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PECULIARITIES OF GROWTH OF STREET PLANTINGS IN THE URBAN CONDITIONS IN KYIV

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Lighted questions regarding the impact urban factors on the growth processes of street woody plants. Analyzed and compared to results of studies regarding the length of the annual increment of shoots of woody plants in different types of landings.

Urban factors, woody plants, streetplanting, street, boulevard, smallhole.

High level of harmful emissions into the atmosphere is largely due to the rapid increase of transport flows, retarded the rate of street and road network, poor fuel quality [4]. The main sources of air pollution in the city is mobility equipment, including the first-ranked vehicles, accounting about 82% of emissions. This is due first of all to the increasing number of vehicles and the lack of reliable methods for monitoring its work, which puts the problem in a leading position among the environmental problems of the city. Extremely large role of street green plantings is protection of air from pollution by dust and gas. One of the mechanisms of the effect of green plantings on the clearing of air from pollutants is mechanical (brake) effect on surface air flow. Reducing the wind speed in the surface layer, trees and shrubs not only prevent further dispel dust, but accumulate it on its leaves. So plants play a great role of natural filter[0].

The purpose of researches is the learning of the growth characteristics of woody plants in street plantings of Kyiv those were influenced by urban factors.

Materials and methods of researches. The causes of growth inhibition of plants that grow along the streets are differents - some acts on the root system of plants: depletion of soil nutrients or, conversely, their surplus (in bulk soils), soil compaction, altered pH and others. The second group of factors affects on aerial parts: smoke, fumes and dust air, and therefore the change of temperature, radiation and light intensity modes, besides mechanical damage [3]. Optimal

development of "urban plants" is also related to a violation of their farming and care.

Plant response to adverse conditions is a complex change of vital processes, including such figures as green organism: growth rate, the rate of seasonal development, flowering and fruiting intensity, the appearance of plants of its structural features, characteristic of the basic physiological processes, durability [0].

The objects of researches were isolated groups of trees (20 individuals of each species in different growth conditions) 20-30 years of age with a maximum close morphological characteristics. These are woody plant street trees of the historical part of Kyiv: *Tilia cordata* Mill., *T. platyphyllos* Scop., *Aesculus hippocastanum* L., *Populus nigra* L., *P. italica* Rosier., *Acer platanoides* L., *A. saccharinum* L., *Sorbus aucuparia* L., *Betula pendula* Roth., *Robinia pseudoacacia* L., *Quercus borealis* Michx., *Fraxinus excelsior* L.

Measuring the length of annual shoots were conducted in August and September for 3 years. The obtained data on the comparative analysis of growth of annual shoots of woody plants that grow in different types of street plantings that were checked by statistical way with using appropriate criteria [4]: F-Fisher criterion (5% significance level nom) - for variances; Student t-test (two-sided test at a confidence level of 0.95) - average values for species numbers.

Results of researches. During his life, the tree goes through a series of stages, each of which is characterized by relevant criteria: stage of growth - constant growth in height and volume, improved decoration; stable condition - stop growth when the plant within a few years it acquired stores decorative quality; extinction phase - loss of decoration, a plant according to biological laws for this species begins to die. In the urban conditions matching of these stages with biological characteristics of street woody plants violated.

In the street woody plants with realization of the program ontogenesis periods of intense growth and development alternate with periods of stopping of these processes. It is this feature of ontogeny leads to the possibility of adaptation

of plants to survive in adverse conditions. Thus, the beginning of shoot growth in woody plants that grow near the roadway is 3-7 days earlier than in other types of plantings but the duration of their growth is much smaller (about 15-20 days).

The influence of adverse factors slowing down the intensity of physiological processes and functions in street plantings reaches a critical level, that causes a breach of vital functions of the plant organism. Therefore, street plantings, particularly of historical part of Kyiv, constantly are in stress. Researches have established that are the most compacted soils along driveways (in holes band lawns and boulevards) [5]. As a manifestation of this factor, was fixed the reducing and dryness of annual growth of shoots (table), early yellowing and defoliation. Conducting of researches and comparing facts of general and life status of annual growth of trees on the compacted soils was observed that excessive compaction (over 30 kg · (cm2) -1) detrimental effect on *T. cordata*, *T. platyphyllos*, *Ae. hippocastanum*, *A. platanoides*, *S. aucuparia* і *B. Pendula* [5]. This factor of compacting impact negative on soil aeration, so that plants get enough oxygen, the roots are not provided by air. It leads to a frequent rotting of root system and aerial part has initially depressed appearance, and later - dies.

Mean values (three years) of annual increments of shoots of woody plants that grow in the historical part of Kyiv

Type of plant	One-year growth of shoots, cm			
	Street plantings		Local area	Squares
	in holes	in a strip of lawn		
A. platanoides	27,5±0,83	28,9±0,90	30,2±0,97	31,6±0,90
A. saccharinum	30,3±1,08	32,7±1,18	33,4±1,11	33,9±1,10
Ae. hippocastanum	9,8±0,49	10,0±0,49	10,7±0,55	11,9±0,59
B. pendula	18,8±0,62	18,7±0,81	21,0±0,74	22,1±0,75
F. excelsior	28,0±0,97	30,8±0,91	30,9±0,98	31,1±0,93
P. nigra	49,1±0,97	52,4±1,50	50,8±1,32	58,0±1,32
P. italica	48,9±1,36	50,6±1,22	55,1±1,57	57,1±1,44
Q. borealis	24,8±1,18	32,6±1,10	34,0±0,94	35,4±1,17
R. pseudoacacia	39,2±1,38	41,9±1,36	42,1±1,90	43,1±1,80
S. aucuparia	21,7±0,93	23,9±1,20	25,2±1,21	27,0±0,88

T. cordata	27,1±2,08	30,0±1,62	31,3±1,53	37,9±1,79
T. platyphyllos	28,6±1,81	31,7±1,72	42,7±1,96	47,9±1,63

According to the table regarding shoot growth of woody plant species most common in street stands the historical part of Kyiv, their lowest rate observe in plants that are planted in the holes.

Thus, in *A. platanoides* difference between the increments in this type of street trees is 19,2-34,1 cm, *Ae. hippocastanum* - 5,2-14,8, *F. excelsior* - 18,9-37,5, *T. cordata* - 7,5-43,6 cm. However, plants *T. cordata,* which grow in street stands in the holes have sometimes differences in the annual growth of more than 36 cm, or about 80%. The same situation is observed in *T. platyphyllos.* Slightly higher growth was found in plants *F. excelsior, Q. borealis, R. pseudoacacia, S. aucuparia, T. cordata* and *T. platyphyllos,* which grow in a strip of lawn and smaller - in *Ae. hippocastanum*, *B. pendula, P. nigra* and *P. italica.* Rather high annual growth found in woody plants that are growing on the local area and squares (except *P. nigra*), which once again points to the complexity of growth conditions of plantings along roads. The largest gain was observed in plants that grow in squares that are separated from the roadway.

To test statistical hypotheses regarding the existence of difference between the mean values of growth shoots the most common species of woody plants in different types of street trees was performed statistical analysis of research materials.

For control of chosen annual growth of shoots of woody plants squares. Comparison of mean values of species numbers by Student's t-test shows that in most cases its critical value is much less than the calculated ($t_{crit.}<t_{calcul.}$). Most clearly seen in comparisons of species numbers of plants that grow in the holes and strip of lawn with control.

A significant difference between the species numbers found in *A. platanoides*, *Ae. hippocastanum*, *B. pendula*, *P. nigra*, *P. italica*, *Q. borealis*, *S. aucuparia*, *T. cordata*, *T. platyphyllos*. Their greatest difference found for

T. platyphyllos, *Q. borealis*, *P. nigra*, least – in *A. saccharinum*, *F. excelsior*, *R. pseudoacacia*. This means that the hypothesis of the importance of difference between the mean value of shoot growth of woody plants in plantations in the holes with the control objects, you should adopt the probability of 0.95, except for *R. pseudoacacia.* In plantations in the strip of lawn – besides *R. pseudoacacia*, *F. excelsior*, *A. saccharinum*; and onthe local area only significant difference in *T. platyphyllos* and *P. nigra.* So, a large difference in the annual growth of shoots in all types of plants is typical for *P. nigra* and *P. italica*, although their general condition rated as good in all stands. It indicates the property mentioned plants adapt to the habitat. The smallest difference in growth in different types of street plantings was in *F. excelsior* і *R. pseudoacacia*, indicating that the stability of these species in the urban conditions of growth.

Street plantings along roads in the historical part of Kyiv mainly grow in holes on the paved streets, in the so-called planks type of growth. It is for this type of growth is characterized by a large number of rubbish in holes and the availability of coverage around them, which limit space for growth and feeding of root system. As a result of these observations in these conditions a relatively good feel only *R. pseudoacacia*, individual species *Populus* and partly *Ae. hippocastanum*, that is mainly due to the feature of the growth and development of their root system. As found seats fill with lots of roots, which often leads to the death of skeletal, fibrous roots and auxiliary. In turn, this leads to not only low form shoots of plants, form of small leaves (*T. cordata*, *B. pendula*, *A. platanoides*), reducing the growing season, drying of branches and leaves (*T. cordata*, *T. platyphyllos*, *Ae. hippocastanum*), loss of decoration and dying plants.

Conclusions

1. Street plantings play an important protective role (brake and accumulative) in the apprehension of harmful emissions from motor vehicles. So, now the question remains to study the features growth, preservation and protection of green plantings in towns.

2. Manifestations impact urban conditions on woody plants, there are two groups of factors: underground and surface. Influence on them decreases the annual growth and drying of shoots, early yellowing and defoliation and others.

3. The difference between the values of increments in different types of plantings goes, sometimes, up to 80%. The largest growth in plants which grow on the houses adjoining areas and squares.

4. Great difference in the growth of shoots was observed for *P. nigra* and *P. italica*, but these species have good state in all types of plantings, and the smallest difference was observed in *F. excelsior* and *R. pseudoacacia,* indicating that the adaptation of plants to habitat conditions.

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Освещены вопросы относительно влияния урбогенных факторов на ростове процессы уличных древесных растений. Проанализированы и сопоставлены результаты исследований относительно длины однолетних приростов побегов древесных растений в разных типах посадок.

Урбогенные факторы, древесные растения, уличные насаждения, улица, бульвар, лунка.

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