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ECOLOGICAL ANALYSIS OF SOME AZERBAIJAN PHANEROPHYTES IN *EX SITU* CONDITIONS

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ЭКОЛОГИЧЕСКИЙ АНАЛИЗ НЕКОТОРЫХ ФАНЕРОФИТОВ АЗЕРБАЙДЖАНА В УСЛОВИЯХ *EX SITU*

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Abstract. Analyzes of the relationship of 115 species of phanerophytes used in cultural conditions (Azerbaijan) against some abiotic factors (light, temperature, water, wind, etc.) have been presented in the paper. 2 species of these taxa are hygrophytes, 56 species are mesophytes, 23 species are xerophytes, 9 species are mesoskerophytes and 25 species are xeromesophytes have been determined depending from the relationship with water according to the results of analyzes. 100 light-loving species, 15 shade-loving species, 97 wind-resistant species and 18 wind-resistant species were found as a result of the study.

Аннотация. В статье представлен анализ взаимосвязи 115 видов фанерофитов, используемых в культурных условиях (Азербайджан), с некоторыми абиотическими факторами (свет, температура, вода, ветер и др.). 2 вида этих таксонов — гигрофиты, 56 видов — мезофиты, 23 вида — ксерофиты, 9 видов — мезоскерофиты и 25 видов — ксеромезофиты. В результате исследования было обнаружено 100 видов светолюбивых, 15 видов тенелюбивых, 97 видов ветроустойчивых и 18 видов ветроустойчивых.

Keywords: Azerbaijan, water, light, temperature, *ex situ*, phanerophyte.

Ключевые слова: Азербайджан, вода, свет, температура, *ex situ*, фанерофит.

Introduction

The protection of nature, including natural resources, and the preservation of the gene pool of the world's flora in general is of great importance for solving global and any country's environmental problems. In this regard, the eco-biological study of plants, including trees and shrubs, both *in-situ* and *ex-situ* is of thegreat interest both theoretically and practically [8, 9].

Any plant species are exposed to a number of environmental factors with different characteristics, both *in-situ* and *ex-situ* as known. These environmental factors directly or indirectly affect plants. These factors that affect plants sometimes reduce the number of a species, adversely affecting their reproduction and other developmental characteristic s[5, 7].

The impact of these factors (heat, light, water, wind) on the growth and development of plants on the studied plants is reflected in the research.

Materials and Methods

The material of the research was 115 species of trees and shrubs used in landscape architecture in the study area. Experiments related to the research work were carried out in the research area under *ex-situ* conditions. Some methods were used in implimenting of the research work [1, 2, 4, 9, 14, 16].

Results and Discussion

Sharp temperature rises occur in the summer months in recent years as known. An experiment was conducted to study the effect of these temperature rises on research plants, and one-day temperature changes were studied in this experiment.

The study was conducted in the third decade of July on 37 species existing in research material.

Highest temperature in all the plants studied is at the closest distance to the soil at 13-14 o'clock have been shown results of the analysis. Decreases in temperature were observed as they moved away from the soil surface. Recorded temperature was between 26-32 °C, depending on the species, in the area closest to the soil surface was found (Table 1).

Table 1

THERMAL CHANGES IN SOME SPECIES OF TREES AND SHRUBS INTRODUCED IN THE STUDY AREA (July 2020)

№	*Species*	*Height above the ground (trunk)*		
		Temperature °C		
		0	*Medium*	*Hill*
1.	*Albizia julibrissin*	30,0±1,5	26,0±1,3	24,0±1,2
2.	*Acer pseudoplatanus*	29,0±1,5	26,0±1,3	25,0±1,2
3.	*Acer laetum*	29,0±1,5	25,0±1,2	24,0±1,2
4.	*Buxus sempervirens*	27,0±1,3	24,0±1,2	23,0±1,1
5.	*Celtis caucasica*	30,0±1,5	25,0±1,2	24,0±1,2
6.	*Celtis australis*	30,0±1,5	26,0±1,3	24,0±1,2
7.	*Colutea orientalis*	30,0±1,5	26,0±1,3	24,0±1,2
8.	*Colutea arborescens*	30,0±1,5	27,0±1,3	25,0±1,2
9.	*Cotoneaster horizontalis*	27,0±1,3	25,0±1,2	24,0±1,2
10.	*Cotoneaster melanocarpus*	26,0±1,3	25,0±1,2	24,0±1,1
11.	*Diospyros lotus*	30,0±1,5	26,0±1,3	25,0±1,2
12.	*Euonymus japonica*	29,0±1,5	26,0±1,3	24,0±1,1
13.	*Ficus hyrcana*	30,0±1,5	26,0±1,3	25,0±1,2
14.	*Gleditsia triacanthos*	29,0±1,5	26,0±1,3	24,0±1,2
15.	*Laurus nobilis*	28,0±1,4	23,0±1,2	22,0±1,1
16.	*Ligustrum japonicum*	26,0±1,3	23,0±1,2	21,0±1,1
17.	*Ligustrum vulgare*	31,0±1,5	28,0±1,4	27,0±1,3
18.	*Parrotia persica*	28,0±1,4	26,0±1,3	24,0±1,2
19.	*Paulownia tomentosa*	29,0±1,5	26,0±1,3	23,0±1,2
20.	*Platanus orientalis*	30,0±1,5	26,0±1,3	22,0±1,1
21.	*Prunus persica*	29,0±1,5	27,0±1,3	24,0±1,2
22.	*Populus hyrcana*	30,0±1,5	27,0±1,3	25,0±1,2
23.	*Populus euphratica*	30,0±1,5	28,0±1,4	26,0±1,2

№	Species	Height above the ground (trunk)		
		Temperature °C		
		0	Medium	Hill
24.	*Pyracantha coccinea*	30,0±1,5	26,0±1,3	23,0±1,1
25.	*Pyrus caucasica*	31,0±1,6	25,0±1,2	24,0±1,2
26.	*Pyrus communis*	30,0±1,5	26,0±1,3	24,0±1,2
27.	*Pyrus salicifolia*	32,0±1,6	29,0±1,4	26,0±1,2
28.	*Quercus iberica*	30,0±1,5	27,0±1,3	24,0±1,2
29.	*Quercus ilex*	30,0±1,5	27,0±1,3	25,0±1,2
30.	*Quercus macranthera*	29,0±1,5	26,0±1,3	24,0±1,2
31.	*Quercus castaneifolia*	29,0±1,5	26,0±1,3	25,0±1,2
32.	*Robinia pseudoacacia*	30,0±1,5	27,0±1,3	25,0±1,2
33.	*Salix caprea*	31,0±1,6	27,0±1,4	26,0±1,3
34.	*Salix babylonica*	30,0±1,5	26,0±1,3	24,0±1,2
35	*Tilia caucasica*	29,0±1,5	26,0±1,3	24,0±1,2
36.	*Ulmus minor*	31,0±1,5	28,0±1,4	25,0±1,2
37.	*Zelkova carpinifolia*	30,0±1,5	27,0±1,3	24,0±1,2

Depending on the species, the temperature at the height from the soil surface to the top of the plant is 4-7^{0}C less than the area close to the soil surface have been shown our observations. Rising temperatures lead to the breakdown of protein in plants, the accumulation of ammonia and the disruption of cell structure [6, 11].

Low rainfall in the study area during the summer months reduces the amount of water in the soil. Higher water evaporation from the plants further reduces the amount of water in the soil. Thus, there is an inversely proportional relationship between the amount of precipitation and the evaporation of water from plants. In this case, there is a delay in the growth and development of plants introduced in the research area. Yellowing, burning and shedding were observed in the leaves of some of the studied species have been showed results of study. Examples include *Parrotia persica, Populus hyrcana, Platanus orientalis, Pyrus caucasica, Quercus castaneifolia, Euonymus latifolia, Albizia julibrissin, Diospyros lotus, Euonymus latifolia, Acer pseudoplatanus* and others. These burns observed in the leaves of plants start at the edges of the leaf and develop towards the middle of the leaf, covering the entire leaf axis, and as a result, the leaf falls off was found result of phenological observations.

The resistance of the studied plants to light and wind was studied during the research. As we know, the increase and decrease of the length of the day can lead to leaf loss, affects processes such as flowering, branching, leaf splitting, pigment formation, etc. in plants [15]. In this regard, the plants are divided into 2 groups - short-day and long-day plants. The plants spread in different geographical regions have acquired signs of ecological adaptation to the light time of the place is known from the ecological point of view. During the research, 102 species of plants were found to be light-loving and 13 species were shade-loving (Table 2).

Phenological observations revealed that a number of morphological changes took place in some studiedspecies among the light-loving introducers. The stems of such plants are thick, tall and very branched. The leaves are small, simple, and the veins are thin and hairy. This type of plants have high flowering and fruiting, late flowering and fast flowering [11, 14]. These plants are resistant to heat and drought. Among the studied plants are *Juniperus sabina, Pinus halepensis, Pinus eldarica, Abelia grandiflora, Acacia dealbata, Berberis thunbergii, Berberis vulgaris, Celtis* *caucasica, Cercis siliguastrum, Colutea arborescental, Colutea obdon, Colutea ordon, Colutea ordon, Colutea ordonas triacanthos, Populus euphratica,* and other types can be shown.

Table 2

RELATION OF STUDIED PLANTS TO LIGHT AND WIND

№	*Species*	*light-loving*	*shade-loving*	*wind resistance*
	Pinophyta			
1.	*Abies nordmanniana* Spach.		+	-
2.	*Cedrus libani* A. Rich	+		-
3.	*Cupressus sempervirens* L.	+		-
4.	*Cupressus sempervirens* L. *var. horizontalis* (Mill). Gord.	+		-
5.	*Cupressus sempervirens* L. *var. pyramidalis*Targ.	+		-
6.	*Cupressus arizonica* Greene.	+		+
7.	*Cupressus x leylandii* A. B. Jacks & Dallim	+		+
8.	*Juniperus communis* L.	+		+
9.	*Juniperus sabina* L.	+		+
10.	*Pinus eldarica* Medw.	+		+
11.	*Pinus halepensis* Mill.	+		+
12.	*Pinus pinea* L.	+		+
13.	*Taxus baccata* L.		+	-
14.	*Taxus cuspidata* Sieb.et Zucc.		+	-
15.	*Thuja orientalis* L.	+		+
	Magnoliophyta			
1.	*Abelia grandiflora* Rehd.	+		+
2.	*Acacia dealbata* Link.	+		+
3.	*Acer campestre* L.		+	+
4.	*Acer velutinum* Boiss.		+	+
5.	*Acer pseudoplatanus* L.		+	+
6.	*Acer laetum* C.A.Mey.		+	+
7.	*Agave americana* L.	+		+
8.	*Ailanthus altissima* (Mill.) Swingle.	+		+
9.	*Albizia julibrissin* Durazz.	+		+
10.	*Berberis thunbergii* DC.	+		+
11.	*Berberis vulgaris* L.	+		+
12.	*Buxus sempervirens* L.		+	+
13.	*Broussonetia papyrifera* (L.)Vent.	+		+
14.	*Catalpa bignonioides* Walt.	+		+
15.	*Carpinus betulus* L.		+	+
16.	*Castanea sativa* Mill.		+	-
17.	*Celtis caucasica* Willd.	+		+
18.	*Cercis siliguastrum* L.	+		+
19.	*Cornus mas* L.		+	-
20.	*Colutea arborescens* L.	+		+
21.	*Colute aorientalis* Mill.	+		+
22.	*Cotoneaster horizontalis* Decne.	+		+
23.	*Cotoneaster melanocarpus* Load.	+		+
24.	*Crataegus monogyna* Jacq.	+		+

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25.	*Cydonia oblonga* Mill.	+		+
26.	*Diospyros lotus* L.	+		+
27.	*Elaeagnus angustifolia* L.	+		+
28.	*Eriobotrya japonica* Lindl.	+		+
29.	*Euonymus japonicus* L.	+		+
30.	*Eucalyptus leucoxylon* F.Muell.	+		+
31.	*Eucalyptus camaldulensis* Dehn.	+		+
32.	*Ficus carica* L.	+		+
33.	*Ficus hyrcana* A. Grossh.	+		+
34.	*Fraxinus excelsior* L.	+		+
35.	*Fraxinus velutina* Torr.	+		+
36.	*Fraxinus malocophulla* Hemsl.	+		+
37.	*Gleditsia triacanthos* L.	+		+
38.	*Hedera colchica* C.Koch.		+	+
39.	*Hedera helix* L.		+	+
40.	*Hydrangea paniculata* Sieb.	+		+
41.	*Hibiscus syriacus* L.	+		-
42.	*Jasminum nudiflorum* Lindl.	+		+
43.	*Juglans regia* L.	+		+
44.	*Laurus nobilis* L.	+		-
45.	*Lonicera japonica* Thunb.	+		+
46.	*Lonicera caucasica* Pall.	+		+
47.	*Lonicera caprifolium*L.	+		+
48.	*Ligustrum japonicum* Thunb.		+	+
49.	*Ligustrum vulgare* L.	+		+
50.	*Maclura pomifera* (Raf.) Sjhn.	+		+
51.	*Magnolia grandiflora* L.	+		-
52.	*Malus domestica* Borkh.	+		+
53.	*Malus silvestris* Mill.	+		+
54.	*Mahonia aquifolium* Nutt.		+	-
55.	*Melia azedarach* L.	+		+
56.	*Mespilus germanica* L.	+		+
57.	*Morus alba* L.	+		+
58.	*Morus nigra* L.	+		+
59.	*Morus rubra* L.	+		+
60.	*Nerium oleander* L.	+		+
61.	*Olea europaea* L.	+		+
62.	*Parrotia persica* (DC.) C. A. Mey.	+		+
63.	*Platanus orientalis* L.	+		+
64.	*Pittosporum tobira* Dryand.	+		+
65.	*Populus euphratica* Olivier.	+		+
66.	*Populus hyrcana* Grossh.	+		+
67.	*Phoenix dactylifera* L.	+		-
68.	*Prunus armeniaca* L	+		+
69.	*Prunus padus* L.	+		+
70.	*Prunus dulcis* Mill.	+		+
71.	*Prunus persica* (L.) Batsch	+		+

72.	*Prunus domestica* L.	+	+
73.	*Pyrus communis* L.	+	+
74.	*Pyrus salicifolia* Pall.	+	+
75.	*Pyrus caucasica* Fed.	+	+
76.	*Pyracantha coccinea* Roem.	+	+
77.	*Quercus castaneifolia* J. A. Mey.	+	+
78.	*Quercus ilex* L.	+	+
79.	*Quercus iberica* Stev.	+	+
80.	*Quercus macranthera* Fisih. M.	+	+
81.	*Rhamnus alaternus* L.	+	+
82.	*Robinia pseudoacacia* L.	+	-
83.	*Rosmarinus officinalis* L.	+	+
84.	*Salix caprea* L.	+	+
85.	*Salix babylonica*L.	+	+
86.	*Sophora japonica* L.	+	+
87.	*Spiraea vanhouttei (*Briot) Zbl	+	-
88.	*Syringa vulgaris* L.	+	+
89.	*Tamarix tetrandra* Pall.	+	+
90.	*Tecoma radicans* Seem.	+	+
91.	*Trachycarpus excelsa*	+	-
92.	*Tilia caucasica* Rupr.	+	+
93.	*Ulmus parvifolia* Jacq.	+	+
94.	*Ulmus minor* Mill.	+	+
95.	*Viburnum tinus* L.Hemsl.	+	+
96.	*Vitex negundo* L.	+	+
97.	*Vitis sylvestris* Gmel.	+	+
98.	*Yucca aloifolia* L.	+	+
99.	*Washingtonia filifera* H.Wendl.	+	-
100	*Zelkova carpinifolia* (Pall.) K. Koch.	+	+

Abelia grandiflora, Albizia julibrissin, Berberis thunbergii, Broussonetia papyrifera, Catalpa bignonioides, Ficus hyrcana, Melia azedarach and others growing in shady places. As a result of observations on the species, it was found that there is a weakening in the development of these plants, including a decrease in the percentage of flowering, an increase in the number of side branches, thinning of the leaves.

Taxus baccata, Taxus cuspidata, Buxus sempervirens, Acer pseudoplatanus, Acer laetum, Carpinus betulus, Castanea sativa, Hedera colchica, Ligustrum japonicum, etc., planted in open areas exposed to light was found during the research. On hot summer days, the formation of burns on the leaves of these plants is observed in growth and developmental delays.

18 of these plants are not wind-resistant and 97 species are wind-resistant was found in studying the wind resistance of the studied plants. In general, wind affects all plant species to one or another degree have been shown in the results of phenological observations.

Water is of special importance in the growth and development of plants and the formation of vegetation from an ecological point of view as known.

The water source, the water intake and evaporation by the plants, and their grouping according to their water needs. So, the ecological importance of water for plants is important to understand, it to know the water needs of the plant species.

In this regard, we tried to study the division of the studied plants in the study area by groups according to their water needs.

The plants studied by us are divided into 5 different groups according to their need for water.

2 of the studied species were hygrophytes, 56 were mesophytes, 23 were xerophytes, 9 were mesoxerophytes, and 25 were xeromesophytes have been shown the analysis results (Table 3).

Two species of plants studied, *Eucalyptus leucoxylon* and *Eucalyptus camaldulensis*, belong to the group of hygrophytes - that is living in humid places. These plants are naturally distributed in humid areas.

The mesophyte (moderately in need of water) group includes 56 plant species (*Abelia grandiflora, Acer pseudoplatanus, Taxus baccata, Thuja orientalis, Acer laetum, Berberis thunbergii, Berberis vulgaris, Catalpa bignonioides, Albizia julib betulus,* etc.) as can be seen from Table 3. The plants included in this group have a well-developed root system and other morphological organs.

Table 3

DISTRIBUTION OF WOODY PLANTS IN EX-SITU CONDITIONS
IN THE STUDY AREA ACCORDING TO THE NEED OF WATER

№	*Species*	*Groups*				
		Hygrophytes	*Mesophytes*	*Xerophytes*	*Mesoxerophytes*	*Xeromesophytes*
	Pinophyta					
1.	*Abies nordmanniana* Spach.		+			
2.	*Cedrus libani* A.Rich					+
3.	*Cupressus sempervirens* L.			+		
4.	*Cupressus sempervirens* L. *var*. *horizontalis* (Mill). Gord.			+		
5.	*Cupressus sempervirens* L. *var*. *pyramidalis*Targ.			+		
6.	*Cupressus arizonica* Greene.			+		
7.	*Cupressus x leylandii* A. B. Jacks &Dallim				+	
8.	*Juniperus communis* L.					+
9.	*Juniperus sabina* L.					+
10.	*Pinus eldarica* Medw.			+		
11.	*Pinus halepensis* Mill.			+		
12.	*Pinus pinea* L.			+		
13.	*Taxus baccata* L.		+			
14.	*Taxus cuspidata* Sieb.et Zucc.		+			
15.	*Thuja orientalis* L.		+			
	Magnoliophyta					
1.	*Abelia grandiflora* Rehd.		+			
2.	*Acacia dealbata* Link.					+
3.	*Acer campestre* L.		+			
4.	*Acer velutinum* Boiss.			+		
5.	*Acer pseudoplatanus* L.		+			
6.	*Acer laetum* C.A.Mey.		+			
7.	*Agave americana* L.					+
8.	*Ailanthus altissima* (Mill.) Swingle.					+
9.	*Albizia julibrissin* Durazz.		+			
10.	*Berberis thunbergii* DC.		+			

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№	Species	Groups				
		Hygrophytes	Mesophytes	Xerophytes	Mesoxerophytes	Xeromesophytes
11.	*Berberis vulgaris* L.		+			
12.	*Buxus sempervirens* L.					+
13.	*Broussonetia papyrifera* (L.)Vent.					+
14.	*Catalpa bignonioides* Walt.		+			
15.	*Carpinus betulus* L.		+			
16.	*Castanea sativa* Mill.		+			
17.	*Celtis caucasica* Willd.			+		
18.	*Cercis siliguastrum* L.			+		
19.	*Cornus mas* L.				+	
20.	*Colutea arborescens* L.			+		
21.	*Colute aorientalis* Mill.			+		
22.	*Cotoneaster horizontalis* Decne.				+	
23.	*Cotoneaster melanocarpus* Load.		+			
24.	*Crataegus monogyna* Jacq.				+	
25.	*Cydonia oblonga* Mill.		+			
26.	*Diospyros lotus* L.		+			
27.	*Elaeagnus angustifolia* L.			+		
28.	*Eriobotrya japonica* Lindl.		+			
29.	*Euonymus japonicus* L.		+			
30.	*Eucalyptus leucoxylon* F.Muell.	+				
31.	*Eucalyptus camaldulensis* Dehn.	+				
32.	*Ficus carica* L.					+
33.	*Ficus hyrcana* A. Grossh.				+	
34.	*Fraxinus excelsior* L.		+			
35.	*Fraxinus velutina* Torr.		+			
36.	*Fraxinus malocophulla* Hemsl.		+			
37.	*Gleditsia triacanthos* L.		+			
38.	*Hedera colchica* C.Koch.		+			
39.	*Hedera helix* L.		+			
40.	*Hydrangea paniculata* Sieb.		+			
41.	*Hibiscus syriacus* L.		+			
42.	*Jasminum nudiflorum* Lindl.		+			
43.	*Juglans regia* L.		+			
44.	*Laurus nobilis* L.				+	
45.	*Lonicera japonica* Thunb.					+
46.	*Lonicera caucasica* Pall.					+
47.	*Lonicera caprifolium*L.		+			
48.	*Ligustrum japonicum* Thunb.		+			
49.	*Ligustrum vulgare* L.					+
50.	*Maclura pomifera* (Raf.) Sjhn.		+			
51.	*Magnolia grandiflora* L.		+			
52.	*Malus domestica* Borkh.		+			
53.	*Malus silvestris* Mill.		+			
54.	*Mahonia aquifolium* Nutt.		+			
55.	*Melia azedarach* L.		+			
56.	*Mespilus germanica* L.					+

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№	Species	Groups				
		Hygrophytes	*Mesophytes*	*Xerophytes*	*Mesoxerophytes*	*Xeromesophytes*
57.	*Morus alba* L.		+			
58.	*Morus nigra* L.		+			
59.	*Morus rubra* L.			+		
60.	*Nerium oleander* L.					+
61.	*Olea europaea* L.				+	
62.	*Parrotia persica* (DC.) C.A. Mey.		+			
63.	*Platanus orientalis* L.		+			
64.	*Pittosporum tobira* Dryand.		+			
65.	*Populus euphratica* Olivier.		+			
66.	*Populus hyrcana* Grossh.				+	
67.	*Phoenix dactylifera* L.		+			
68.	*Prunus armeniaca* L				+	
69.	*Prunus padus* L.					+
70.	*Prunus dulcis* Mill.					+
71.	*Prunus persica* (L.) Batsch		+			
72.	*Prunus domestica* L.		+			
73.	*Pyrus communis* L.		+			
74.	*Pyrus salicifolia* Pall.			+		
75.	*Pyrus caucasica* Fed.			+		
76.	*Pyracantha coccinea* Roem.		+			
77.	*Quercus castaneifolia* J.A.Mey.			+		
78.	*Quercus ilex* L.			+		
79.	*Quercus iberica* Stev.			+		
80.	*Quercus macranthera* Fisih. M.			+		
81.	*Rhamnus alaternus* L.					+
82.	*Robinia pseudoacacia* L.					+
83.	*Rosmarinus officinalis* L.			+		
84.	*Salix caprea* L.		+			
85.	*Salix babylonica*L.		+			
86.	*Sophora japonica* L.					+
87.	*Spiraea vanhouttei* (Briot) Zbl		+			
88.	*Syringa vulgaris* L.					+
89.	*Tamarix tetrandra* Pall.			+		
90.	*Tecoma radicans* Seem.		+			
91.	*Trachycarpus excelsa*		+			
92.	*Tilia caucasica* Rupr.					+
93.	*Ulmus parvifolia* Jacq.					+
94.	*Ulmus minor* Mill.					+
95.	*Viburnum tinus* L.Hemsl.		+			
96.	*Vitex negundo* L.					+
97.	*Vitis sylvestris* Gmel.		+			
98.	*Yucca aloifolia* L.			+		
99.	*Washingtonia filifera* H.Wendl.					+
100.	*Zelkova carpinifolia* (Pall.) K. Koch.		+			

The analysis showed that 23 species enteredto this group (*Cupressus sempervirens, Cupressus arizonica, Pinus eldarica, Pinus halepensis, Celtis caucasica, Cercis siliguastrum, Colutea arborescens, Elaeagnis, Elaeagnus slag,* etc.) belong to the xerophyte group (low water needs). It became clear that these plants are naturally distributed in arid regions in result of observations.

In general, unlike plants belonging to the mesophyte group, xerophytic plants are divided into two types of adaptation to the conditions under which they grow. Therefore, the root system, including the main root, develops well, the leaves shrink or change shape, and the leaves are covered with a layer of wax or hair at xerophyte plants.

9 species (*Cotoneaster horizontalis, Prunus armeniaca, Tamarix tetrandra, Populus euphratica, Padus mahaleb,* etc.) belong to the mesoxerophyte group. Plants in this group are drought tolerant and have a certain need for water have been shown the results of the analysis.

The xeromesophyte group includes 25 species (*Ailanthus altissima, Vitex negundo, Ulmus minor, Syringa vulgaris, Robinia pseudoacacia, Sophora japonica,* etc.). Species belonging to this group are more resistant to drought than mesoxerophyte species. These species did not show any damage to their morphological organs during the hot summer months have been shown results of phenological observations.

The trees and shrubs studied according to their water needs have different ecological needs and can be widely used for landscaping in the cities and settlements according to their wishes have been revealed in the results of the research.

Conclusion

1. 102 species are light-loving, 13 species are shade-loving, 97 are wind-resistant, 56 are mesophytes, 23 are xerophytes, 9 are mesoxerophytes, 25 are xeromesophytes and 2 are hygrophytes found to form the cultural dendroflora according to the ecological attitude of the studied plants to the light.

2. The temperature changes between 26-32°C in the area closest to the soil surface and at the height from the soil surface to the top of the plant it was found to be less than 4-7°C at studying the daily temperature changes of the studied plants at different heights from the soil surface, depending on the type.

Recommendations

Collect and mobilize planting and sowing materials from productive species of different geographical origins with different gene- and phenotypic characteristics in their natural habitat, taking into account *in situ* conditions their bioecological characteristics and historical past is necessary in order to increase the rate of introduction of trees and shrubs to be used in cultural conditions.

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