

УДК 712.3:582.711.26

DOI: 10.37128/2707-5826-2021-10

**BIOECOLOGICAL FEATURES
OF GROWING THE SPECIES
AND CULTIVARS OF THE
GENUS HYDRANGEA L. IN
VINNYTSIA AREA CONDITIONS**

M. V. MATUSIAK, Candidate
of Agricultural Sciences, Senior Lecturer,
Vinnytsia National Agrarian University

*We found that in the botanical garden of VNAU two species and four cultivars of the genus *Hydrangea* L. are growing, in the City Central park – two species and three cultivars, in the Druzhby Narodiv park – three species and one cultivar, in the biostationary of VNAU – two species and one cultivar. Thus, it can be stated that in the studied Vinnytsia area grow four species and four cultivars of the genus *Hydrangea* L.*

*Studies have shown that duration of flowering depends primarily on the biological characteristics of the species and cultivars of the genus, plant age, air temperature, and ranges from 27 days in *H. serrata* «Imperatrice Eugenie» to 145 days in *H. macrophylla* «Normalis».*

*Observations during 2018-2019 and 2019-2020 revealed damage of shoots of *H. aspera* «Macrophylla», *H. macrophylla*, *H. macrophylla* «Alba», *H. macrophylla* «Normalis», *H. serrata* «Bluebird» and *H. serrata* «Imperatrice» Eugenie. In hydrangeas *H. macrophylla* and *H. macrophylla* «Normalis» in 2018-2019 the damage for the entire length of annual shoots was recorded. Signs of subfreezing of annual shoots of the crown in adult shrubs of other species and cultivars of the genus in winter period were not found.*

*The result of visual observations showed high drought resistance of hydrangeas in conditions of Vinnytsia. It should be noted that short periods of drought are tolerated by the plants without noticeable morphological damage or with wilting of leaves during daytime. In conditions of dry season extension, the hydrangeas under study behave differently. Thus, in 2020, due to a longtime summer drought, *H. bretschneideri* shrubs dropped some of their leaves in late August. However, most species and cultivars of the genus were quite resistant to drought.*

*Based on the obtained results, such hydrangeas as *H. arborescens*, *H. arborescens* «Grandiflora», *H. arborescens* «Sterilis», *H. aspera* «Macrophylla», *H. bretschneideri*, *H. paniculata*, *H. paniculata* «Grandiflora», *H. paniculata* «Limelight», *H. petiolaris*, *H. serrata* «Bluebird» and *H. serrata* «Imperatrice Eugenie», can be recommended for widespread use in ornamental plantations of the city. The rest of the plants are sensitive to fluctuations in winter air temperature.*

Key words: *Hydrangea* L., rhythms of development, stability, reproduction, introduction, perspectiveness, decorativeness, use.

Tabl. 5. Fig. 2. Lit. 8.

Problem statement. Green plantings play an extremely important role in creating optimal living conditions for people. They significantly contribute to the improvement of the natural surrounding, perform climate-regulating, environmental and sanitary functions. Their decorative potential in creating the architectural and artistic appearance of the city is limitless. One of the ways to improve the urban environment is landscaping, which is especially important in conditions of intensive urbanization [2].

Diversification of the range of trees and shrubs for landscaping is closely linked to the introduction and acclimatization of plants which are new for the region. One of the promising is the group of species and cultivars of *Hydrangea* L. genus. High decorative properties of hydrangeas determine their use for landscaping in Vinnytsia.

The main problem of the limited use of hydrangeas in landscaping is insufficient information on their biological and ecological features, as well as on their decorative properties in terms of introduction. There is a need to enrich the range of hydrangeas used in landscaping of Vinnytsia, at the expense of the introduced species, tested in botanical gardens and arboretums. In this regard, a comprehensive study of species of the genus *Hydrangea* L. for widespread use in urban landscaping is certainly relevant [5].

Analysis of recent publications. Successful use of different species of the genus *Hydrangea* L. in culture is possible only in case of a comprehensive study of biological and morphological features of these plants. Such scientists as Kokhno M.O., Kurdyuk A.M., Korkulenko O.M. and others dealt with the problem of hydrangea distribution in culture. Lipa A.L., Molchanov A.A., Kalinichenko O.A., Lapin P.I. and others [4-8] devoted their works to the present-day level of development of landscape architecture and landscaping where paid considerable attention to the expansion of species diversity and introduction into culture of the flowering plants.

Materials and methods of research. Stationary observations of plants were carried out in botanical gardens and street plantings in Vinnytsia city.

Phenological observations in order to establish the rhythm of seasonal development were carried out according to the “Methodology of phenological observations in botanical gardens of the USSR” [5]. Plants were divided into phenogroups according to the P.I. Lapin’s method [7].

The abundance of flowering (fruiting) was established by the O.A. Kalinichenko’s unified six-point scale [1], where:

0 – the plant does not reproduce – 0%:

1 – the crown is very poorly covered with reproductive organs, by 0-20 %;

2 – the crown is poorly covered with reproductive organs, by 21-40 %;

3 – the crown is moderately covered with reproductive organs, by 41-60 %;

4 – the crown is well covered with reproductive organs, by 61-80 %;

5 – the crown is very well covered with reproductive organs, by 81-100 %.

Winter hardiness of the plants in the field conditions was established by the S.Ya. Sokolov scale [4], where:

- I – the plant is quite winter-hardy;
- II – the ends of the shoots of the previous growing season freeze;
- III – the shoots of the previous growing season freeze along their entire length;
- IV – 3-year-old and older branches freeze;
- VI – the plant freezes to the level of snow cover;
- VII – the plant freezes to the root neck, but grows again;
- VIII – the plant freezes completely.

Drought resistance in the field conditions was evaluated by the S.S. Piatnytsky six-point scale [8], where:

- 0 – the plant dies of drought;
- 1 – leaves fall off, the ends of shoots dry up;
- 2 – half of all leaves on the plant and a part of shoots dries up;
- 3 – the smaller part of all leaves on a plant is damaged;
- 4 – during the day-time leaves lose their turgor, wilt, but recover in the night;
- 5 points – the plant does not answer to drought.

Results and discussion. In order to identify species and cultivars of the genus *Hydrangea* L., which grow in conditions of Vinnytsia, we examined the collection plantations of botanical institutions, as well as ornamental plantations, to establish the taxonomic composition of hydrangeas grown in them.

For each taxon of the genus growing in the botanical institutions of Vinnytsia, age, biomorph and height are indicated (Table 1). Age is determined by inventory cards, height – by the results of the 2019 inspections.

We found that in the botanical garden of VNAU grow two species and four cultivars of the genus *Hydrangea* L., in the City Central park – two species and three cultivars, in the Druzhby Narodiv Park – three species and one cultivar, in the biostationary of VNAU – two species and one cultivar. Thus, it can be stated that in the studied Vinnytsia area grow four species and four cultivars of the genus *Hydrangea* L.

Duration of flowering is one of the most valuable qualities of ornamental plants, which is important for ornamental horticulture. It must be taken into account in creating decorative compositions, as well as gardens of continuous flowering.

We conducted a study on the abundance of flowering of the species and cultivars of the genus *Hydrangea* L. in Vinnytsia city, where the introduced hydrangeas bloom annually. Most plants were characterized by abundant (5 points) and good (4, 4.3 points) flowering. Poor flowering was characteristic of *H. petiolaris* (2 points), as well as *H. macrophylla*, *H. macrophylla* «Alba» and *H. macrophylla* «Normalis» (poor flowering was observed for some years).

Poor flowering in *H. macrophylla*, *H. macrophylla* «Alba» and *H. macrophylla* «Normalis» is primarily due to the damage to generative buds in winter and early spring by subzero temperatures.

Table 1

Species and cultivars of the genus *Hydrangea* L. grown in Vinnytsia botanical institutions and parks

Taxons, Latin name	Age, years	Biomorph	Height, m	Natural habitat
VNAU Botanical garden				
<i>H. macrophylla</i> (Thunb.) DC.	47	Shrub	1,50	Western and Central China, Japan
<i>H. paniculata</i> «Grandiflora» Sieb.	8	Shrub	1,60	–
<i>H. arborescens</i> «Grandiflora» Rehd.	52	Shrub	1,75	North America
City Central park				
<i>H. macrophylla</i> (Thunb.) DC.	52	Shrub	1,20	Western and Central China, Japan
<i>H. macrophylla</i> (Thunb.) DC. «Alba»	14	Shrub	1,50	–
<i>H. macrophylla</i> (Thunb.) DC. «Bergfink»	8	Shrub	0,80	–
<i>H. macrophylla</i> (Thunb.) DC. «Bordo»	21	Shrub	1,00	–
<i>H. arborescens</i> L.	46	Shrub	2,00	North America
Druzhby Narodiv park				
<i>H. macrophylla</i> (Thunb.) DC.	60	Shrub	1,00	Western and Central China, Japan
<i>H. arborescens</i> «Sterilis» Torr. et Gr.	12	Shrub	1,75	North America
<i>H. serrata</i> (Thunb.) DC.	4	Shrub	0,85	Korea, Japan
Biostationary of VNAU				
<i>H. arborescens</i> «Sterilis» Torr. et Gr.	23	Shrub	1,70	North America
<i>H. macrophylla</i> (Thunb.) DC.	23, 47	Shrub	1,50	Western and Central China, Japan

Source: based on own research

Since the generative organs in *H. macrophylla* are formed in the buds in the year of their laying (generative buds enter the winter at the III-Vth stages of



Fig. 1. Flowering of *H. macrophylla* (Botanical Garden of VNAU)

Source: based on own research

organogenesis), the plants begin to bloom in early summer next year. In 2020, annual shoots of *H. macrophylla* shrubs were half-length damaged by frosts, but despite this, the plants bloomed. Regular fruiting and high seed germination are one of the main indicators of the degree of the plants adaptation to the new habitat conditions. The period of fruit formation of the introduced hydrangeas is very long and ranges from 88 days in *H. paniculata* to 132 days in *H. bretschnideri* and depends on the terms of the fertile flowers blossoming (Table 2).

Table 2

Dates of beginning and mass ripening of hydrangea fruits (Vinnytsia, 2018-2020)

Species, cultivar	Ripening of fruits							
	beginning				mass			
	years				years			
	2018	2019	2020	average	2018	2019	2020	average
<i>H. arborescens</i>	26.10	24.10	20.10	23.10	04.11	03.11	29.10	02.11
<i>H. arborescens</i> «Grandiflora»	01.11	28.10	18.10	26.10	12.11	08.11	27.10	05.11
<i>H. aspera</i> «Macrophylla»	09.11	05.11	01.11	05.11	19.11	17.11	11.11	16.11
<i>H. bretschnideri</i>	10.10	26.10	10.09	04.10	27.10	03.11	09.10	23.10
<i>H. macrophylla</i> «Normalis»	11.11	08.11	14.11	11.11	18.11	14.11	18.11	17.11
<i>H. paniculata</i>	08.11	03.11	29.10	03.11	19.11	15.11	13.11	16.11
<i>H. petiolaris</i>	28.09	06.10	18.09	27.09	06.10	12.10	02.10	07.10
<i>H. serrata</i> «Imperatrice Eugenie»	–	01.11	24.10	28.10	–	11.11	05.11	08.11

Source: based on own research

During ripening the fruits (seed cases) of hydrangeas change color from green to brown and begin to crack at the top. Fig. 2 shows ripening of fruits in *H. bretschnideri*.



Fig. 2. Fruits ripening of *H. bretschnideri* (Botanical Garden of VNAU, 2020)

Source: based on own research

Winter hardiness of hydrangea shoots was evaluated by the eight-point scale proposed by S.Ya. Sokolov [4]. Visually winter hardiness was determined by analyzing the physical condition of plants after wintering (Table 3).

Table 3

Winter hardiness of species and cultivars of the genus *Hydrangea* L. in conditions of Vinnytsia, in points, according to S.Y. Sokolov

Species and cultivars	Years		Average indicator
	2018-2019	2019-2020	
<i>H. arborescens</i>	1	1	1
<i>H. arborescens</i> «Grandiflora»	1	1	1
<i>H. arborescens</i> «Sterilis»	1	1	1
<i>H. aspera</i> «Macrophylla»	1	2	2 (1)
<i>H. bretschneideri</i>	1	1	1
<i>H. macrophylla</i>	1	3	2 (1, 3)
<i>H. macrophylla</i> «Alba»	1	2	2 (1)
<i>H. macrophylla</i> «Normalis»	1	3	2 (1, 3)
<i>H. paniculata</i>	1	1	1
<i>H. paniculata</i> «Grandiflora»	1	1	1
<i>H. paniculata</i> «Limelight»	1	1	1
<i>H. petiolaris</i>	1	1	1
<i>H. serrata</i> «Bluebird»	1	2	2 (1)

Source: based on own research

Temperature conditions of the winter period of 2019-2020 were favorable for wintering of all the studied members of the genus. We did not find any signs of hydrangeas annual shoots freezing. Observations during 2018-2019 and 2019-2020 revealed damage to shoots of *H. aspera* «Macrophylla», *H. macrophylla*, *H. macrophylla* «Alba», *H. macrophylla* «Normalis», *H. serrata* «Bluebird» and *H. serrata* «Imperatrice Eugenie».

Studying drought resistance of the introduced hydrangeas, we evaluated it using the scale of S.S. Piatnytsky [8] (Table 4).

During the years of observation, hydrothermal conditions of the vegetation period fluctuated significantly, in particular the terms of dry season, its intensity and duration. It should be noted that short periods of drought are tolerated by the plant without noticeable morphological damage or with wilting of leaves during the day. In conditions of the dry season period extension, the hydrangeas under study behave differently. Thus, in 2020, due to a long summer drought, *H. bretschneideri* shrubs dropped some of their leaves in late August. However, despite this, most species and cultivars of the genus were quite resistant to drought.

As can be seen from table 4, the introduced hydrangeas have different level of drought resistance. The lowest one had *H. bretschneideri* – 3 points, the highest –

Table 4

Drought resistance of species and cultivars of the genus *Hydrangea* L. in conditions of Vinnytsia according to S.S. Piatnytsky (1960)

Species and cultivars	Years, points		Average indicator, points
	2019	2020	
<i>H. arborescens</i>	4	3	3,7
<i>H. arborescens</i> «Grandiflora»	4	4	4,0
<i>H. arborescens</i> «Sterilis»	4	3	3,7
<i>H. aspera</i> «Macrophylla»	4	3	3,7
<i>H. bretschneideri</i>	4	3	3,0
<i>H. macrophylla</i>	4	3	3,3
<i>H. macrophylla</i> «Alba»	4	3	3,7
<i>H. macrophylla</i> «Normalis»	4	3	3,7
<i>H. paniculata</i>	5	3	4,3
<i>H. paniculata</i> «Grandiflora»	5	3	4,3
<i>H. paniculata</i> «Limelight»	5	3	4,3
<i>H. petiolaris</i>	4	4	4,0
<i>H. serrata</i> «Bluebird»	4	3	3,7
<i>H. serrata</i> «Imperatrice Eugenie»	4	3	3,7

Source: based on own research

H. paniculata, *H. paniculata* «Grandiflora» and *H. paniculata* «Limelight» – 4.3 points. All other hydrangeas were characterized by a medium drought resistance – from 3 to 3.3 points.

Recently, due to the global warming, the problem of heat tolerance of plants has become a significant one, especially in conditions of the modern city due to the use of a considerable quantity of inert materials for its development and improvement. A significant disadvantage of many of them is the ability to sharply increase the temperature under the action of sunlight, which leads to changes in the microclimate of residential areas. This is especially important for those plants whose crown is located close to overheated surfaces, the temperature of which in some cases can reach 60-65 °C [5]. Dry air, along with high temperature, causes spots on the plant leaves – dark brown areas with dead tissues.

For the purpose of determining the heat tolerance of plants in urban territories, the effect of high temperatures on the degree of damage to the leaf blades of the species and cultivars of the genus *Hydrangea* was studied in artificially controlled conditions according to the method of F.F. Matskov [7]. The method is based on formation of pheophytin under the action of various damaging factors on cell membranes [5]. The signs of temperature effect were fixed from the appearance of spots to complete browning of the entire surface of the leaf blade (Table 5).

Based on the table 5 data analysis, the criteria for assessing the heat tolerance of hydrangeas by the degree of the leaf blade damage under the action of higher temperatures were distinguished and the plants are distributed according to these criteria:

Table 5

Heat tolerance of the introduced hydrangeas

Species, cultivars	The degree of leaves damage, %					
	50 °C	55 °C	60 °C	65 °C	70 °C	75 °C
<i>H. arborescens</i>	–	++	+++			
<i>H. arborescens</i> «Grandiflora»	–	++	+++			
<i>H. arborescens</i> «Sterilis»	–	+++				
<i>H. aspera</i> «Macrophylla»	–	++	+++			
<i>H. bretschneideri</i>	–	+	++	+++		
<i>H. macrophylla</i>	–	+++				
<i>H. macrophylla</i> «Alba»	–	+++				
<i>H. macrophylla</i> «Normalis»	–	+++				
<i>H. paniculata</i>	–	–	+	++	++	+++
<i>H. paniculata</i> «Grandiflora»	–	–	+	++	++	+++
<i>H. paniculata</i> «Limelight»	–	–	+	++	+++	
<i>H. petiolaris</i>	–	–	–	+	++	+++
<i>H. serrata</i> «Bluebird»	–	+	++	+++		
<i>H. serrata</i> «Imperatrice Eugenie»	–	–	++	+++		

Symbols: – not affected, 0 %, + 25-50 % affected, ++ 51-75 % affected, +++76-100 % affected

Source: based on own research

- less heat-tolerant – plants with 51-75 % and 100 % damage to the leaf blade at a 55 and 60 °C temperature. This group includes: *H. arborescens* «Sterilis», *H. macrophylla* (Fig. 1), *H. macrophylla* «Alba», *H. macrophylla* «Normalis», *H. arborescens*, *H. arborescens* «Grandiflora», *H. aspera* «Macrophylla», *H. bretschneideri*, *H. serrata* «Bluebird», *H. serrata* «Imperatrice Eugenie»;

- heat-tolerant – with up to 25-50 % damage to the leaf blade at a temperature of 60 °C and 51-75 % at a 65 °C temperature. This group includes *H. paniculata*, *H. paniculata* «Grandiflora», *H. paniculata* «Limelight»;

- the most heat-tolerant – 25-50 % damage of leaf blade at a 65 °C temperature and more than 51 % at a 70 °C temperature. *H. petiolaris* belongs to this group.

Most species of the genus *Hydrangea* L. were less heat-tolerant. Thus, they should not be planted in direct sunlight, but in a slightly shaded place, because in partial shade they better tolerate high daytime temperatures than plants of the same species in the open sunlight.

Conclusions. Based on the obtained research results, the following conclusions can be drawn:

1. In the botanical gardens of Vinnytsia grow 4 species and 4 cultivars of the genus *Hydrangea* L. In ornamental plantations of Vinnytsia *H. arborescens* «Grandiflora», *H. arborescens* «Sterilis» and *H. macrophylla* are used, mainly in flower arrangements.

2. Duration of the growing season of hydrangeas ranges from 191 (in *H. paniculata* and *H. paniculata* «Grandiflora») to 228 days (in *H. macrophylla*

«Normalis»). Their vegetation begins with the sum accumulation of temperatures above + 0 °C from 67.5 to 301.5 °C. In terms of beginning and end of the growing season, six phenological groups have been identified. The development cycle of most of the studied hydrangeas is consistent with the local climatic conditions of Vinnytsia area.

3. According to the indicator of winter hardiness the studied hydrangeas are divided into three groups: winter hardy – *H. arborescens*, *H. arborescens* «Grandiflora», *H. arborescens* «Sterilis», *H. paniculata*, *H. paniculata* «Grandiflora», *H. petiolaris*; medium winter hardy – *H. serrata* «Imperatrice Eugenie», *H. aspera* «Macrophylla» and *H. macrophylla* «Alba»; less winter hardy – *macrophylla*, *H. macrophylla* «Normalis».

4. Hydrangeas in conditions of Vinnytsia are moderately drought-resistant, short periods of drought the plant tolerates without noticeable morphological damage or with wilting of leaves in the daytime.

АНОТАЦІЯ

БІОЕКОЛОГІЧНІ ОСОБЛИВОСТІ ВИРОЩУВАННЯ ВИДІВ ТА СОРТІВ РОДУ HYDRANGEA L. В УМОВАХ М. ВІННИЦІ

Нами встановлено, що в ботанічному саду ВНАУ зростають два види й чотири культивари роду *Hydrangea* L., у центральному міському парку – два види і три культивари, у парку дружби народів – три види та один культивар, на території біостаціонару – два види й один культивар. Таким чином, можна констатувати, що на дослідженій території м. Вінниці зростають чотири види і 4 культивари роду *Hydrangea* L.

У результаті досліджень встановлено, що тривалість цвітіння залежить, насамперед, від біологічних особливостей видів та культиварів роду, віку рослин і температури повітря, й коливається від 27 у *H. serrata* «Imperatrice Eugenie» до 145 днів у *H. macrophylla* «Normalis».

В результаті спостережень протягом 2018-2019 і 2019-2020 років виявлено пошкодження пагонів у *H. aspera* «Macrophylla», *H. macrophylla*, *H. macrophylla* «Alba», *H. macrophylla* «Normalis», *H. serrata* «Bluebird» та *H. serrata* «Imperatrice» Eugenie. У таких гортензій, як *H. macrophylla* та *H. macrophylla* «Normalis» у 2018-2019 роках пошкодження зафіксовані на всю довжину однорічних пагонів. Ознак підмерзання однорічних пагонів крони у дорослих кущів інших видів і культиварів роду в зимовий період не виявлено.

Результат візуальних спостережень показали високу посухостійкість гортензій в умовах м. Вінниці». Слід зазначити, що нетривалі періоди посухи рослини переносять без помітних морфологічних пошкоджень або з в'яненням листків у денні години. З подовженням посушливого періоду досліджувані гортензії поводять себе по-різному. Так, у 2020 році внаслідок тривалої літньої посухи кущі *H. bretschneideri* в кінці серпня скинули частину листків. Проте,

незважаючи на це, більшість видів і культиварів роду виявилися досить стійкими проти дії посухи.

На основі одержаних результатів такі гортензії, як *H. arborescens*, *H. arborescens* «Grandiflora», *H. arborescens* «Sterilis», *H. aspera* «Macrophylla», *H. bretschneideri*, *H. paniculata*, *H. paniculata* «Grandiflora», *H. paniculata* «Limelight», *H. petiolaris*, *H. serrata* «Bluebird» та *H. serrata* «Imperatrice Eugenie», можна рекомендувати для широкого використання в декоративних насадженнях міста. Решта рослин є чутливими до зимових коливань температури повітря.

Ключові слова: гортензія Л., тривалість цвітіння, стійкість, розмноження, інтродукція, перспективність, декоративність, використання.

Табл. 5. Рис. 2. Літ. 8.

АННОТАЦИЯ

БИОЭКОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ВЫРАЩИВАНИЯ ВИДОВ И СОРТОВ РОДА HYDRANGEA L. В УСЛОВИЯХ М. ВИННИЦА

Нами установлено, что в ботаническом саду ВНАУ растут два вида и четыре культивары рода *Hydrangea* L., в центральном городском парке – два вида и три культивары, в парке дружбы народов – три вида и один культивар, на территории биостационару – два вида и один культивар. Таким образом, можно констатировать, что на исследованной территории г. Виннице растут четыре вида и 4 культивары рода *Hydrangea* L. В результате исследований установлено, что продолжительность цветения зависит, прежде всего, от биологических особенностей видов и культиваров рода, возраста растений и температуры воздуха, и колеблется от 27 в *H. serrata* «Imperatrice Eugenie» до 145 дней в *H. macrophylla* «Normalis».

В результате наблюдений в течение 2018-2019 и 2019-2020 годов обнаружено повреждение побегов в *H. aspera* «Macrophylla», *H. macrophylla*, *H. macrophylla* «Alba», *H. macrophylla* «Normalis», *H. serrata* «Bluebird» и *H. serrata* «Imperatrice» Eugenie. В таких гортензий, как *H. macrophylla* и *H. macrophylla* «Normalis» в 2018-2019 годах повреждения зафиксированы на всю длину однолетних побегов. Признаков подмерзания однолетних побегов кроны у взрослых кустов других видов и культиваров рода в зимний период не выявлено.

Результат визуальных наблюдений показали высокую засухоустойчивость гортензий в условиях г. Винницы ». Следует отметить, что непродолжительные периоды засухи растения переносят без заметных морфологических повреждений или с увяданием листьев в дневные часы. С удлинением засушливого периода исследуемые гортензии ведут себя по-разному. Так, в 2020 году в результате длительной летней засухи кусты *H. bretschneideri* в конце августа сбросили часть листьев. Однако, несмотря на это, большинство видов и культиваров рода оказались достаточно устойчивыми к действию засухи.

На основе полученных результатов такие гортензии, как *H. arborescens*, *H. arborescens* «Grandiflora», *H. arborescens* «Sterilis», *H. aspera* «Macrophylla», *H. bretschneideri*, *H. paniculata*, *H. paniculata* «Grandiflora», *H. paniculata* «Limelight», *H. petiolaris*, *H. serrata* «Bluebird» и *H. serrata* «Imperatrice Eugenie», можно рекомендовать для широкого использования в декоративных насаждениях города. Остальные растения чувствительны к зимним колебаниям температуры воздуха.

Ключевые слова: гортензия Л., продолжительность цветения, устойчивость, размножение, интродукция, перспективность, декоративность, использование.

Табл. 5. Рис. 2. Лит. 8.

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Інформація про автора

Матусяк Михайло Васильович – канд. с.-г. наук, доцент кафедри лісового, садово-паркового господарства, садівництва та виноградарства Вінницького національного аграрного університету (21008, м. Вінниця, вул. Сонячна 3. e-mail: mikhailo1988@gmail.com).

Матусяк Михаил Васильевич – кандидат сельскохозяйственных наук, доцент кафедры лесного, садово-паркового хозяйства, садоводства и виноградарства Винницкого национального аграрного университета (21008, г. Винница, ул. Солнечная, 3. e-mail: mikhailo1988@gmail.com).

Matusiak Mikhailo – PhD of Agricultural Sciences, senior lecturer of the Department of Forestry, Landscape Gardening, Horticulture and Viticulture of Vinnytsia National Agrarian University (21008, Vinnytsya, Soniachna st. 3. e-mail: mikhailo1988@gmail.com).