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Full Length Research Paper

Determination of native woody landscape plants in Bursa and Uludag

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Around Bursa and Uludag is a wide range of native woody plants of which are commonly used for landscape planning. The present study pointed out a total of 72 plant species, consisting of 36 trees, 32 shrubs, 7 treelets and 4 climber groups, around the region which are notified to be suitable for rural and urban planning with the intentions of solitary, group, alley, wind-break, ground cover and attractive flowering and fruit.

Key words: Woody plants, landscape planning, Bursa-Uludag.

INTRODUCTION

The presence and variety of native plants is concerned as a measure of landscape planning. The interactions of living and non-living elements constitute landscape planning of which is based on ecology as dynamic mechanism. Native plants are a compiling measure of geological structure, land, climate and hydrological possibilities. Natural resources define the native plants and inform about the ecological characteristics of their landscape (Bayraktar, 1980). In the studies of landscape architecture, the plant using policy of successful and sustainable can be realized by using of right plant in right place. The success in using of proper plant can be achieved by identifying each plant species (Ferguson, 1984). Therefore, examination and mapping of the natural plants are very important in landscape planning.

Native plants can adjust themselves to various sites, such as wet or dry, sun or shade, high or low fertility soils and acidic or calcareous soils. If the usage is appropriate, native plants might;

1. be of an added contribution to wildlife,
2. require less maintenance,
3. provide a four-season use,
4. be a good option for an irregular landscape planning,
5. preserve the native varieties and the maintain the biodiversity, and
6. add a local touch to the landscape (Sheaffer and Rose, 1998).

The diversity of native plant species has a considerable role on rural and urban landscape planning. It is important to understand that most residential and particularly urban landscapes do not resemble any natural habitat. In these situations, the soil has been disturbed, natural vegetation has been cleared and the microclimate has been changed. Furthermore, urban stresses such as compaction, pollution, salt runoff and heat reflection can have a negative impact on remnant native trees and shrubs. The survival and growth potential of native species in these conditions may be no better or worse than exotic species. Many plants present in river bottomlands are surprisingly adaptable to urban conditions. The needs of native plants may differ from conventional landscape plants. Fertilization may not be necessary for some meadow and prairie species (Sheaffer and Rose, 1998).

The aim of this study was to determine the dendrologic and landscape characteristics of native woody landscape plants being very important for sustainable landscape and existing in Bursa and Uludag.

MATERIALS AND METHODS

Materials

In this study, Bursa and Uludag region existing in A2 square according to Davis (1965) were examined.

Bursa situated in the North-west of Anatolia and South-west of Marmara Region, between 40° North latitude and 28-30° east longitude, have a wide range of native plant species suitable for landscape planning.

The city is landed in the outer skirts of the mountain Uludag (2543 m). There are 6 different plant zones of the mountain according to altitude; 1. Lauretum (150-400 m), 2. Castaneum

Table 1. The list of native woody landscape plants systematic in Bursa and Uludag.

Subdivision: Gymnospermae	
Family	**Species**
1. Pinaceae	1.1.*Pinus pinea* L. 1.2. *Pinus brutia* Henry. 1.3. *Pinus nigra* Arn. ssp. *pallasiana* (Lamb.) Holmboe. 1.4. *Pinus silvestris* L. 1.5. *Abies nordmanniana* (Stev.)Spach ssp. *bornmülleriana* Mattf.
2. Cupressaceae	2.1. *Juniperus communis* ssp. *nana* 2.2. *Juniperus oxycedrus* L. 2.3. *Juniperus excelsa* L.
3. Taxaceae	3.1. *Taxus baccata* L.
Subdivision: Angiospermae	
Family	**Species**
1. Aceraceae	*Acer campestre* L. *Acer platanoides* L.
2. Anacardiaceae	2.1. *Pistacia terebinthus* L. 2.2. *Rhus coriaria* L.
3. Betulaceae	3.1. *Alnus glutinosa* Gartn. 3.2. *Carpinus betulus* L. 3.3. *Coryllus avellana* L.
4. Cornaceae	4.1. *Cornus mas* L. 4.2. *Cornus sanguinea* L. subsp. *sanguinea*
5. Ericaceae	5.1. *Arbutus unedo* L. 5.2. *Arbutus andrachne* L. 5.3. *Erica arborea* L. 5.4. *Vaccinium myrtillus* L. 5.5. *Vaccinium uliginosum* L. 5.6. *Vaccinium arctostaphyllos* L.
6. Fagaceae	6.1. *Fagus orientalis* Lipsky. 6.2. *Castanea sativa* Mill. 6.3. *Quercus robur* L. ssp.*robur* 6.4. *Q. frainetto* Ten. 6.5. *Q. petraea*(Mattuschka) Liebl.ssp. *iberica* (Steven ex Bieb.) 6.6. *Q. infectoria* Olivier ssp. *infectoria* (Reut) Schwarz. 6.7. *Q. pubescens* Wild. 6.8. *Q. ithaburensis* Decne ssp. *Macrolepis* Hedge.Yalt. 6.9. *Q. trojena* P.B. Webb. 6.10. *Q. coccifera* L. 6.11. *Q. hartwissiana* Stev.
7. Lauraceae	7.1. *Laurus nobilis* L.
8. Oleaceae	8.1. *Fraxinus ornus* L. 8.2. *Olea europa* L. 8.3. *Jasminum fruticans* L. 8.4. *Phillyrea latifolia* L.
9. Platanaceae	9.1. *Platanus orientalis* L.
10. Salicaceae	10.1. *Salix caprea* L. 10.2. *Salix cinerea* L. 10.3. *Salix amplexicaulis* L. 10.4. *Populus alba* L.

Table 1. Contd.

	10.5. *Populus tremula* L.
11.Ulmaceae	11.1. *Ulmus glabra* L. 11.2. *Celtis australis* L.
12. Tiliaceae	12.1. *Tilia argentea* Desf.ex.DC.
13. Tamariaceae	13.1. *Tamarix parviflora* DC.
14. Fabaceae (Leguminosae)	14.1. *Cercis siliquastrum* L. subsp. *siliquastrum* 14.2. *Spartium junceum* L. 14.3. *Chamaecytisus hirsutus* (L.) Link. 14.4. *Chamaecytisus austriacus* (L.) Link. 14.5. *Chamaecytisus pygmaeus* (Willd) Rothm.
15. Verbenaceae	15.1. *Vitex agnus castus* L.
16. Araliaceae	16.1. *Hedera helix* L.
17. Tymelaeaceae	17.1. *Daphne oleides* Schreb. 17.2. *Daphne pontica* L. 17.3. *Daphne sericea* L.
18. Cistaceae	18.1. *Cistus laurifolius* L. 18.2. *Cistus salviiflorus* L. 18.3. *Cistus creticus* L.
19.Celastraceae	19.1. *Euonymous europaeus* L.
20. Rosaceae	20.1. *Pyracantha coccinea* Roem. 20.2. *Rosa gallica* L. 20.3. *Rosa canina* L.
21. Ranunculaceae	21.1. *Clematis viticella* L. 21.2. *Clematis cirrhosa* L.
22. Liliaceae	22.1. *Ruscus aculeatus* L.
23. Styracaceae	23.1. *Styrax officinalis* L.
24. Caprifoliaceae	24.1. *Viburnum tinus* L.

850 m), 3. Fagetum (850-1100 m), 4. Pinetum (1100-1300 m), 5. Abietum (2100-2493 m) and 6. Alpinetum (2100-2493 m) (Öztan, 1962; Malyer and Tunca, 1990).

Methods

In order to identify the species land etudes were carried out to resemble each season. The identification of the native species and determination of their use for landscape planning were done with reference to floral, taxonomic and landscape planning literature (Davis, 1965-1982; Koç, 1965; Öztan, 1962; Polunin, 1969; Kayacık, 1954, 1980, 1981, 1982; Polunin and Huxley, 1981; Ferguson, 1984; Güçlü, 1988; Malyer and Tunca, 1990; Korkut, 1993; Yaltırık, 1993; Anonymous, 1998).

RESULTS AND DISCUSSION

The results of the present study showed that the native woody plants of Bursa and Uludag were classified under Gymnospermae and Angiospermae subdivisions. Under Gymnospermae there were 9 species belonging to 3 families and 63 species of 24 families were under Angiospermae (Tables 1 and 2). The native plants were characterised 36 species as trees, 7 species as treelets, 32 species as shrubs and 4 species as climbers. However, 5 species were classified as treelet and shrub, with 2 species being tree and shrubs. In addition, 36.11% trees and 46.87% shrubs were considered as evergreen plants (Table 3).

The domination of deciduous trees and shrubs among native woody plants confirmed the priority of these types of plants in rural and urban landscape planning (Öztan, 1962). Another priority is to use these plants with evergreen plants in combined compositions.

On the other hand, in the classification made according to usage properties in landscape, it was determined that 35 species were suitable for usage as solitary (Table 4), 5 species were suitable for usage as group (Table 5), 13 species were suitable for alley (Table 6), 17 species were suitable for usage as wind-break (Table 7), 15 species were suitable for usage as ground cover (Table 8), 33 species were suitable for usage as attractive flower property in spring and summer season (Table 9), 16 species were also suitable for usage as attractive fruit property (Table 10).

Therefore, it can be said that Bursa and Uludag have a

Table 2. The ratios of native woody landscape plant species and genera in Bursa and Uludag.

Family	Genus	%	Species	%
Gymnospermae				
Pinaceae	2	50	5	55.55
Cupressaceae	1	25	3	33.33
Taxaceae	1	25	1	11.11
Total	4	100	9	100
Angiospermae				
Aceraceae	1	2.56	2	3.16
Anacardiaceae	2	5.12	2	3.16
Betulaceae	3	7.68	3	4.74
Cornaceae	1	2.56	2	3.16
Ericacea	3	7.68	6	9.48
Fagaceae	3	7.68	11	17.38
Lauraceae	1	2.56	1	1.58
Oleaceae	4	10.24	4	6.32
Platanaceae	1	2.56	1	1.58
Salicaceae	2	5.12	5	7.90
Ulmaceae	2	5.12	2	3.16
Tiliaceae	1	2.56	1	1.58
Tamariciacea	1	2.56	1	1.58
Fabaceae	3	7.68	5	7.90
Verbenaceae	1	2.56	1	1.58
Araliaceae	1	2.56	1	1.58
Tymelaeaceae	1	2.56	3	4.74
Cistaceae	1	2.56	3	4.74
Celestraceae	1	2.56	1	1.58
Rosaceae	2	5.12	3	4.74
Ranunculaceae	1	2.56	2	3.16
Liliaceae	1	2.56	1	1.58
Styracaceae	1	2.56	1	1.58
Caprifoliaceae	1	2.56	1	1.58
Total	39	100	63	100

Table 3. The dendrological characteristics of native woody landscape plants in Bursa and Uludag.

Species	Plant type				Leaf characteristic			
	Tree	Treelet	Shrub	Climber	Conifererous	Broad - leafed	Evergreen	Deciduous
Abies bornmülleriana ssp. bornmülleriana	+				+		+	
Juniperus comminus nana			+		+		+	
Juniperus oxycedrus L.	+				+		+	
Juniperus excelsa L.	+				+		+	
Pinus pinea L.	+				+		+	
Pinus brutia Henry	+				+		+	
Pinus nigra Arn. ssp. *pallasiana*	+				+		+	

Table 3. Contd.

Pinus silvestris L.	+				+		+	
Taxus baccata L.	+				+		+	
Acer campestre L.	+					+		+
Acer platanoides L.	+					+		+
Alnus glutinosa Gartn.	+					+		+
Arbutus unedo L.		+				+	+	
Arbutus andrachne L.		+				+	+	
Carpinus betulus L.	+					+		+
Castanea sativa Mill.	+					+		+
Celtis australis L.	+					+		+
Cercis siliquastrum L. ssp.*siliquastrum*	+		+			+		+
Cistus laurifolius L.			+			+	+	
Cistus salviiflorus L.			+			+	+	
Cistus creticus L.			+			+	+	
Clematis viticella L.				+		+	+	+
Clematis cirrhosa L.				+		+	+	+
Chamaecytisus hirsutus L.			+			+		+
C.austriacus L.			+			+		+
C. pygmaeus (Willd) Rothm.			+			+		+
Cornus mas L.		+	+			+		+
C..sanguinea L. subsp. *sanguinea*		+	+			+		+
Coryllus avellana L.		+	+			+		+
Daphne oleides Schreb.			+			+	+	
Daphne pontica L.			+			+	+	
Daphne sericea L.			+			+	+	
Erica arborea L.			+			+	+	
Euonymous europus L.			+			+		+
Fagus orientalis Lipsky.	+					+		+
Fraxinus ornus L.	+					+		+
Jasminum fruticans L.				+		+		+
Laurus nobilis L.	+		+			+	+	
Hedera helix L.				+		+	+	
Quercus robur L. ssp. *Robur*	+					+		+
Q.frattinetto Ten.	+					+		+
Q. infectoria Oliver ssp. *İnfectoria*	+					+	+	
Q. pubescens Wild.	+					+		+
Q. ithaburensis ssp. *macrolepis*	+					+		+
Q. trojena P.B. Webb.	+					+	+	+
Q. coccifera L.		+	+			+	+	
Q. hartwissiana Stev.	+					+		+
Q.petrea ssp. *İberica*	+					+		+
Olea europa L.	+					+	+	
Pistacia terebinthus L.	+					+	+	+
Platanus orientalis L.	+					+		+
Phillyrea latifolia L.			+			+	+	
Populus alba L	+					+		+
Populus tremula L.	+					+		+
Pyracantha coccinea Roem.			+			+	+	
Rosa gallica L.			+			+		+
Rosa canina L.			+			+		+
Rhus coriaria L.			+			+		+
Ruscus aculeatus L.			+			+	+	+

Table 3. Contd.

Salix caprea L.	+					+		+
Salix cinerea L.	+					+		+
S. amplexicaulis L.	+					+		+
Spartium junceum L.			+			+		+
Styrax officinalis L.			+			+		+
Tamarix parviflora DC.		+	+			+		+
Tilia argentea Desf.ex.DC.	+					+		+
Ulmus glabra L.	+					+		+
Vaccinium myrtillus L.			+			+	+	+
V. uliginosum L.			+			+		+
V. arctostaphyllos L.			+			+		+
Viburnum tinus L.			+			+	+	
Vitex agnus castus L.			+			+		+

Table 4. The suitable species for usage as solitary of native woody landscape plants in Bursa and Uludag.

S/N	Species
1	*Abies,bornmülleriana,*ssp.*bornmülleriana*
2	*Juniperus oxycedrus* L.
3	*Juniperus exalsa* L.
4	*Pinus pinea* L.
5	*Pinus brutia* Henry.
6	*Pinus nigra* Arn.ssp.*pallasiana*
7	*Pinus silvestris* L.
8	*Taxus baccata* L.
9	*Acer campestre* L.
10	*Acer platanoides* L.
11	*Arbutus unedo* L.
12	*Arbutus andrachne* L.
13	*Carpinus betulus* L.
14	*Castanea sativa* Mill.
15	*Celtis australis* L.
16	*Clematis viticella* L.
17	*Clematis cirrhosa* L.
18	*Cornus sanguinea* L. subp.sanguinea
19	*Fagus orientalis* Lipsky.
20	*Fraxinus ornus* L.
21	*Quercus pubescens* Wild.
22	*Q. coccifera* L.
23	*Q. hartwissiana* Stev.
24	*Q. petra* ssp. iberica
25	*Olea europa* L.
26	*Platanus orientalis* L.
27	*Populus alba* L.
28	*Populus tremula* L.
29	*Pyracantha coccinea* Roem.
30	*Rhus coriaria* L.
31	*Salix cinerea* L.
32	*Salix amplexicaulis* L.
33	*Tamarix parviflora* DC
34	*Tilia argentea Desf*.ex.DC.
35	*Ulmus glabra* L.

Table 5. The suitable species for usage as group of native woody landcape plants in Bursa and Uludag.

Species	Species
1. *Abies bornmülleriana* ssp. *bornmülleriana*	37. *Laurus nobilis* L.
2. *Juniperus comminus nana*	38. *Hedera helix* L.
3. *Juniperus oxycedrus* L.	39. *Quercus robur* L. ssp. *Robur*
4. *Juniperus excelsa* L.	40. *Q. frattinetto* Ten.
5. *Pinus pinea* L.	41. *Q. infectoria* Oliver ssp. *İnfectoria*
6. *Pinus brutia* Henry	42. *Q. pubescens* Wild.
7. *Pinus nigra* Arn. ssp. *pallasiana*	43. *Q. ithaburensis* ssp. *macrolepis*
8. *Pinus silvestris* L.	44. *Q. trojena* P.B. Webb.
9. *Taxus baccata* L.	45. *Q. coccifera* L.
10. *Acer campestre* L.	46. *Q. hartwissiana* Stev.
11. *Acer platanoides* L.	47. *Q. petrea* ssp. *İberica*
12. *Alnus glutinosa* Gartn.	48. *Olea europa* L.
13. *Arbutus unedo* L.	49. *Pistacia terebinthus* L.
14. *Arbutus andrachne* L.	50. *Platanus orientalis* L.
15. *Carpinus betulus* L.	51. *Phillyrea latifolia* L.
16. *Castanea sativa* Mill.	52. *Populus alba* L
17. *Celtis australis* L.	53. *Populus tremula* L.
18. *Cercis siliquastrum* L. ssp.*siliquastrum*	54. *Pyracantha coccinea* Roem.
19. *Cistus laurifolius* L.	55. *Rosa gallica* L.
20. *Cistus salviiflorus* L.	56. *Rosa canina* L.
21. *Cistus creticus* L.	57. *Rhus coriaria* L.
22. *Clematis viticella* L.	58. *Ruscus aculeatus* L.
23. *Clematis cirrhosa* L.	59. *Salix caprea* L.
24. *Chamaecytisus hirsutus* L.	60. *Salix cinerea* L.
25. *C. pygmaeus* (Willd) Rothm.	61. *S. amplexicaulis* L.
26. *Cornus mas* L.	62. *Spartium junceum* L.
27. *C..sanguinea* L. subsp. *sanguinea*	63. *Styrax officinalis* L.
28. *Coryllus avellana* L.	64. *Tamarix parviflora* DC.
29. *Daphne oleides* Schreb.	65. *Tilia argentea* Desf.ex.DC.
30. *Daphne pontica* L.	66. *Ulmus glabra* L.
31. *Daphne sericea* L.	67. *Vaccinium myrtillus* L.
32. *Erica arborea* L.	68. *V. uliginosum* L.
33. *Euonymous europus* L.	69. *V. arctostaphyllos* L.
34. *Fagus orientalis* Lipsky.	70. *Viburnum tinus* L.
35. *Fraxinus ornus* L	71. *Vitex agnus castus* L.
36. *Jasminum fruticans* L.	

Table 6. The suitable species for usage as alley of native woody landscape plants in Bursa and Uludag.

S/N	Species
1	*Acer platanoides* L.
2	*Celtis australis* L.
3	*Cercis siliquastrum* L. ssp. *siliquastrum*
4	*Fagus orientalis* Lipsky.
5	*Fraxinus ornus* L.
6	*Laurus nobilis* L.
7	*Quercus robur* L. ssp. *robur*
8	*Q. frattinetto* Ten.
9	*Olea europa* L.
10	*Pistacia terebinthus* L.
11	*Platanus orientalis L.*
12	*Populus alba L.*
13	*Ulmus glabra L.*

Table 7. The suitable species for usage as wind - break of native woody landscape plants in Bursa and Uludag.

S/N	Species
1	*Taxus baccata* L.
2	*Clematis viticella* L.
3	*Clematis cirrhosa* L.
4	*Cornus mas* L.
5	*Jasminum fruticans* L.
6	*Hedera helix* L.
7	*Quercus robur* L. ssp. *robur*
8	*Q. frattinetto* Ten.
9	*Q. petrea* ssp. *İberica*
10	*Q. infectoria* Oliver ssp. *İnfectoria*
11	*Q. pubescens* Wild.
12	*Q. coccifera* L.
13	*Populus tremula* L.
14	*Pyracantha coccinea* Roem.
15	*Salix cinerea* L.
16	*Spartium junceum* L.
17	*Vibirnum tinus* L.

Table 8. The suitable species for usage as ground cover of native woody landscape plants in Bursa and Uludag.

S/N	Species
1	*Cistus laurifolius* L.
2	*Cistus salviiflorus* L.
3	*Cistus creticus* L.
4	*Chamaecytisus hirsutus* L.
5	*C.austriacus* L.
6	*C. pygmaeus* L.
7	*Daphne oleides* L.
8	*Daphne pontica* L.
9	*Daphne sericea* L.
10	*Hedera helix* L.
11	*Q. coccifera* L.
12	*Phillyrea latifolia* L.
13	*Vaccinium myrtillus* L.
14	*Vaccinium uliginosum* L.
15	*Vaccinium arctostaphyllos* L.

Table 9. The suitable species for usage as attractive flower property of native woody landscape plants in Bursa and Uludag.

Species	Colour of the flowers	Species	Colour of the flowers
1. *Cercis siliquastrum* L. ssp. *siliquastrum*	Red bud	19. *Olea europa* L.	White
2. *Cistus laurifolius* L.	Yellow spotted-white	20. *Phillyrea latifolia* L.	White
3. *Cistus salviiflorus* L.	Yellow spotted-white	21. *Pyracantha coccinea* Roem.	White
4. *Cistus creticus* L.	Yellow centered-purple	22. *Rosa gallica* L.	White-pink
5. *Clematis viticella* L.	Pink-purple	23. *Rosa canina* L.	White-pink
6. *Clematis cirrhosa* L.	Yellow-white	24. *Rhus coriaria* L.	Red

Table 9. Contd.

7. *Chamaecytisus hirsutus* L.	Pink-yellow	25. *Ruscus aculeatus* L.	White
8. *C.austriacus* L.	Yellow	26. *Spartium junceum* L.	Sulphourus yellow
9. *C. pygmaeus* L.	Yellow	27. *Styrax officinalis* L.	White
10. *Cornus mas* L.	Yellow	28. *Tamarix parviflora* DC.	Pink
11. *C. sanguinea* L. subp. *sanguinea*	Yellow	29. *Tilia argentea* Desf.ex.DC.	Yellowish-white
12. *Daphne oleides* L.	Cream-white	30. *Vaccinium myrtillus* L.	Light greenish-red
13. *Daphne pontica* L.	Yellow-green	31. *V. uliginosum* L.	Light pink
14. *Daphne sericea* L.	Pink	32. *V. arctostaphyllos* L.	White
15. *Erica arborea* L.	Duul white	33. *Viburnum tinus* L.	White-cream
16. *Fraxinus ornus* L.	White-cream	34. *Vitex agnus castus* L.	Purple
17. *Jasminum fruticans* L.	Yellow		
18. *Laurus nobilis* L.	Yellow-green		

Table 10. The suitable species for usage as attractive fruit property of native woody landscape plants in Bursa and Uludag.

S/N	Species
1	*Arbutus unedo* L.
2	*Arbutus andrachne* L.
3	*Castanea sativa* L.
4	*Celtis australis* L.
5	*Cornus mas* L.
6	*Cornus sanguinea* L. subsp. *sanguinea*
7	*Coryllus avellana* L.
8	*Laurus nobilis* L.
9	*Pyracantha coccinea* Roem.
10	*Rosa gallica* L.
11	*Rosa canina* L.
12	*Rhus coriaria* L.
13	*Ruscus aculeatus* L.
14	*Vaccinium myrtillus* L.
15	*Vaccinium uliginosum* L.
16	*Vaccinium arctostaphyllos* L.

(400-wide range of native woody plants with respect to appro-priateness for landscape planning. The areas where these plants are intensively situated should be protected. However, it has to be encouraged the cultivation and more intensive usage of these plants in landscape planning.

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