UDC 582:973:712.25[477]

ACTION ON URBAN ENVIRONMENT ON THE WATER REGIME OF ASSIMILATION SYSTEM AND REPRODUCTIVE ABILITY OF SEEDLINGS *VIBURNUM OPULUS* AND *LANTANA*

O. F. Brovko, *candidate of biological sciences*
F. M. Brovko, *doctor of agricultural sciences*

It is shown that the leaves of Viburnum plants that grows on the shoots of the current year on the water content in 3,3-3,8% greater, water scarcity in 2,8-4,0 times higher, intensity of transpiration in 16,5-37,6 % higher than that of leaves formed on the shoots of yesteryear. It was found that the flow of water through transpiration in leaf Viburnum opulus L. *in 71,8-75,2% less than the usual snowball, indicating its greater adaptability to growth y xerophytic conditions.*

Keywords: viburnum, seedling, water regime, transpiration, seed purity.

On the territory of Ukraine two native species of viburnum - Viburnum usual (*Viburnum opulus* L.) and Viburnum hordovyna (*Viburnum lantana* L.) are growing in the stands of natural origin. *Viburnum opulus* L. usually found in the undergrowth of different composition of forests and forest edges, which maintain an attractive appearance to the age of 70, and *Viburnum lantana* L. gardeners long to incorporate planting as undergrowth or tapeworm. Both species tolerate hardiness and shade. They can withstand drought and Viburnum usual prefers moist habitat. However, these species tolerate dust and air pollution [3, 9]. However, in the urban environment are formed extremely challenging environment for the growth of woody plants, because they are subject to constant exposure to adverse factors such as air pollution by dust and gas, the limited amount of plant nutrition, insufficient aeration of the soil and its intoxication [1, 7], that negative impact on the viability and aesthetic qualities of plants and definitely updated creating plant communities resistant to the conditions of the urban environment. These circumstances also led to this study.

The purpose of the study. Expansion of information on bio-ecological characteristics and reproductive plants of Viburnum usual and Viburnum hordovyny in urban landscapes of Kyiv.

Materials and methods of research. Seedlings Viburnum usual and Viburnum hordovyny growing in Kyiv served as an object of research. The intensity of transpiration water by Viburnum leaves was determined by rapid weighing on torsion balance [10]. Total water content of the leaf calculated as a percentage of the weight of raw sample and water shortages - in percent of the mass of leaves saturated with water [8]. Repeated determinations were 5. The mass of 1000 seeds and purity were determined based on applicable standards [4, 5]. Average values of experimental data were calculated using the methods of mathematical statistics [2], and the statistical significance of the difference between the obtained result of evaluated by Student's test [6].

Results. Water plays an important role y all processes of plants, but its content in plant tissues is extremely dynamic and depends on the season, plant age, the presence of moisture in the soil, transpiration intensity and other environmental factors which have an effect in urban landscapes [1, 7]. According to the data table 1, the highest rates of water content (68,7 %) we observed in the leaves of Viburnum usual, which was formed on non-wooden shoots this year. The water content of the leaf, which is formed on the shoots of the previous year was significantly lower (3,8 %) and amounted to 66.2%. Watering the leaves of Viburnum hordovyny was on 11,3-12,0 % compared with conventional and Viburnum usual leaves, respectively was 54,9 and 56,7 % for leaves formed on the shoots of the previous and current years.

Water scarcity in leaf, which was formed on the shoots of the previous year, did not have significant differences and stood at 4,4 % - in Vibutnum usual and conventional 5,1 % - in Viburnum hordovyny. Based on the data given y table 1, in leaves on shoots growing water shortage this year reached 12,5 % - in Vibutnum usual and 20,5 % - in Viburnum hordovyny, indicating a more intensive course of physiological processes in leaves, which operates on the non-wooden shoots in current year.

1. Water treatment of leaf of Viburnum growing in the University Park

Researched:		Content water in leaves			Water scarcity in leaves		
Species	Leaves on shoots	%	With respect to the leaves on the shoots of the previous year		%	With respect to the leaves on the shoots of the previous year	
			%	t		%	t
Viburnum opulus L.	previous year	66,2±0,15	100,0	-	4,4±0,41	100,0	-
	current year	68,7±0,62	103,8	3,9	12,5±0,59	284,1	11,3
Viburnum lantana L.	previous year	54,9±0,33	100,0	-	5,1±0,47	100,0	-
	current year	56,7±0,21	103,3	4,6	20,5±1,09	402,0	13,0

Note. Tabulated values of quantiles of Student's test (t) at 0.05 level of probability - 2,45.

This thesis is confirmed by the data given y table 2, because the difference in the intensity of transpiration in leaves investigated shoots of Viburnum usual was 16,5 % and 37,6 % - in leaf of Viburnum hordovyny and indicates that the cost of water for transpiration in Viburnum hordovyny on 71,8-75,2 % smaller than in Viburnum usual and indicates its greater adaptability to xerophytic conditions.

2. The intensity of leaf transpiration in Viburnum growing in the University Park

Researched:		Intensity of transpiration, $g \cdot (kGr \cdot hour)^{-1}$	With respect to the leaves on the shoots of the previous year	
Species	Leaves on shoots		%	t
Viburnum opulus L.	previous year	1010,2±43,21	100,0	-
	current year	1177,0±33,06	116,5	3,1
Viburnum lantana L.	previous year	250,1±18,02	100,0	-
	current year	344,2±22,41	137,6	3,3

Note. Tabulated values of quantiles of Student's test (t) at 0.05 level of probability - 2,45.

Environmental conditions that increase researched species of Viburnum in urban landscapes of Kyiv some extent affect their reproductive capacity and performance of seeds. The weight of 1000 seeds of Viburnum usual (Table 3) was in the range of 31,6 to 53,3 g. Thus, in the plants of National Botanical Garden weight of 1000 seeds was 12.6% and in Holosiivo Park - 68, 4% higher than the control.

However, the purity of the seed plants growing in Golosiivo Park was lower by 47,5 % compared to saplings that grow in the park of Friendship of Peoples. It should also be noted that the seeds collected in Golosiivo Park, contained in the air-dry water by 36,5 % more, and its complete saturation of water was observed in the water content of 56,7 %, which is 18,6 % less than in plants that grow under control. The seeds of Viburnum usual collected from seedlings growing at the National Botanic Garden purity (98 %) had water content in air-dry condition (10,5 %) and water content after saturation with water (68,7 %) did not differ significantly from control, and the difference was in the limits of 1,0-1,4 %.

3. Indicators of seed quality in Viburnum usual growing in urban landscapes of Kyiv

Researched indicators of seed quality	Units	Place seedlings growth:		
		Park of Friendship of Peoples "Control"	National nature Park «Golosiivo»	National Botanical Garden
Weight of 1000 seeds	g	31,6±1,58	53,3±2,53	35,6±1,36
	% of control	100,0	168,4	112,6
Goodness	%	99±0,41	51±0,71	98±0,63
	% of control	100,0	52,5	99,0
The water content of the seeds in:				
air-dry state	%	10,4	14,2	10,5
	% of control	100,0	136,5	101,0
after saturation with water	%	69,7	56,7	68,7
	% of control	100,0	81,4	98,6

The seeds of Viburnum hordovyny harvested from plants that grow in the northern part of the Golosiivo Park (Table 4) had the weight of 1000 seeds in the range of 33,6 to 50,6 g. In this case, the maximum weight of seed was observed in plants that grow on open areas of the park at a distance of more than 20 meters from the roadway of Golosiivo Avenue. Minimum weight and purity of seed plants Viburnum hordovyny were observed in biogroup that grew under the canopy of oak stand (opposite the M. Stelmach street.) and near the roadway Holosiivo Avenue (near the trolley stop "Moscow department store"), which thanks to the shading and the negative impact emissions of road transport weight of 1000 seeds fell by 26,5-

28,8 % and their purity was at 46-49% less than favorable growing conditions that occurred in communities that were identified as controls.

4. Weight of 1000 seeds and seed purity of Viburnum hordovyny growing in National Park "Holosiivo"

Place seedlings growth on northern part of Golosiivo Park	Weight of 1000 seeds			Goodness		
	g	relative to control		%	relative to control	
		%	t		%	t
Opposite Lane Uzhgorod "control"	47,3±1,93	100,0	-	98±0,85	100,0	-
Near Park Hotel "Golosiivo"	50,6±3,30	107,1	0,9	97±0,83	99,0	0,8
Opposite M/ Stelmakh street	34,7±1,99	73,5	4,5	53±1,11	54,0	25,7
Opposite A. Bubnov street	44,5±2,01	94,2	1,0	72±0,65	73,0	24,3
Near the trolley stop "Moscow department store"	33,6±1,87	71,2	5,1	50±2,72	50,8	16,8

Note. Tabulated values of quantiles of Student's test (t) at 0.05 level of probability - 2,45.

Watering the seeds of Viburnum hordovyny in air-dry state (Table 5) also depends on where the growth of seedlings in urban landscapes. Thus, under the canopy vegetation water content of seeds was higher by 35,2 %, and y the growth in direct proximity to the highway by 38,4 % lower than in control. With the deteriorating growth conditions also decreased the upper threshold saturation seeds of Viburnum hordovyny water on 18,1-29,4 %.

5. Watering plants seeds of Viburnum hordovyny growing in Golosiivo Park"

Place seedlings growth on northern part of Golosiivo Park	The water content of the seeds in:			
	air-dry state		after saturation with water	
	%	% of control	%	% of control
Opposite Lane Uzhgorod "control"	18,5	100,0	63,8	100,0
Near Park Hotel "Golosiivo"	19,1	103,2	64,4	100,9
Opposite M/ Stelmakh street	25,0	135,2	52,3	81,9
Opposite A. Bubnov street	27,2	147,0	48,0	75,1
Near the trolley stop "Moscow department store"	11,4	61,6	45,0	70,6

Conclusions:

1. In urban landscapes of Kyiv the highest water content of leaves of Viburnum usual, was observed in non-wooden shoots of the current year (68,7 %) and higher

than the water content of the leaves, which is formed on the shoots of the previous year by 3,8 %. In Viburnum hordovyny, water content in the leaves was 11,3-12,0 % compared with Viburnum usual leaves, respectively was 54,9 and 56,7 % for leaves formed on the shoots of the previous and current years.

2. Water scarcity in leaves that grew on the shoots of last year stood at 4,4 % - in Viburnum hordovyny and 5,1 % - in Viburnum hordovyny leaves formed on the shoots of the current year was higher and amounted to 12,5 % - in Viburnum uasual and 20,5 % - in Viburnum hordovyny. The amount of water through transpiration in Viburnum hordovyny on 71,8-75,2 % lower than y Viburnum usual, indicating its greater adaptability to xerophytic conditions of growth.

3. In plants of Viburnum usual the weight of 1000 seeds was in the range of 31,6 to 53,3 g and purity in seed plants growing in Golosiivo Park was by 47,5 % lower compared to saplings that grow in the park of Friendship of Peoples. Seeds collected in Golosiivo Park, contained in the air-dry water by 36,5 % more, and its complete saturation of water was observed in the water content of 56,7 %, which is 18,6 % less than the plants that grow under control.

4. The weight of 1000 seeds of Viburnum hordovyny harvested from plants that grow in the northern part of the park Golosiivo was in the range of 33,6 to 50,6 g. Greatest mass of seeds was typical of seedlings growing in open areas of the park, and the lowest mass and purity of seeds observed in biogroup that grew under the canopy and near the highway (10 m), where due to shading and the negative impact of road transport emissions the mass of 1000 seeds fell by 26,5-28,8 % and purity values were 46-49 % less than favorable growing conditions.

References:

1. Білецька Г. А. Фітомеліорація. Функції рослинного покриву у містах. Комплексні зелені зони міста [Електронний ресурс] / Г. А. Білецька. – Режим доступу http://bookdn.com/book_538_glava_7.FITOMELIOCIJA._F.html.

2. Боровиков В. STAISTICA: Искусство анализа данных на компютере. Для профессионалов / В. Боровиков. – СПб. : Питер, 2001. – 658 с.

3. Волков В. Калина красная: красота и польза / Владимир и Нина Волковы // Огородник. – 2006. - № 11. – С. 20 – 21.

4. ДСТУ 5036 : 2008 Насіння дерев та кущів. Методи відбирання проб, визначення чистоти, маси 1000 насінин на вологості. – К. : Держспоживстандарт України, 2009. – 45 с.

5. ДСТУ проект. Насіння дерев та кущів. Методи визначення посівних якостей (схожість, життєздатність, доброякісність). – К. : Держспоживстандарт, 2014. – 67 с.

6. Корн Г. Справочник по математике для научных работников и инженеров. Определения, теоремы, формулы / Г. Корн, Т. Корн. – М. : Наука, 1984. – 831 с.

7. Левон Ф. М. Створення зелених насаджень в умовах урбанізованого середовища : вимоги, лімітуючі чинники, шляхи оптимізації / Ф. М. Левон // Науковий вісник НЛТУ України, 2003. – Вип. 13.5. – С. 157–161.

8. Починок Х. Н. Методы биохимического анализа растений / Х. Н. Починок. – К. : Наукова думка, 1976. – 334 с.

9. Рубцов Л. И. Деревья и кустарники в ландшафтной архитектуре / Л. И. Рубцов – К. : Наукова думка, 1977. – 272 с.

10. Сказкин Ф. Д. Определение интенсивности транспирации при помощи торсионных весов // Ф. Д. Сказкин, Е. И. Логвиновская, М. С. Миллер, В. В. Аникеев / Практикум по физиологии растений. – М. : Советская наука. – 1958. – С. 75–78.