scale and proportion; it should perceive the space without weighing the scale in his mind and feeling uncomfortable (Robinson, 1992; Kalın, 2004; Bell, 2004; Hansen, 2011; Karaşah and Var, 2012; Alp et al., 2016).

The dominant structure and skeleton in planting design are trees and shrubs, and secondly, seasonal flowers and bulbous tubers plants shape the structure. These plants are immediately noticed with their vivid colors and abundant flowering and as well as remarkable forms. Due to its dendrological and aesthetic features, seasonal flowers and bulbous plants are widely used in urban areas, especially in flower beds (Kalın, 2004; Bell, 2004; Alp

and Asur, 2006; Hansen, 2011; Alp et al., 2016). According to Seyidođlu (2009) and Onat (2012) the use of geophytes in landscape designs is as follows (Kılıçaslan and Dönmez, 2016):

- Due to their variety of species and can be planted at different periods, geophytes use at curb plantings.
- They can effective appearances in single or groups with shrub groups or herbaceous at curb plantings (Rees, 1992; Giles and Cornwell, 2004; Evans, 2005; Alp and Asur, 2006).
- In grass lands, spring flowering species are generally preferred. They are used in single color or multi-colored groups. But it should be carefull that not to mow grass until bulbous plants' leaves turn yellow (Leholm, 1998; Evans, 2005).
- For humid conditions, it must be choosen suitable species of bulbous plants to arrangements at natural and artificial lakes and ponds (Leholm, 1998; Cornwell, 2004).
- Species such as *Allium*, *Colchicum*, *Fritillaria*, *Lilium*, *Narcissus*, *Galanthus*, *Muscari*, *Scilla* can be used in arrangements of rock gardens. Group plantings are preferred in designs (Rees, 1992; Leholm, 1998; Giles and Cornwell, 2004).
- Bulbous species are suitable for use with deciduous shrubs and trees, but it is

unadvisable for use with evergreen species as they can't get enough light. It can facilitate movement that using them with at the bottom of the trees around the buildings, on the edges of narrow-leaved trees or bushes as combinations (Leholm, 1998; Sarıbaşı, 1999; Giles and Cornwell, 2004).

- In flower beds, informal arrangements should be preferred instead of formal (De Hertog and Powell, 1999; Giles and Cornwell, 2004; Alp and Aşur, 2006).
- They can use in large pots (container) and according to Gutterman [27], the use of bulbous plants may be preferred where green areas are at a minimum level such as urban areas, squares, airports, bus terminals, railway stations, pier squares.
- Plantations with geophytes in places as plazas, hotel gardens, in the office, shopping centers, home gardens and so on is provided a pleasant and effective appearance (Rees, 1992; Leholm, 1998; Alp and Aşur, 2006).
- The use of bulbous plants with groundcover plants together can create beautiful combinations. In designs, the height relationship between ground cover plants and bulbous plant species should be considered. Groundcover species should not be more than half height of bulbous plants. In addition, the ground cover plants

support the body of bulbous plants. Thus, the flowers do not mud with rain or irrigation water (Leholm, 1998; Avans, 2005). Among the bulbous plants, tulips are mostly used for show and exhibition purposes, followed by hyacinths and daffodils. These are followed by species with large and showy flowers such as *Dahlia*, *Fritillaria*, *Lilium*, *Crocus*. They can be used with single or small/large groups in designs (Leeds, 2001; Evans, 2005).

- Bulbous plants with pleasant scents and showy flowers may be preferred in fragrance gardens. For example, *Narcissus* species have an effective appearance with their fragrant flowers. *Liliums* blossom in summer are one of the indispensable species with their excellent scents (Relf, 1997; Leeds, 2001).

Geofit species grown in Siirt province and their usage in landscape architecture

There are 54 geophyte species growing in Siirt province (Table 1) and 7 of these species are endemic species. These species are *Hyacinthella siirtensis*, *Fritillaria armena*, *Crocus biflorus* subsp. *Pseudonubigena*, *Crocus karduchorum*, *Ophrys cilicica*, *Ophrys Phrygia* and *Ophrys bornmuelleri* subsp. *carduchorum*.

Table 1. List of geophytes growing in Siirt

FAMILY	SPECIES	FAMILY	SPECIES
Ranunculaceae	<i>Ranunculus diversifolius</i>		<i>Crocus biflorus</i> subsp. <i>Pseudonubigena</i> (Endemic)
Araceae	<i>Biarum carduchorum</i>	Iridaceae	<i>Crocus karduchorum</i> (Endemic)
	<i>Allium paniculatum</i>		<i>Gladiolus antekiensis</i>
	<i>Allium akaka</i>		<i>Gladiolus kotschyanus</i>
	<i>Allium chrysantherum</i>		<i>Iris persica</i>
	<i>Scilla persica</i> Hausskn		<i>Cephalanthera longifolia</i>
	<i>Scilla hyacinthoides</i> L.		<i>Epipactis helleborine</i>
	<i>Muscari comosum</i> (L.) Miller		<i>Limodorum abortivum</i> var <i>abortivum</i>
	<i>Bellevalia pycnantha</i> (C.Koch) A.Los.-Los.		<i>Platanthera chlorantha</i>
	<i>Hyacinthella siirtensis</i> Mathew (Endemic)		<i>Ophrys transhyrcana</i> subsp. <i>transhyrcana</i>
	<i>Fritillaria imperialis</i> L.		<i>Ophrys reinholdii</i> subsp. <i>straussii</i>
Lilaceae	<i>Fritillaria armena</i> Boiss. (Endemic)	<i>Ophrys cilicica</i> (Endemic)	
	<i>Fritillaria pinardii</i> Boiss.	<i>Ophrys holoserica</i> subsp. <i>holoserica</i>	
	<i>Fritillaria assyriaca</i> subsp. <i>assyriaca</i>	<i>Ophrys bornmuelleri</i> subsp. <i>grandiflora</i>	
	<i>Fritillaria uva-vulpis</i>	<i>Ophrys oestriifera</i> subsp. <i>oestriifera</i>	
	<i>Gagea villosa</i> var. <i>Villosa</i>	Orchidaceae <i>Ophrys phrygia</i> (Endemic)	
	<i>Scilla persica</i>	<i>Ophrys umbilicata</i> subsp. <i>Khuzestanica</i>	
	<i>Ornithogalum narbonense</i>	<i>Ophrys schulzei</i>	
	<i>Ornithogalum umbellatum</i>	<i>Himantoglossum affine</i>	
	<i>Muscari comosum</i>	<i>Anacamptis pyramidalis</i>	
	<i>Tulipa sintenesii</i>	<i>Comperia comperiana</i>	
<i>Gynandriris sisyrinchium</i>	<i>Orchis tridentata</i>		
<i>Gladiolus antakiensis</i>	<i>Orchis simia</i>		
Amaryllidaceae	<i>Narcissus tazetta</i> subsp. <i>tazetta</i>	<i>Orchis spitzelli</i>	
	<i>Iris aucheri</i>	<i>Dactylorhiza romana</i> subsp. <i>georgica</i>	
Iridaceae	<i>Iris pseudocaucasica</i>	<i>Ophrys bornmuelleri</i> subsp. <i>Bornmuelleri</i>	
	<i>Gynandriris sisyrinchium</i>	<i>Ophrys bornmuelleri</i> subsp. <i>carduchorum</i> (Endemic)	

In order to determine the use of geophytes grown in Siirt in the landscape designs, their properties such as color, size, growing area, etc. were investigated and it is discussed their features for 10 parameters (it is or not endemic, flower colour, blossoming time

(from month to month), medical and aromatic use, shade and semi-shade resistance, use in flower beds, use at medians, use at natural and artificial water's edge, use for exhibition and demonstration purposes, use in rock gardens) (Table 2).

Table 2. Evaluation of Siirt geophytes in terms of their usage in landscape architecture works

Latin Name	It is or not endemic	Flower colour	blossoming time (month)	medical and aromatic usage	shade and semi-shade	use in flower beds	use at medians	use at natural and artificial	use for exhibition and demonstration purposes	use in rock gardens
<i>Ranunculus diversifolius</i>		Yellow	6 – 9							✓
<i>Biarum carduchorum</i>		Purple	8 – 9					✓	✓	
<i>Allium paniculatum</i>		Lilac	6 – 8		✓				✓	✓
<i>Allium akaka</i>		Light purple	5 – 6	✓	✓					✓
<i>Allium chrysantherum</i>		Yellow	5 – 6		✓	✓				
<i>Scilla persica</i> Hausskn		Blue	4 – 5		✓	✓			✓	
<i>Scilla hyacinthoides</i> L.		Light lilac	4 – 5			✓		✓		
<i>Muscari comosum</i> (L.) Miller		Purple	3 – 8		✓	✓	✓	✓	✓	✓
<i>Bellevalia phcnantha</i> (C.Koch) A.Los.- Los.		Purple	5 – 6			✓		✓	✓	
<i>Hyacinthella siirtensis</i> Mathew	✓	Light blue	3 – 3							✓
<i>Fritillaria imperialis</i> L.		Orange	3 – 5						✓	✓
<i>Fritillaria armena</i> Boiss.	✓	Purple	4 – 7						✓	✓
<i>Fritillaria pinardi</i> Boiss.		Purple	4 – 6						✓	✓
<i>Fritillaria assyriaca</i> subsp. <i>assyriaca</i>		Purple	3 – 5			✓			✓	✓
<i>Fritillaria uva-vulpis</i>		Purple						✓	✓	
<i>Gagea villosa</i> var. <i>Villosa</i>		Yellow	3 – 5			✓	✓			
<i>Scilla persica</i>		White	4 – 5						✓	✓
<i>Ornithogalum narbonense</i>		White					✓			

<i>Ornithogalum umbellatum</i>	Purple	3 – 5	✓	✓				
<i>Muscari comosum</i>	Purple	3 – 8	✓	✓	✓	✓	✓	✓
<i>Tulipa sintenesii</i>	White	4 – 5	✓			✓		
<i>Gynandriris sisyrinchium</i>	Purple	2 – 5	✓			✓		✓
<i>Gladiolus antakiensis</i>	Purple	5 – 5						✓
<i>Narcissus tazetta</i> subsp. <i>tazetta</i>	White	11 – 5	✓			✓	✓	✓
<i>Iris aucheri</i>	Light blue	2 – 4	✓					✓
<i>Iris pseudocaucasica</i>	Yellow	3 – 4						✓
<i>Gynandriris sisyrinchium</i>	Blue	2 – 5	✓				✓	✓
<i>Crocus biflorus</i> subsp. <i>Pseudonubigena</i>	✓ White	2 – 6					✓	✓
<i>Crocus karduchorum</i>	✓ Lilac	9 – 10					✓	✓
<i>Gladiolus antekiensis</i>	Purple	5 – 5						✓
<i>Gladiolus kotschyanus</i>	Purple	4 – 8				✓		✓
<i>Iris persica</i>	Light blue	3 – 4					✓	✓
<i>Cephalanthera longifolia</i>	Purple	4 – 6	✓	✓			✓	✓
<i>Epipactis helleborine</i>	Purple	6 – 7						✓
<i>Limodorum abortivum</i> var. <i>abortivum</i>	Purple	4 – 7		✓			✓	
<i>Platanthera chlorantha</i>	White	6 – 7	✓	✓			✓	✓
<i>Ophrys transhyrcana</i> subsp. <i>transhyrcana</i>	Purple	4 – 5	✓	✓			✓	
<i>Ophrys reinholdii</i> subsp. <i>straussii</i>	Lilac	4 – 5	✓	✓			✓	✓
<i>Ophrys cilicica</i>	✓ Purple	4 – 5	✓	✓			✓	✓
<i>Ophrys holoserica</i> subsp. <i>holoserica</i>	Orange	3 – 5	✓	✓			✓	✓
<i>Ophrys bornmuelleri</i> subsp. <i>grandiflora</i>	Purple	3 – 4	✓	✓			✓	✓
<i>Ophrys oestrifera</i> subsp. <i>oestrifera</i>	Yellow	5 – 7	✓	✓		✓	✓	✓
<i>Ophrys phrygia</i>	✓ Yellow	4 – 6	✓	✓			✓	✓

<i>Ophrys umbilicata</i> subsp. <i>Khuzestanica</i>	Yellow	4 – 5	✓	✓	✓	✓
<i>Ophrys schulzei</i>	Tile red	4 – 5		✓	✓	✓
<i>Himantoglossum affine</i>	Purple	5 – 7				✓
<i>Anacamptis pyramidalis</i>	Light purple	4 – 6	✓			✓
<i>Comperia comperiana</i>	Purple	4 – 7		✓	✓	✓
<i>Orchis tridenta</i>	White	4 – 5		✓	✓	
<i>Orchis simia</i>	White	4 – 5		✓	✓	✓
<i>Orchis spitzelli</i>	White	4 – 5	✓	✓	✓	✓
<i>Dactylorhiza romana</i> subsp. <i>georgica</i>	Pink	4 – 6				✓
<i>Ophrys bornmulleri</i> subsp. <i>Bornmulleri</i>	White	4 – 5	✓			✓
<i>Ophrys bornmuelleri</i> subsp. <i>carduchorum</i>	✓ Yellow	4 – 5	✓	✓		✓

The geophytes growing in Siirt and generally blooming in April remain flowering for an average of 3-4 months. Flower colors range from purple to lilac, blue to yellow and white. 27.7% of them are used as medicinal and aromatic plants. Approximately 29.7% of them resist shade and semi-shade and 40.8% is suitable for use in flower beds. Only 9.3% of Siirt geophytes are suitable for use in medians and 24% of them can be used in natural and artificial water sides. 63% of the species can be used for exhibition and demonstration purposes. The rate of species that can be used in rock gardens is 72.2%.

CONCLUSION

Natural species are distributed under natural conditions and without human intervention. Therefore, natural species are more durable and satisfied than the cultivated species. The ability of natural species to tolerate extreme conditions also ensures their sustainability. The usage of natural species is great importance in landscape designs because of reducing maintenance costs, providing a healthy plant texture, adapting to the local environment, and improving environmental quality. According to Ozhatay (2009) the installation and maintenance costs of natural plants are

lower than other cultural or exotic species (Atik et al., 2013).

Geophytes are quite abstemious with regard to grow. Especially the naturally growing geophytes have very low irrigation requirements. For this reason, the use of naturally grown geophytes in xeriscape designs is important both in aesthetic and ecological aspects (Kılıçaslan and Dönmez, 2016).

Natural plant species which are very low costs and maintenance can be successfully to be used in urban and rural landscape designs. In order to use natural species widely, they should be cultured, especially endemic species should be adapted, produced and sold in nurseries. Catalogs should be prepared to identify the natural plant species sold in nurseries. Thus, by using natural vegetation effectively and consciously in landscape designs, it will contribute to the national economy in terms of sustainable designs and development (Cengiz et al., 2016).

As a result, the geophytes grown naturally in Siirt province were investigated for landscape designs and it was precipitated that the species were generally showy flowers, they could be used in landscape designs, flower beds, exhibition and

demonstration purposes as well as in rock gardens, water sides and under forest cover. It is very important to take the concrete steps to establish the necessary infrastructure for producing and reproducing of these species in nurseries, for carrying out researches and for bringing these species to landscape architecture works.

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