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Determination of the usability of woody plant species in Tortum - Creek Watershed for functional and aesthetical uses in the respect of landscape architecture

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Abstract

This study was carried out in Tortum – Creek Watershed in 2002 and 2003, which is included in the provincial boundary of Erzurum, which exhibits reservoir characteristics hydrographically, and has a surface area of 1.900 km². The study area is also on the cross-section point of Irano-Turanian and Euro-Siberian floristic regions. The aim of this study was to determine the native woody plant species which can be used in landscape planning and designs. As the result of the study, totally 54 woody plant species from 25 families were found in the area. After the evaluation of the phenological and morphological characteristics of the plants, it was determined that of all the determined species, 30 can be used in landscape restorations; 28 in the planning of road-sides, refuges and car-parks; 19 in rocky gardens and dry-wall gardens, 9 as ground-covering and 39 for their aesthetical characteristics.

Key Words: Woody plants Llandscape planning, Natural plant species, Tortum – Creek Watershed

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Tortum Çayı Havzası'nın odunsu bitkilerinin peyzaj mimarlığı açısından fonksiyonel ve estetik amaçlı kullanım olanaklarının belirlenmesi

Özet

Bu araştırma, 2002 ve 2003 yıllarında, hidrografik açıdan bir havza özelliği gösteren yaklaşık 1900 km^2 lik bir yüzölçüme sahip, Erzurum'un Tortum ve Uzundere ilçeleri içerisinde yer alan Tortum Çayı Havzası'nda yapılmıştır. Çalışma alanı fitocoğrafik konum itibari ile A8 ve A9 kareleri içerisinde yer alır. Araştırma alanı aynı zamanda İran- Turan ve Avrupa- Sibirya floristik bölgelerinin kesişim noktasındadır. Araştırmanın amacı; yöredeki kentsel ve kırsal mekanlarda peyzaj planlama ve tasarım çalışmalarında kullanılabilecek doğal odunsu bitkileri belirlemektir. Araştırma alanında, 25 familyaya ait 54 odunsu bitki türü tespit edilmiştir. Ayrıca yetişme ortamı özellikleri ile bitkilerin fenolojik ve morfolojik özellikleri belirlenmiştir. Yapılan değerlendirme sonucunda bu bitki türlerinden, 30'unun peyzaj onarım çalışmalarında, 28'inin karayolu kenarı, orta refüj ve otopark planlamalarında, 19'unun kaya ve kuru duvar bahçelerinde, 9'unun yer örtücü olarak ve 39'unun estetik özelliklerinden dolayı kullanılabileceği sonucuna varılmıştır.

Anahtar Kelimeler: Odunsu bitkiler, peyzaj planlama, doğal bitki türleri, Tortum Çayı Havzası

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1. Introduction

Turkey is rich in plant diversity since it has the capability of inhabiting the plant species from Mediterranean, Irano-Turanian and Euro-Siberian floristic regions due to the great variety in its soil structures formed by geological and topographical factors and several types of climates. According to Özhatay et al. (2005), of 10,765 flowering and fern species naturally growing in Turkey, 3,022 are endemic, which are 3,043 if added the varieties and subspecies. East Anatolia Region takes an important part in this diverse flora. It is followed by the Mediterranean Region with 750 species (Ekim et al., 2000).

Although the study area, which is on the cross-section point of the Irano-Turanian and Euro-Siberian floristic regions, has a miscellaneous nature, it has been paid less attention compared to other zones. In the study area, while species originating from Irano-Turanian are prevalent in the surrounding area of the district of Tortum, the species from Euro-Siberian and Mediterranean floristic regions can be encountered in the area around the Lake of Tortum (Aksoy, 1981; Altan, 1991). In a previous study over the study area, it was determined that 50,3 % of the plants which were identified between the elevations of 1900-3169 m are from Irano-Turanian, 14,6 % from Euro-Siberian and 7,3 % from Mediterranean floristic regions while the rest (13,2 %) are commonly distributed species (Tatlı and Behçet, 1989).

Trees can have contributions to urban environment in many ways such as reduction of air pollution; energy conservation by balancing heat; releasing moisture to the surrounding; inhabiting flora and fauna (Beckett et al., 1998; Akbari et al., 2001); noise control (Çepel, 1988; Walker, 1991); reducing wind velocity and amount of dust and green house gases (Nowak et al., 2000; Nowak and Crane, 2002); reducing light reflection (Walker, 1991; Heisler, 1986; Heisler and Grant, 2000). In addition to favourable functions such as preventing erosion, conditioning waste areas, reducing avalanche and land slide risk, coast stabilisation, improving soil, for landscape restoration techniques (Urgenc, 1990; Braun and Fluckiger, 1998), trees may also have many advantageous effects on city aesthetics and contribute to city image, in many ways such as aesthetical sensation, outlining, bordering, surrounding, directing, shadowing, avoiding stress and providing safety (Arslan et al., 1996; Leszczynski, 1999; Aslanboga, 2002; Moore, 2002).

The number of ornamental woody plants, which can be used at outdoors, is not much in Erzurum and its surrounding due to the extreme climatic conditions. In this study, it was aimed to make an inventory of the woody plants in native vegetation; to observe their landscape characteristics in all season, and to determine those, which can be used in Erzurum and its surrounding for their aesthetical and functional characteristics. Another aim in the study may be that data obtained in the study can be used for various researches to be carried out in the future, such as propagation, collection gardens, flora tourism and gene source studies.

2. Materials and methods

This study deals with the woody plant species growing naturally in Tortum – Uzundere valley, which constitutes Tortum – Creek Watershed. Size of the watershed is about 1,900 km² and it is 70 km away from Erzurum.

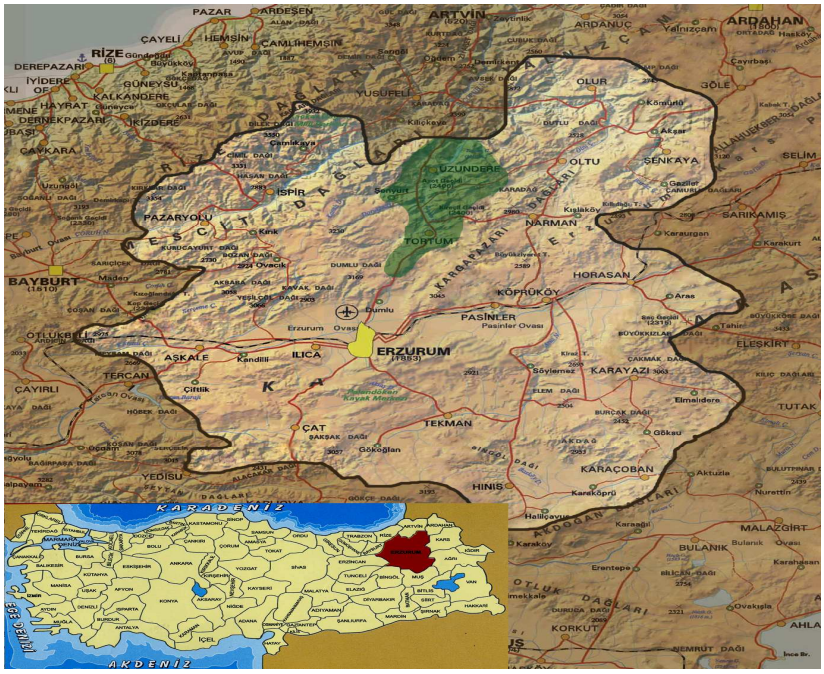

Figure 1. Location of study area

The valley is a micro-climatic area with its fantastic topographical features and richness in biologic diversity. It is phyto-geographically located at the intersection of A8 and A9 squares (Davis, 1965). The mean annual temperature in the study area is 8.2 ºC, with maximum average of 19.6 ºC in July and minimum average of -3.4 ºC in January. Means of maximum temperature never fall below zero throughout the year. Mean yearly rainfall is 435 mm, which mainly falls in spring, especially in May.

The study site was chosen based on the variations in plant species considering different landscape types such as forest, wetlands and arid ecosystems. The study comprises the stages of (1) field surveying for plant species, which includes the collection and identification of the species and the determination of the features of their habitats and their dendrological characteristics; and (2) analysis and evaluation of their possible functional and aesthetical uses.

2.1. Field Survey

Field surveys were conducted in a two – year period by visiting the area in regularly intervals in order to determine the naturally growing plant species. Samples were collected from watersides, roadsides, forest areas, field-sides, grasslands, stony and arid areas, alpine areas, around settlements, orchards and house-gardens in different seasons. Plant parts (stems, leaves, flowers and fruits) were collected in order to identify the plant species. The herbarium at the Black-Sea Technical University supported the identification process and related literature (Davis, 1965-1985; Var, 1992; Kaya, 1996; Ansin, 1994; and Brickell, 1996) was used to compare their species with the collected ones. Prepared plant materials were turned into herbarium specimens and saved for the use in the herbarium constituted in the Atatürk University Atapark Botanical Garden. Data on soil properties of the study area was taken from the previous studies about the area. Habitat features of the species (e.g. arid, wet, moist, stony, sloppy, orientation, altitude, species density), and their dendrological characteristics (e.g. structure, height, colour, flower-fruit status and ground covering rate) were also recorded for each plant species. The altitude was measured using the GPS (Global Positioning System).

2.2. Analysis and Evaluation

Data obtained from field surveys was evaluated considering the functional use of plant species such as for the protection from erosion and avalanche, stabilization of roadsides, amelioration of sand hills, wind break and plantation of refuge and auto parking. In order to better determine the aesthetical and functional use of plant species in landscape design and planning, several previous studies on the topic (Foster, 1968; Çetik, 1973; Koç, 1977; Bayraktar, 1980; Altan et al., 1982; Uzun et al., 1982; Var, 1992; Walker et al., 1994; Gültekin, 1994; Arslan et al., 1996; Brickell, 1996; Daşdemir et al., 1996; Yılmaz et al. 1996a, Dirr 1998; Jim and Liu 2001; Aslanboğa, 2002; Güngör et al., 2002; Yücel, 2002) were reviewed by considering the phyto-sociological, phyto-ecological and phonological properties of the species in the area and the features of their habitats.

3. Results

There is a high plant potential in the study area, which is located on the intersection point of East Anatolia Region and East Blacksea Region, since it inhabits plants from various vegetation types such as forest, plateau, steppe and wetlands. The plants collected from different parts of the area (e.g. riverbanks, roadsides, forests, proximity of cultivated areas, rangelands, rocky and arid areas, areas in alpine zone, around settlements, orchards, and home gardens) in different vegetation periods in 2002 and 2003 and identified are shown in Table 1. Among the plant species determined in the study area especially *Pinus slyvestris* L. are commonly found at 2350 m. On steep hills and stone covered areas with dry surfaces, *Acer divergens* Pax var. d*ivergens, Colutea armena* Boiss. & Huet, *Cotinus coggygria* Scop., *Cotoneaster nummularia* Fisch & Mey., *Juniperus oxycedrus* L. subsp. *oxycedrus, Paliurus spina-christii* Miller, *Populus tremula* L., *Quercus macranthera* subsp. *syprensis* (C.Koch.) Menitsky, *Rosa canina* L. are found in mixed forests. Along the water ways *Hippophea rhamnoides* L., *Salix triandra* L. subsp. *bornmulleri* L., *Tamarix smyrnensis* Bunge., are common. However, some plant species *Punica granatum* L., *Euonymus latifolius* L., Miller subsp. *latifolius, Jasminum fruticans* L., *Mespilus germanica* L., *Sorbus umbellata* (Desf.) Fritsch *var. umbellata* are rarely found in arid areas.

As the result of the study, totally 54 woody plant species were identified. Most of these species (92%) are deciduous and the number of coniferous species is only four while only Scotch pine is prevalent.

Thirty plant species growing on steep slopes and stone covered areas under arid conditions, resistant to extreme conditions, stemming form bottom and having high regeneration capacity were determined (Table 1). Among them are *Acer divergens* Pax var. d*ivergens, Ailanthus altissima* (Mill.) Swingle, *Berberis vulgaris* L., *Carpinus betulus* L., *Colutea armena* Boiss.& Huet, *Cotinus coggygria* Scop., *Cotoneaster nummularia* Fisch & Mey., *Ephedra major* Host., *Ficus carica* L. subsp. *Carica*, *Hippophea rhamnoides* L., *Juniperus communis* L. subsp. *nana* Syme, *Juniperus oxycedrus* L. subsp. *oxycedrus, Lonicera iberica* Bieb., *Paliurus spina-christii* Miller, *Populus tremula* L., *Quercus macranthera* subsp. *syprensis* (C.Koch.) Menitsky, *Rosa canina* L., *Salix triandra* L.subsp. *bornmulleri* L., *Tamarix smyrnensis* Bunge. and *Ulmus minor* Miller subsp. *minor*.

In the study area, species that can grow in partial or wholly rocky fields were determined to be ideal for rock and dry wall gardens with their special habitats and aesthetic features such as form and colour (Walker et al., 1994). It was found that 19 species could be used for this purpose (Table 1). The most important of them are *Berberis vulgaris* L., *Colutea armena* Boiss.& Huet, *Cotinus coggygria* Scop., *Cotoneaster nummularia* Fisch & Mey., *Ephedra major* Host., *Hippophea rhamnoides* L., *Jasminum fruticans* L., *Juniperus communis* L. subsp. *nana* Syme, *Juniperus oxycedrus* L. subsp. *oxycedrus, Lonicera iberica* Bieb., *Paliurus spina-christii* Miller, *Punica granatum* L., *Rosa canina* L. and *Vitis sylvestris* Gmelin.

Because they can be grown with less maintenance expenses, ground-covering species are seen as the alternatives to grassy species. Such species are also found in the study area and given in Table 1. It was determined that totally nine species can be used as ground-covering. Among them are *Colutea armena* Boiss & Huet., *Ephedra major* Host., *Juniperus communis* L. subsp *nana* Syme, *Juniperus oxycedrus* L. subsp. *oxycedrus, Rosa canina* L.

Aesthetical values of the species were determined considering their features, such as form, texture, leaflet colour, stem, branch, flower and fruit, colour effect of leaflet in fall, beauty of form, beauty of view, canopy effect and winter view ability. Among the species found in the area, thirty-nine pull attraction with their aesthetic features (Table 1). In this respect, following natural and cultured species were found to be important; *Ailanthus altissima* (Mill.) Swingle *Berberis vulgaris* L., *Colutea armena* Boiss. & Huet, *Cornus mas* L., *Cotinus coggygria* Scop., *Crataegus oriantalis* Palas ex Bieb. var. *oriantalis, Elaeagnus angustifolia* L., *Ephedra major* Host., *Cydonia oblonga* Miller, *Diospyros kaki* L., *Diospyros lotus* L., *Euonymus latifolius* L. Miller subsp. *latifolius, Ficus carica* L. subsp. *carica, Hippophea rhamnoides* L., *Jasminum fruticans* L., *Juniperus communis* L. subsp *nana* Syme, *Juniperus foetidissima* Wild., *Juniperus oxycedrus* L. subsp. *oxycedrus, Lonicera iberica* Bieb., *Malus communis* L., *Mespilus germanica* L., *Morus alba* L., *Ostrya carpinifolia* Scop., *Paliurus spina-christii* Miller, *Persica vulgaris* Miller, *Pinus sylvestris* L., *Populus nigra* L. subsp. *nigra, Populus tremula* L., *Prunus avium* L., *Prunus cerasus* L., *Punica granatum* L., *Rubus caesicus* L., *Sorbus umbellata* (Desf.) Fritsch *var. umbellate, and Tamarix smyrnensis* Bunge.

In the study area, several native species were determined and among the most important ones are *Cotinus coggygria* Scop., *Crataegus oriantalis* Palas ex Bieb. var. o*riantalis, Elaeagnus angustifolia* L., *Ficus carica* L. subsp. *carica, Hippophea rhamnoides* L., *Ostrya carpinifolia* Scop., *Paliurus spina-christii* Miller, *Pyrus eleagrifolia* Pall., *Sorbus umbellata* (Desf.) Fritsch *var. umbellata, Tamarix smyrnensis* Bunge and *Ulmus minor* Miller subsp. *Minor*

Table 1. Woody plant species found in the study area with their characteristics and usability opportunities in landscape architecture

Species	Family	Altitude, (m)	Usability in landscape restorations	Road and auto-parking planting	Usability in rock-gardens	Aesthetical characteristics	Usability as ground covering plants
Acacia longifolia Wild.*	*Leguminosae*	1000-1900	▲ Δ ◙	╣ ╪ ╟	+	☼ Θ ▉ ●	
Acer divergens Pax var. *divergens*	*Aceraceae*	1300-1600	↔ Δ ▓ ▒			Θ ♠	
Ailanthus altissima (Mill.) Swingle *	*Simaroubaceae*	1400-1700	↔ ▲ Δ ▓ ▒	╣ ╪ ╟		☼ ♣ ▉ ●	
Berberis vulgaris L.	*Berberidaceae*	1000-1900	▲ ↔	╟	+	☼ Θ ♣ ♠	
Carpinus betulus L.	*Corylaceae*	1600-1900	↔ ▲	╣ ╪ ╟			

Table 1 (Continue)

Celtis glabrata L.	*Ulmaceae*	1300-1600	↔	╣ ╪ ╟			
Colutea armena Boiss. & Huet	*Leguminosae*	1200-1800	↔ Δ ◙ ▓ ∩ ▒		+	☼ Θ ▉ ♠	+
Cornus mas L.	*Cornaceae*	1000-1600				☼ ♣ Θ ▉ ♠	
Cornus sanguinea L. subsp. *australis* (J.A. Mayer) Jav.	*Cornaceae*	1000-1600				☼ ♣ Θ ♠ ▉ ●	
Corylus maxima Miller *	*Corylaceae*	1000-1500				☼ ♣ Θ ♠ ▉ ●	
Cotinus coggygria Scop.	*Anacardiceae*	1000-1900	↔ ▲ Δ ▓ ∩ ▒	╣ ╪ ╟	+	☼ ♣ ▉ ♠	
Cotoneaster nummularia Fisch & Mey.	*Rosaceae*	1000-2100	↔ Δ	╟	+		
Crataegus oriantalis Palas ex Bieb. var. *Oriantalis*	*Rosaceae*	1200-1400	▲	╣ ╪ ╟		☼ ♣ Θ ▉ ♠ Ω	
Cydonia oblonga Miller	*Rosaceae*	1000-1500				☼ Θ ♣ ♠	
Diospyros kaki L.	*Ebenaceae*	1000-1200				☼ ♣ Θ ▉ ♠ ●	
Diospyros lotus L.	*Ebenaceae*	1000-1200				☼ ♣ Θ ♠ ▉ ●	
Elaeagnus angustifolia L.	*Elaeagnaceae*	1000-1900	▲ Δ	╣ ╪ ╟			
Ephedra major Host.	*Ephedraceae*	1700-1800	↔ ▓ ▒		+		+
Euonymus latifolius L. Miller subsp. *latifolius*	*Celastaraceae*	1400-2000	▲			☼ Θ ▉	
Ficus carica L.subsp. *carica*	*Moraceae*	1000-1700	↔ Δ	╣ ╪ ╟		♣ Θ ♠ ▉	
Hippophea rhamnoides L.	*Eleagnaceae*	1000-1900	↔ ▲ Δ ▓ ∩ ▒	╣ ╪ ╟	+	♣ Θ ▉ Ω	
Jasminum fruticans L.	*Oleaceae*	1400-1600			+	☼ ▉	
Juglans regia L.	*Juglandaceae*	1000-1600		╬		Θ ♠ ●	
Juniperus communis L. subsp *nana* Syme	*Cupressaceae*	1200-2350	↔ Δ		+		+
Juniperus foetidissima Wild.	*Cupressaceae*	1500-2200	▲	╬		♣ ● Ω ▉	
Juniperus oxycedrus L. subsp. *oxycedrus*	*Cupressaceae*	1400-2000	▲ ↔ Δ		+	♣ ● ▉ Ω	+
Lonicera iberica Bieb.	*Caprifoliaceae*	1000-1700	▲ ↔	╣ ╟	+		
Malus communis L. *	*Rosaceae*	1000-1850		╟ ╪		☼ Θ ♠	
Mespilus germanica L. *	*Rosaceae*	1300-1600		╣ ╪ ╟		☼ Θ ♠	
Morus alba L. *	*Moraceae*	1000-1600		╬			
Ostrya carpinifolia Scop.	*Corylaceae*	1500-2000	↔ ▲ ▓ Δ ∩ ▒	╣ ╪ ╟		☼ Θ ♠ ●	
Paliurus spina-christii Miller	*Rhamnaceae*	1200-1600	↔ ▲ Δ ▓ ∩ ▒	╣ ╟	+	☼ Θ ▉ ♠	
Persica vulgaris Miller *	*Rosaceae*	1000-1600				☼ Θ ♠	
Pinus sylvestris L.	*Pinaceae*	1000-2350	▲			♣ Ω ▉	
Populus nigra L. subsp. *nigra*	*Salicaceae*	1000-2000	▲				
Populus tremula L.	*Salicaceae*	1000-2200	↔ ▲ ▒				
Prunus avium L. *	*Rosaceae*	1200-1500				☼ Θ ♠	
Prunus cerasus L. *	*Rosaceae*	1200-1500				☼ Θ ♠ ↑	
Prunus domestica L. *	*Rosaceae*	1000-1300					

Table 1 (Continue)

Punica granatum L. *	*Punicaceae*	1000-1400			+	☼ ♣ Θ ♠	
Pyrus eleagrifolia Pall.	*Rosaceae*	1000-1800		╣ ╪ ╟		☼ ♣ Θ ♠	
Pyrus salicifolia Pallas *var. salicifolia*	*Rosaceae*	1000-1800				☼ ♣ Θ ♠	
Quercus macranthera subsp. *syprensis* (C.Koch.)	*Fagaceae*	1400-2000	↔ Δ ▲ ◙				
Rhamnus pallasii Fisch.& Mey.	*Rhamnaceae*	1400-1600					
Rosa canina L.	*Rosaceae*	1000-2000	↔ Δ ▲ ◙	╣ ╟	+	☼ Θ ♠ ▉	+
Rosa iberica Stev.	*Rosaceae*	1700-1800		╟	+	☼ Θ ▉ ♠	+
Rosa gallica L.	*Rosaceae*	1600-1700		╟	+	☼ Θ ♠ ▉	+
Rosa pimpinellifolia L.	*Rosaceae*	1800-2000		╟	+	☼ Θ ▉ ♠	+
Rubus caesicus L.	*Rosaceae*	1000-1600	↔ ▲	╣	+	☼ Θ ♣ ▉	+
Salix triandra L. subsp. *bornmulleri* L.	*Salicaceae*	1300-1500	↔ Δ ▒				
Sorbus umbellata (Desf.) Fritsch *var. umbellata*	*Rosaceae*	1800-2200		╣ ╪ ╟		☼ ♣ Θ ▉ ♠ ●	
Tamarix smyrnensis Bunge.	*Tamaricacea*	1000-1500	↔ ▒ Δ	╣ ╟		☼ ♣ ▉ Ω ↑	
Ulmus minor Miller subsp. *minor*	*Ulmaceae*	1300-1800	↔ ▲	╣ ╟			
Vitis sylvestris Gmelin *	*Vitaceae*	1000-1400			+	☼ ♣ Θ ▉ ♠	

Suitable for; ↔ : erosion, avalanche and land-sliding protection, ▲ : using as fence for hiding bad views, sound and wind prevention, Δ : road stabilization, ∩:, ◙ : refuge planting, ▓ : mine area management and reforestation, ▒ : sand stabilisation ╣: road-side plantation, ╟: refuge planting, ╪ : auto-parking, ╬ : cross-section planting.

Important for ; ☼ :flower beauty, ♣ :leave beauty, Θ : fruit effect, ▉ :form beauty, Ω : winter characteristics, ↑ :stem beauty, ● : shadow effects, ♠:autumn leave colourfulness

* indicates species cultured in the study area

4. Conclusions

In the study, woody-plant species naturally growing in Tortum – Creek Watershed and use possibilities tried to be determined. According to the results of the study, species growing on steep slopes and stone covered areas under arid conditions, resistant to extreme conditions, stemming form bottom and having high regeneration capacity can be used for the restoration of ecosystem and erosion prevention as proposed by Daşdemir et al. (1996), Yılmaz et al. (1996b), Dir (1998), Koç (2000) and Güven (2004).

Rocky gardens are among the most attractive artificial green area forms in landscape designs. Selection of the plant species for these forms is also important. The most important green tissues of rock gardens are grass, flowers, shrubs and small trees (Foster, 1968). In this respect, many native species, which can be used in rocky gardens, were found in the study area.

The species which were evaluated in the study as ground – covering can be used in all areas instead of grass in the cities like Erzurum, where it is very difficult and costly to maintain lawn surfaces because of harsh climatic features. These species may provide areas with different textures, colours and borders when used especially in refuges.

The species whose aesthetical values were found to be high in the scope of the study were reported to be used for their these features by several authors such as Walker (1991), Mc Pherson (1992), Dirr (1998), Leszczynski (1999), Aslanboğa (2002), Moore (2002), Yılmaz and Irmak (2004).

Success in the application of urban and rural landscape projects is associated closely with the physical conditions and utilisation of native species (Ayaşlıgil, 1990). In contrast, it is almost impossible to be successful in plantation without considering the ecological, dendrological and other features of species (Hepcan, 1992; Koç and Şahin, 1999). In the scope of the study, 54 species from 25 families, which can be used both aesthetically and functionally, were determined. This potential of the study area must be utilised in the city centre and rural areas of Erzurum. For this respect, native species must be cultured and propagated. Local municipalities and Forestry Management must be in corporation and establish nurseries including native species.

Although some of the native tree species in the area Erzurum (e.g. *Pinus sylvestris* L., *Betula verrucosa* Ehrh., *Cratageus monogyna* Jacq., *Tamarix tetrandra* Pall.) are already propagated and used in various purposes for high prices, many other species, which are native and can be grown very easily in the area, are not utilised adequately and they do not take place in nurseries (Yılmaz et al., 1996a). In addition to economical loss from this method, exterior species are extensively used in the urban and suburban areas of the city, which means additional expenses for local administrations.

Roadside plantation in Erzurum and its environs is considerably inadequate. The species, which can be used in these areas, must be those, which are resistant to poor ecological conditions and compatible to the environment and require low maintenance conditions. Naturally growing species can meet these criteria in a region and they may be more cost effective than exterior ones. Only in this way, plantation of roadsides may bring aesthetical and functional features in environment (Aslanboğa, 1986; Jim, 1996; Walker, 1991; Heisler, 1986; Heisler and Grant, 2000; Braun and Fluckiger, 1998).

Propagation of the native species in the nurseries to be established contributes to the utilisation of natural sources, and their introduction, in addition to supporting the economy of the country and district. Native species of the district can be used in roadside plantation for both traffic technique and visual aspects.

Since native species may contribute to economy of a country and provide favourable effects on improvement of the climatic conditions and preventing soil erosion, obtaining sites for experimental studies, supplying forestry productions, food, and raw materials for drugs, fuel and visual improvement (Dirr, 1998; Akbari, 2002; Braun and Fluckiger, 1998), they must be conserved.

The extremely hard climatic conditions and elevation of the city of Erzurum provides limiting environment for the growth of many woody plants. However, in some transition, preserved, low zones woody plants survive densely. Because of the steepness of the area, soil erosion is at its maximum. The forest existing in the area is under anthropological effects. It is vital for the region that these species be conserved in the areas (in-situ), where they densely

exist, biological restoration studies be carried out in the sites, where vegetation were previously deteriorated and existing forest be conserved.

As a consequence, it is suggested in the study that botanical gardens must be established to familiarize and introduce the species in the district and district collection gardens must take part in these gardens in order to conserve native species in the region. Experimental parts must be reserved for conservation and improvement studies. Web sites exhibiting these species must be broadcast and people must be trained about conservation of these species.

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