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CHARACTERISTIC OF WOODY PLANTS ON THE TERRITORY OF NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

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This paper presents results from a study focusing on species composition of woody plants on the territory of baseline institution of National University of Life and Environmental Sciences of Ukraine (Kyiv). An accurate description of systematic structure and taxonomic composition has been given. The life condition of woody plants are estimated.

In the industrial agglomerations the optimization problems of urban environment by the growing of the anthropogenic load require systematic approaches based on scientific and ecological-biological fundamentals of creation stable vegetative covering.

We analyzed species composition plantings on the territory of the baseline institution of National University of Life and Environmental Sciences of Ukraine (NULES of Ukraine) because the taxonomic composition defines a common view of green spaces and their resistance to stressful factors of urban environment.

NULES of Ukraine is situated in the southern part the city of Kyiv, in picturesque woodland – Golosievo. Climate is moderate, with an average temperature range + 7,3 ˚C, of the hottest month (July) – + 20 ˚C, the coldest month (January) – - 5,5 ˚C. The absolute maximum + 39,4 ˚C, the absolute minimum –32,2 ˚C. Soil – dark gray forest sod-podzolic loams with low content of humus. The total annual rainfall is 550-650 mm.

An individual accounting of landscaping system of basic institution of NULES of Ukraine was formed by dozens of years. According to archive photos, greenery of academic seventeen buildings largely was represented by native species of trees and shrubs.

The analyze of available literature and materials of city Kyiv services shown that the information about the results of inspection of green spaces on the territory of basic institution NULES of Ukraine is missing. Therefore, the purpose of our study was to investigate the taxonomic composition and evaluation of the vital state of woody plants.

Materials and methods. The species composition of woody plants of basic institution of the University was determined by the route inspection of plantings. For clarifying the names of taxonomic units and placing of plants we used numbers of scientific publications from systematics [1–3, 5, 10–16]. The vital state (VS) of woody plants was assessed visually on the 5-point E.N. Andreeva scale [9]. According to this method, for woody plant that refer to that or another category of vitality given a score: healthy – 1,0; damaged – 0,7; severely damaged – 0,4; dying – 0,1; deadwood – 0. The calculation of indices of

vital state woody plants by the number of trees (shrubs) was carried out by the formula:

$$I_n = \frac{n_1 + 0{,}7n_2 + 0{,}4n_3 + 0{,}1n_4}{n},$$

where the I_n – index of vital state of plant by the quantity of plants, n_1 – number of healthy, n_2 – damaged, n_3 – severely damaged, n_4 – dying and deadwood; n – total quantity of plants. An index from 1,0 to 0,8 of vital state evaluated as "healthy", 0,79–0,5 – "damaged", 0,49–0,2 – "severely damaged" and in the index and 0,19 or below – "completely degraded".

The objects of research – woody plants that grow on the territory near the academic buildings of a basic institution of NULES of Ukraine, Kyiv.

Results of research. The woody flora inventory was made in 2012-2013 years on the territory of the basic institution of NUBiP Ukraine (see Table. 1).

Dendroflora represented by 15 species Pinophyta, counts 12,3 % of the total, and 107 species Magnoliophyta – 87,7 % respectively.

We have found that on territory near the academic buildings of the University is growing 5761 samples of woody plants which belong to 32 families, 66 genus, among them 122 species, 6 hybrids and 30 cultivars. The most numerous species of representatives: Juniperus sabina L., Picea abies (L.) H.Karst., Thuja occidentalis L., Th. occidentalis 'Columna', Buxus sempervirens L., Tilia cordata Mill., Aesculus hippocastanum L.

The most numerous families by number of species Cupressaceae – 7 (5,73 % of the total species), Oleaceae – 9 (7,37 %), Rosaceae – 37 (30,33 %). Six species have the family Pinaceae and Aceraceae, five – Hydrangeaceae and Salicaceae, four – Berberidaceae, Fagaceae, Corylaceae. The families Fabaceae, Juglandaceae, Moraceae submitted by three species. Two species represented by families Anacardiaceae, Bignoniaceae, Hippocastanaceae, Cornaceae, Caprifoliaceae, and Viburnaceae and Tiliaceae. Such as families Ginkgoaceae, Taxodiaceae, Betulaceae, Celastraceae, Sambucaceae, Ulmaceae, Elaeagnaceae, Platanaceae, Buxaceae, Simaroubaceae, Grossulariaceae, Caesalpiniaceae have only one species.

We have marked representatives of two life forms during the analysis of biomorphological structure of green spaces of the University, among which the dominant group is trees – 71 (58,2%) species, main elements of dendrocomposition (Fig. 1, 2).

Among total number of trees the deciduous are dominated – 107 species (87,7 %), unfortunately, coniferous represented only by 15 species (12,3 %), but almost of them are members of the IUCN Red List. Among dominated deciduous plants such species as Betula pendula Roth, Aesculus hippocastanum L., Carpinus betulus L., Acer platanoides L., Tilia cordata Mill., T. platyphyllos Scop., Buxus sempervirens L., Berberis thunbergii DC., Catalpa bignonioides Walter, Spiraea ×vanhouttei (Briot) Zabel, Thuja occidentalis L., Forsythia viridisima, Picea abies (L.) H.Karst., Picea pungens Engelm., Juniperus sabina L., Fraxinus excelsior L.

The species can be protected on the local, state or international level depending from the rank of "red lists" they belong to [6]. Plant species that protected on the international level represented in the Red List of the International Union for Conservation of Nature and Natural Resources (IUCN Red List) [17], the European Red List [4], the Convention on the Conservation of of Wild flora and Fauna and Natural Habitats in Europe [7], the Convention on International Trade in Endangered Species of Wild Fauna and Flora Endangered [8] (Table 2).

In Table 2 submitted the information about natural spread of species for characterizing the level of endemism [13].

Consequently, on the territory of basic institution of NULES of Ukraine grows 13 species of Gymnospermous Plants listed in the IUCN Red List. Of these, 11 species refers to group of low-risk (LR), 1 – group of species under threat of extinction critical in the future (CR), 1 – group of species that are endangered (EN).

Class Ginkgopsida represented by one species – Ginkgo biloba, and another 12 species represent a class coniferous (Pinopsida).

Table 1. Taxonomic composition of woody plants on the territory of basic institution of NULES of Ukraine, Kyiv

№	Division	Family	Quantity, pcs.	
			genus	species
1	Pinophyta	*Ginkgoaceae* Engler	1	1
2		*Cupressaceae* Bartl.	4	7
3		*Pinaceae* Lindl.	3	6
4		*Taxodiaceae* .W.Neger	1	1
5	Magnoliophyta	*Berberidaceae* Juss.	2	4
6		*Betulaceae* S.F.Gray	1	1
7		*Bignoniaceae* Juss.	1	2
8		*Fabaceae* Lindl.	2	3
9		*Celastraceae* R.Br.	1	1
10		*Sambucaceae* Link	1	1
11		*Fagaceae* Dumort.	3	4
12		*Ulmaceae* Mirb.	1	1
13		*Salicaceae* Mirb.	2	5
14		*Hippocastanaceae* DC.	1	2
15		*Juglandaceae* Rich. ex Kunth	1	3
16		*Hydrangeaceae* Dumort.	3	5
17		*Cornaceae* Dumort.	1	2
18		*Caprifoliaceae* Juss.	2	2
19		*Viburnaceae* Dumort.	1	2
20		*Aceraceae* Juss.	1	6
21		*Tiliaceae* Juss.	1	2
22		*Corylaceae* Mirb.	2	4
23		*Elaeagnaceae* Juss.	1	1
24		*Oleaceae* Hoffmans. et Link	4	9
25		*Platanaceae* Dumort.	1	1
26		*Rosaceae* Juss.	17	37
27	Magnoliophyta	*Buxaceae* Dumort.	1	1
28		*Simaroubaceae* DC.	1	1
29		*Grossulariaceae* DC.	1	1
30		*Anacardiaceae* Lindl.	2	2
31		*Caesalpiniaceae* R.Br.	1	1
32		*Moraceae* Link.	1	3
		Total	**66**	**122**

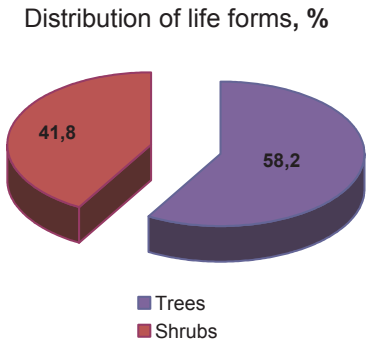

Fig. 1. The quantitative distribution of woody species plantings per life forms, %

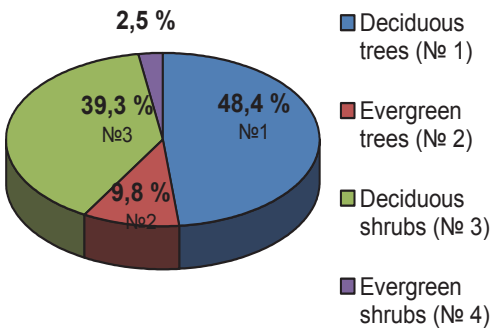

Fig. 2. Ratio deciduous and evergreen plant, %

Table 2. Species of Gymnosperms included in IUCN Red List, which grow on the territory of basic institution of NULES of Ukraine

Species	Origin [1]	Category of species [2]
Abies alba Mill.	1.3, 1.2	LR/lc
Chamaecyparis pisifera Sieb. et Zucc.	2.3	LR/lc
Juniperus communis L.	1.3, 1.7, 1.6, 1.9-1.13, 1.15, 4.2	LR/lc
Ginkgo biloba L.	2.3, 2.8	EN
J. sabina L.	1.2-1.4, 1.6, 1.7, 1.10, 8(8b.)1, 8.(8b.)2	LR/lc
J. scopulorum Sarg.	4.2, 4.1	LR/lc
Larix sibirica Ledeb.	1.10, 1.9, 1.8, 1.11, 1.12	LR/lc
Metasequoia glyptostroboides Hu et Cheng	2.8	CR
Picea abies (L.) Karst.	1.3, 1.8, 1.7	LR/lc
P. pungens Engelm.	4.2	LR/lc
Platycladus orientalis (L.)Franco	2.7, 2.3	LR/nt
Thuja occidentalis L.	1.15	LR/lc
Th. plicata D. Don	4.1	LR/lc

Notes. 1. Information about area of distribution of plants are presented according A.L. Takhtadzhyan floristic zoning (1978). All species attributed to Holarctic Realm. Classification units of lower rank indicated in the form numbers, which the author pointed in the appropriate sections and subsections (the first number - area, the second number - a province, in parentheses indicated the subregion) [13].

2. According to the IUCN classification [17] used the following categories (small letters – subcategories) rarity: EN – species that are threatened with extinction; CR - species that are under threat of extinction critical in the future; LR – species on low-risk group; lc – species that need to minimal measures for the preservation; nt - species that are not depending on the measures of protection, but are on the brink of danger.

Table 3. Evaluation of the vital state of woody plants on the territory of basic institution of NULES of Ukraine, Kyiv

Family	Categories of vital state, %					Quantity, pcs.	% from total quantity	Index VS, %
	1	2	3	4	5			
PINOPHYTA								
Cupressaceae Bartl.	419	243	125	32	5	824	14,2	0,78
Ginkgoaceae Engler	3	0	0	0	0	3	0,04	1,00
Pinaceae Lindl.	356	44	29	10	3	442	7,6	0,90
Taxodiaceae .W.Neger	2	3	0	0	0	5	0,08	0,82
MAGNOLIOPHYTA								
Aceraceae Juss.	51	28	12	1	0	92	1,5	0,82
Anacardiaceae Lindl.	22	5	2	0	0	29	0,48	0,91
Berberidaceae Juss.	54	29	16	0	0	99	1,7	0,81
Betulaceae S.F.Gray	74	45	15	1	4	139	2,4	0,80
Bignoniaceae Juss.	13	7	5	0	0	25	0,4	0,79
Buxaceae Dumort.	2781	109	4	3	0	2897	50,2	0,98
Caesalpiniaceae R.Br.	1	0	0	0	0	1	0,01	1,00
Caprifoliaceae Juss.	4	5	10	2	0	21	0,3	0,56
Celastraceae R.Br.	1	0	0	0	0	1	0,01	1,00
Cornaceae Dumort.	6	0	38	0	0	44	0,7	0,48
Corylaceae Mirb.	54	12	37	0	0	103	1,7	0,75
Elaeagnaceae Juss.	4	1	0	0	0	5	0,08	0,94
Fabaceae Lindl.	33	9	3	3	0	48	0,8	0,85
Fagaceae Dumort.	55	11	1	1	0	68	1,2	0,93
Grossulariaceae DC.	1	1	0	0	0	2	0,03	0,85
Hippocastanaceae DC.	41	74	28	3	4	150	2,6	0,69
Hydrangeaceae Dumort.	15	10	3	0	0	28	0,5	0,83
Juglandaceae Rich. ex Kunth	4	3	0	0	0	7	0,1	0,87
Moraceae Link	10	4	3	2	0	19	0,3	0,75
Oleaceae Hoffmans. et Link	60	46	56	3	0	165	2,8	0,69
Platanaceae Dumort.	3	1	0	0	0	4	0,07	0,93
Rosaceae Juss.	139	83	44	2	2	270	4,6	0,79
Salicaceae Mirb.	20	12	4	0	4	40	0,7	0,76
Sambucaceae Link	0	1	0	0	0	1	0,01	0,70
Simaroubaceae DC.	1	0	0	0	0	1	0,01	1,00
Tiliaceae Juss.	63	99	51	2	1	216	3,7	0,71
Ulmaceae Mirb.	4	1	0	0	0	5	0,08	0,94
Viburnaceae Dumort.	5	1	1	0	0	7	1,1	0,87
The total number, pieces	4299	887	487	65	23	5761	-	0,83 ± 0,02
% from the total number, %	74,6	15,4	8,5	1,1	0,40	-	100	-

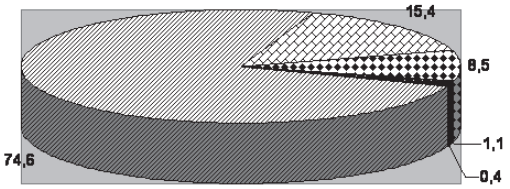

Fig. 3. Distribution of woody species of basic institution of NULES of Ukraine by categories of vitality, where – "healthy"; – "damaged"; – "severely damaged"; – "dying"; – "deadwood"

Among the rarity coniferous a significant portion species with relatively small areas of distribution, which often confined to mountain environment (endemic or well-nigh endemic): Chamaecyparis pisifera, Metasequoia glyptostroboides.

The vital state of valuable rarity conifers, in accordance to these groups are good and satisfactory (Table. 3). The vast majority of rarity conifers under conditions of basic institution of University were winter- and droughtresistant.

In some years plants species of Chamaecyparis pisifera and Juniperus communis slightly freeze, and in years when it is high rainfall happens massive overthrowing by hacking plants of Thuja occidentalis. In some individuals of Metasequoia glyptostroboides occurs dropping a turgor in short-term without signs of drying needles and branches in the dry periods.

Obviously, the level of adaptation of indicated conifers preferably conditioned by the level of their reproductive ability. The most adapted species are Abies alba, Picea abies, P. pungens, Thuja occidentalis, Th. plicata.

We established, woody plants that grow on the territory of basic institution of NULES of Ukraine have different indicators of the vital state and refer to different categories (Table. 3). After calculating the indices of state tree stand (index STS) by E. N. Andreevoy, average indicator of relative life status is 0,82, and corresponds to the estimation of "healthy".

We have found that the largest number of woody plants (4299 samples) belongs to the category "healthy plants." It should also to note that on the territory of the University are growing over 50 % of healthy plants which belong to different genus: Acer L., Armeniaca Mill., Berberis L., Betula L., Buxus L., Castanea Mill., Catalpa Scop., Cotoneaster Medik., Crataegus L., Fagus L., Forsythia Vahl, Juniperus L., Laburnum Medik., Metasequoia Hu et W.C.Cheng, Morus L., Physocarpus (Cambess.) Maxim., Picea A. Dietr., Platanus L., Quercus L., Rhus L., Robinia L., Salix L., Sorbus L., Spiraea L., Ulmus L.

A category of "severely damaged" has 8,5% of total plants quantity (Fig. 3).

We attributed 444 samples from division Pinophyta to the categories of "damaged" and "severely damaged" plants, representing 34,9% of the total number of plants of this division.

Among the representatives of division Magnoliophyta 930 samples of woody plants attributed to the second and third categories of vitality – 25,4% of the total number of plants of this department. It should be noted that in existing plantings are most widely represented taxa such families Cupressaceae, Pinaceae, Fagaceae, Berberidaceae, Oleaceae, Rosaceae and Hydrangeaceae.

Conclusions

1. Dendroflora of basic institution of NULES of Ukraine includes 122 species belonging to 66 genera, 32 families and 25 orders, 3 classes and 2 divisions by the evaluation of the taxonomic composition of green spaces.
2. Division Pinophyta represented by 15 species (12,3 % of total quantity), Magnoliophyta – 107 (87,7 %). The most numerous families (quantity of species) are Cupressaceae – 7 (5,73 % of the total number), Oleaceae – 9 (7,37 %), Rosaceae – 37 (30,33 %).
3. Analysis of the biomorphological structure dendroflora indicates about the predominance of deciduous – 107 species (87,7 %), compared with coniferous – 15 (12,3 %). The dominant life form is a group of trees – 58,2 %, shrubs constitute 41,8 %.
4. Established that 74,6 % of woody plants that grow on the territory of basic institution of

NULES of Ukraine are categorized as "healthy plants". The category of "damaged" and "severely" included nearly 24 %.

5. Determined, on the territory of basic institution of NULES of Ukraine grows 13 species of gymnosperms plants listed in the IUCN Red List. Among them 11 species belong to the group of low risk (LR), one species (Metasequoia glyptostroboides) to groups of species which are under the critical threatened with extinction in the future (CR), one (Ginkgo biloba) to a group of species that are endangered (EN).

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АНОТАЦІЯ

Колесніченко О.В., Якобчук О.М., Середюк О.О., Романова Т.С. *Характеристика деревних насаджень на території Національного університету біоресурсів і природокористування України // Біоресурси і природокористування. – 2015. – 7, №1–2. – С. 5–11.*

Показано результати вивчення видового складу деревної рослинності на території базового закладу Національного університету біоресурсів і природокористування України у Києві. Встановлено систематичну структуру та таксономічний склад. Зроблено оцінку життєвого стану деревних рослин.

АННОТАЦИЯ

Колесниченко Е.В., Якобчук О.М., Середюк О.О., Романова Т.С. *Характеристика древесных насаждений на территории Национального университета биоресурсов и природопользования Украины // Биоресурсы и природопользование. – 2015. – 7, №1–2. – С. 5–11.*

Представлены результаты изучения видового состава древесной растительности на территории базового заведения Национального университета биоресурсов и природопользования Украины в Киеве. Установлены систематическая структура и таксономический состав. Проведена оценка жизненного состояния древесных растений.