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Drought tolerance of woody vines of the Vitaceae Juss. family under conditions of introduction in the Right-Bank Forest-Steppe of Ukraine

V. V. Makovskyi*, N. H. Vakhnovska

M. M. Gryshko National Botanical Garden, NAS of Ukraine, 1 Tymiriazievska St., Kyiv, 01014, Ukraine,
**e-mail: vitaliimakovskyi10@gmail.com*

Purpose. Investigate the drought tolerance of woody vines of *Ampelopsis* Michx and *Parthenocissus* Planch. genera introduced in the Right-Bank Forest-Steppe of Ukraine on the specificity of leaf surface anatomical and morphological structure, peculiarities of water regime of the leaves and characteristics of physicochemical processes inside their tissues during wilting. **Methods.** Field surveys, morphometric, physiological, statistical. **Results.** The drought resistance of woody vines of the *Ampelopsis* and *Parthenocissus* genera of the Vitaceae family collection at the M. M. Gryshko National Botanical Garden collection site "Climbing plants" was studied. According to visual observations, during periods with a low level of moisture supply, there was no damage to leaves, turgor did not decrease. The main differences in the structure of the abaxial epidermal surface of woody vine leaves of the *Ampelopsis* and *Parthenocissus* genera are in the form of epidermal cells and a number of stomata. The electrical conductivity of the leaves of all the studied plants decreased stably during wilting (on average, by 0.12–0.19 mcS in two hours of wilting). The leaf water loss as a result of wilting was 10.05–25.63%. In conditions of insufficient moisture supply water deficit of leaves was at the level of 6.16–8.87%. **Conclusions.** According to the value of average long-term assessment of actual drought tolerance, the studied plants have a high degree of drought tolerance. The stomatal apparatus of woody vines of the genus *Ampelopsis* is distinguished by a greater manifestation of signs of xeromorphism than members of the genus *Parthenocissus*. High adaptability of the studied plants to growing conditions was revealed. High level of water holding capacity of the leaves was determined. It was revealed that in the period with low moisture provision the water stress in the leaves was low. The studied representatives are distinguished by a high degree of drought resistance due to the presence of signs of xeromorphism in the anatomical and morphological structure of the leaf surface, as well as the peculiarities of water regime and physicochemical processes inside leaf tissues, which makes it possible to use them extensively in the conditions of introduction.

Keywords: *stomatal index; electrical conductivity of leaves; water storage capacity; water deficit.*

Introduction

Plants with flexible unstable (weak) shoots, for the growth of which upward additional supports are necessary are called lianas. According to the way of attaching themselves to a support A. G. Golovach [1] assigns the woody vines of the genera *Ampelopsis* and *Parthenocissus* to the group of the tendril bearing, that is, those that rise on the supports with the help of special organs – tendrils. They can be widely used to improve the ugly facades of service, economic, industrial buildings, decorate walls and fences, as well as grow on special pillars – arches, trellis, pergolas. In vertical gardening – in conditions when there is not enough space for planting and development of trees and bushes, the use of climbers can provide necessary decorative and hygienic effect. At the same time, woody vines of the genus *Ampelopsis* are rare plants on the territory of Ukraine because of the low level of their bioecological features research and illuminating the methods of their application. In semi-shady places the species and forms of woody vines of the genus *Parthenocissus* can be successfully used as ground cover plants for phytomeliorative and decorative purposes. In the absence of support, their shoots, easily rooting in the nodes, are able to create a thick cover on the soil surface and fasten it, thus preventing erosion and weathering. Planting such species on slopes can prevent soil displacement processes [1, 2]. Considering that the species of woody vines of the Vitaceae family belong to ancient plants that arose in the Cretaceous period, D. G. Kostyrko and co-workers [3] came to the conclusion that anatomical structure of their leaves contains both primitive and complicated structural features, which or survived from ancient times, or formed in the process of evolution. They found that in the anatomical and morphological structure of woody vine leaves of the genus *Ampelopsis* there is a large number of stomata per unit area, which is characteristic of mesophytes developed in arid conditions. Based on the relatively high rates of

Vitalii Makovskyi
http://orcid.org/0000-0001-6137-9542
Natalia Vakhnovska
http://orcid.org/0000-0001-9251-4962

palisade, the presence of a large number of stomata, a thick cutinized layer of the epidermis, secretory capacities, the studied representatives are characterized as mesoxerophytes. According to the most common classification (developed by Metcalfe C. R. and Chalk L. [4], I. G. Zubkova [5] categorized species of the *Ampelopsis* and *Parthenocissus* genera as plants with an actinocyte type of stomatal apparatus. Studying the drought tolerance of woody vines in the conditions of the Right-Bank Forest-Steppe of Ukraine, N. M. Yartseva [6] found that the ability of their leaves to hold moisture decreases during the growing season. A. N. Bahatska [7] came to the same conclusion analyzing the total moisture content in leaves of woody vines.

The purpose of the research is to study the drought tolerance of woody lianas of *Ampelopsis* Michx and *Parthenocissus* Planch. genera introduced in the Right-Bank Forest-Steppe of Ukraine and through the specificity of the anatomical and morphological structure of the leaf surface, the peculiarities of the water regime of the leaves, and the indices of the physicochemical processes inside their tissues during wilting.

Materials and methods

Eight taxa of woody vines of the Vitaceae family of the *Ampelopsis* and *Parthenocissus* genera were studied. Among them there are five species distributed under natural conditions in temperate and subtropical regions of the northern hemisphere, and according to the A. L. Takhtadzhyan's botanical and geographical regionalization of the Earth [8] belong to two floristic areas: East Asian – *Ampelopsis aconitifolia* Bunge., *A. brevipedunculata* (Maxim.) Trautv., *A. heterophylla* (Thunb.) Siebold & Zucc., and Atlantic-North American – *P. inserta* (Kern.) Fritsch. and *P. quinquefolia* (L.) Planch., as well as two forms – *A. aconitifolia* f. *glabra* Diels and *P. quinquefolia* f. *engelmannii* Rehder, and one cultivar – *P. tricuspidata* 'Veitchii' Graebn. [9]. The studied plants belong to the collection fund of the exhibition and "Climbing Plants" collection site of M. M. Gryshko National Botanical Garden, NAS of Ukraine. The site is located on the gentle slope of a dry beam with a southwest exposure, the age of the studied plants is approximately 20 years. For research, five model plants were selected for each of the taxonomic units under study. The mature leaves of each plant were selected in triple repetition, following the Method of difference.

Laboratory studies of drought tolerance by electrical conductivity, water-holding capacity, water deficiency of leaves, as well as studies of the anatomical and morphological structure of the leaf surface were conducted in the first decade of August 2014. As of the beginning of the research, the average temperature in the daytime was 28–30 °C within the last 10 days. No precipitation was recorded during this period. To determine the structural features of the stomatal apparatus of leaves, preparations that represent the imprints of the leaf surface were made using the Molotkovsky-Polacci methodical guidelines [10]. The preparations were studied using a Carl Zeiss Primo Star light microscope (Carl Zeiss, Jena, Germany) equipped with a Canon Power Shot A640 digital camera. To compare the studied representatives by the anatomical and morphological structure of leaf surface, we measured the length and width of stomata and epidermis cells, and also counted their number in the Axio Vision Rel. 4.8. using the methodological recommendations of S. Zakharevich [11]. Statistical processing of the results was carried out by calculating the arithmetic mean and standard deviations for the series of obtained data as a result of taking measurements in ten fields of view of microscope for each of the taxa under study. The stomatal index was calculated using the generally accepted formula [12].

The drought tolerance of the studied representatives on electrical conductivity, water holding capacity and water deficit of leaves was determined in the laboratory of plant physiology of the Institute of Horticulture of the NAAS of Ukraine. During the research, the temperature in the laboratory averaged 29.15 °C, and relative air humidity was 45.5%. The degree of drought tolerance by the electrical conductivity of leaves was determined by the method of V. V. Torop [13] using an electrometer E 7-13, which makes it possible to record changes in the electrical conductivity of leaves in the process of wilting, which depends on the amount of water and electrolytes in their tissues. Studies were conducted for six hours with an interval of two hours. Two measurements were made for each leaf. The control measurement was carried out immediately after leaves were separated from mother plants. The obtained results were statistically processed by the method of single factor ANOVA in Microsoft Excel (2007). The loss of electrical conductivity was expressed as a percentage relative to the control.

The degree of drought tolerance by the water holding capacity of leaves was determined by the weighted method of M. D. Kushnirenko [14]. The dynamics of leaf water loss in the process of wilting was studied by weighing the leaves every 2 hours for six hours. The initial raw weight of the leaves, obtained as a result of their weighing immediately after separation from parent plants, was taken for control. Water loss, expressed as a percentage, was characterized by the amount of leaves weight loss between weighings. During statistical processing of results, the standard deviation of the percentage of water loss in the periods between weighings was calculated.

Leaf water deficit which causes plant drought tolerance was determined by the carving method based on the ability of the leaves to restore water balance when a source of water supply appears [15]. To this end, 30 die-cuttings of the same diameter (two die-cuttings for each leaf) were made from the middle part of the leaf blades and their weighing was carried out, after which the die-cuttings were submerged in water. Water deficit was expressed as the percentage difference between the weight of the die-cut in the state of complete saturation and control. The dynamics of water saturation was studied by weighing the die-cuttings with an interval of two hours for six hours. The value of the actual long-term drought tolerance was determined on M. A. Kokhno and A. M. Kurdyuk scale [16], for what the plants were visually assessed in field conditions during periods with a low level of moisture supply. The degree of drought tolerance was assessed according to a scale for assessing the parameters of leaf water regime, developed by scientists from the Pavlovsk Experimental Station VIR (All-Union Institute of Plant Industry) (Table 1) [17].

Table 1

Scale of assessment of leaves water regime parameters to determine relative drought tolerance (%)

Assessment of drought tolerance	Leaves water content	Water deficit	Leaves water loss by wilting	Average water loss within an hour of wilting
Low	≤ 59.9	≥ 20.1	≤ 50.1	≥ 11.1
Average	60.0–69.9	10.1–20.0	30.1–50.0	10.1–11.0
High	≥ 70	≤ 10	≤ 30	≤ 10

Results and discussion

The actual drought tolerance under field conditions was assessed during the growing season 2012–2015 (Table 2).

Table 2

Estimation of the factual multiple-year drought tolerance of woody vines of the Vitaceae family (according to M. A. Kokhno and A. M. Kurdyuk scale). The score

Species	2012	2013	2014	2015	Average
A. brevipedunculata	5	5	5	5	5
A. heterophylla	5	5	5	5	5
A. aconitifolia f. *glabra*	5	5	5	5	5
A. aconitifolia	5	5	5	5	5
P. tricuspidata 'Veitchii'	5	5	5	5	5
P. quinquefolia	5	5	5	5	5
P. quinquefolia f. *engelmannii*	5	5	5	5	5
P. inserta	5	5	5	5	5

According to visual observations, all studied representatives received the highest drought tolerance score. During the growing season, plants showed a high leaf turgor even during periods with a long absence of precipitation. A slight decrease in turgor in the daytime and its recovery at night was observed in late summer – early autumn, which may indicate a decrease in water-holding capacity of leaves over time.

Stomatal density is the feature of the epidermis that determines the higher rate of conductivity of substances. It is believed that this process depends largely on the number of stomata, and not on increasing their length. According to some researchers [18], in species with a large number of small stomata per unit surface area their degree of openness is better regulated. The stomatal index expresses the ratio of leaf area per stomata and the number of main epidermal cells per unit area, regardless of their size [12]. The high density of stomatal distribution and small cells are among the most characteristic signs of leaf xeromorphism [19]. As a result of anatomical and stomatographic studies of the leaves it was found that the main part of stomata was located on their abaxial surface (Table 3).

Placement of stomata is chaotic, type of stomatal apparatus – actinocytic. The cells of the epidermis are different in size, each type of plant has its own characteristic features. No logical differences in the size of stomata and epidermis cells were found, but the leaves of all the studied plants differ in the number of stomata, which was reflected in the stomatal index values. The smallest number of stomata was observed in *P. tricuspidata* 'Veitchii' plants (6.78%), and the largest – in *A. brevipedunculata* (16.7%). So, according to the results of a comparative anatomical and stomatographic study of leaf abaxial surface of the Vitaceae family woody vines, it can be said that the main

Table 3

Anatomical and stomatagraphic studies of the abaxial leaf surface and the stomatal index of woody vines of the Vitaceae family

Species	Stomata			Epidermis cells			I (%)
	number (pcs / sq. mm)	length (μm)	width (μm)	number (pcs / sq. mm)	length (мкm)	width (мкm)	
P. tricuspidata 'Veitchii'	94±1.5	28.59±2.47	16.15±1.41	1292±6.61	23.99±4.88	17.26±3.03	6.78
P. inserta	106±.64	26.49±3.12	14.36±2.57	1029±3.12	36.24±3.79	22.85±2.97	9.34
P. quinquefolia	118±0.83	26.12±2.69	14.84±1.53	1131±4.44	34.61±6.89	19.8±2.51	9.45
P. quinquefolia f. *engelmannii*	134±0.99	30.76±3.92	17.57±3.87	1220±8.36	52.61±9.57	25.6±5.56	9.90
A. aconitifolia f. *glabra*	176±2.6	26.28±4.2	16.74±3.39	1257±7.89	37.73±9.23	21.49±6.82	12.28
A. aconitifolia	184±2.19	23.87±3.33	14.5±3.19	1248±9.08	36.53±9.2	25.08±7.74	12.85
A. heterophylla	189±1.07	26.71±4.44	14.49±2.61	1241±4.27	33.28±6.05	20±3.42	13.22
A. brevipedunculata	241±3.92	25.56±2.77	14.51±1.87	1202±4.56	28.21±3.93	17.56±2.03	16.70

differences in the structure of their stomatal apparatus are displayed in the stomatal index value. Taking into account the stomatal index values, it was found that the leaves of woody vines of the genus *Ampelopsis* have a greater number of stomata per unit area. It could therefore be concluded that the signs of xeromorphism in the anatomical structure of their leaves are more pronounced in comparison with members of the genus *Parthenocissus*.

When studying the physicochemical changes in leaves of the studied representatives while wilting, it was found that this process was accompanied by a loss of electrical conductivity (Table 4).

Table 4

Dynamics of changes in the electrical conductivity of woody vine leaves of the Vitaceae family by their wilting within six hours with two hours interval

Species	Electrical conductivity (mcS)				Loss of conductivity in 6 hours, %
	control	in 2 hours	in 4 hours	in 6 hours	
A. brevipedunculata	1.59	1.55	1.53	1.42	10.74
A. heterophylla	1.70	1.67	1.62	1.44	15.16
A. aconitifolia f. *glabra*	1.88	1.80	1.69	1.61	14.06
A. aconitifolia	1.68	1.51	1.45	1.42	15.24
P. tricuspidata 'Veitchii'	2.52	2.36	2.05	2.02	19.94
P. inserta	2.60	2.43	2.32	2.07	20.53
P. quinquefolia f. *engelmannii*	3.05	2.51	2.42	2.29	24.99
P. quinquefolia	2.56	2.20	2.02	1.88	26.63
$HIP_{0.05}$	0.0266	0.0220	0.0267	0.0249	–

The plants that lose less water can be classified as more drought tolerant. The plants that are more adapted to the growing conditions also have less changes in metabolic reactions, therefore the value of the electrical conductivity of their leaves is stable [20]. The absolute values of electrical conductivity at the beginning of the experiment were 1.59 mcS (*A. brevipedunculata*) – 3.05 mcS (*P. quinquefolia* f. *engelmannii*), and during six-hour wilting decreased by 10.74% (*A. brevipedunculata*) – 26.63% (*P. quinquefolia*). According to the values of leaves electrical conductivity loss during wilting, plants of the genus *Ampelopsis* turned out to be more drought tolerant. The leaves of all the studied plants were characterized by a stable decrease in electrical conductivity, which was associated with a gradual change in the ionic balance inside the tissues and suggests that they are well adapted to the growing conditions. The actual difference between the mean values of electrical conductivity at different time intervals was significant, with the exception of rates in *A. brevipedunculata*, *A. aconitifolia* and *A. heterophylla* after six hours of withering. It is therefore possible to state that the absolute values of electrical conductivity are close in values in species belonging to the same genus.

Adaptive changes in introduced plants occur in stages at the subcellular, cellular, tissue and organism levels as a whole. Significant changes in the metabolism and structure of the plant organism in extreme conditions are preceded by changes in plant cells. Cell adaptive processes are closely related to water regime and water content in a cell [21]. The structure and behavior of the stomatal apparatus counteracts the dehydrating effect of drought, determining water holding capacity of cells [22], which is an indispensable characteristic feature of the drought tolerance of plants. Changes in leaf mass of the studied plants in the periods between weighings

Table 5

Dynamics of leaf water loss in woody vines of the Vitaceae family by their wilting (%)

Species	The amount of water loss in the periods between weighing			Total water loss during 6 hours	Average water loss per one hour	Assessment of drought tolerance
	2 hours	2 hours	2 hours			
P. quinquefolia	9.99	7.59	8.52	26.11±0.99	4.35±0.16	High
P. inserta	11.13	7.76	8.82	27.71±1.41	4.62±0.23	High
P. quinquefolia f. *engelmannii*	10.54	8.4	7.67	26.61±1.22	4.43±0.2	High
P. tricuspidata 'Veitchii'	8.45	11.82	7.89	28.15±1.74	4.69±0.29	High
A. brevipedunculata	4.47	4.63	4.31	13.4±0.13	2.23±0.02	High
A. heterophylla	4.49	4.55	4.05	13.08±0.22	2.18±0.04	High
A. aconitifolia	4.67	2.68	3.04	10.4±0.87	1.73±0.14	High
A. aconitifolia f. *glabra*	6.28	3.81	3.01	13.1±1.39	2.18±0.23	High

indicate that the process of water loss as a result of wilting occurs unevenly (Table 5).

The value of water loss indicators of woody vine leaves of *P. quinquefolia* coincides with the information given in the works of N. M. Doiko and A. N. Bahatska [6, 7] for this species. From the studied plants, the higher water holding capacity of leaves was found in woody vines of the genus *Ampelopsis*, which follows from the value of the total water loss for six hours and the average water loss rates for one hour. On evaluation scale of parameters of leaf water regime and identification of relative drought tolerance, leaves of all the studied plants lost after wilt ≤ 30% moisture, and the average water loss per one hour wilt was ≤ 10%, which indicated their high degree of drought tolerance.

It is known that the lack of moisture in leaves correlates well with the degree of water supply of a plant as a whole [23]. As a result of determining the water deficit of woody vines of the Vitaceae family, it was revealed that the process of water saturation with leaf die-cuttings of all the studied representatives is uneven (Table 6).

Table 6

Water deficiency of leaves in woody vines of the family Vitaceae (%)

Species	Exposition			Water deficiency	Assessment of drought tolerance
	2 hours	4 hours	6 hours		
A. brevipedunculata	5.07	1.22	-0.08	6.16	High
A. aconitifolia	6.88	2.01	-1.46	7.42	High
A. heterophylla	7.71	0.99	-0.48	8.19	High
A. aconitifolia f. *glabra*	5.54	0.55	1.01	8.01	High
P. tricuspidata 'Veitchii'	6.54	0.98	0.85	8.25	High
P. inserta	6.09	1.69	0.17	7.84	High
P. quinquefolia f. *engelmannii*	6.47	1.38	1.36	8.52	High
P. quinquefolia	6.2	2.73	0.13	8.87	High

From the results of the study it emerges that the basic mass of water was accumulated during the first two hours. According to the obtained data, the complete water saturation in the plants of *A. brevipedunculata*, *A. aconitifolia* and *A. heterophylla* occurred in four hours, since the mass of the die-cuttings did not increase further. The greatest value of leaf water deficiency was distinguished by the woody vines of *P. quinquefolia* (8.87%), and the smallest by *A. brevipedunculata* (6.16%). According to the value of water deficit in *P. quinquefolia*, the data obtained by A. N. Bohatska [7] were confirmed, since the obtained results were within the limits defined by her. On a scale of assessement the parameters of leaf water regime and identification of relative drought tolerance, water deficit of ≤ 10% was detected in all representatives what corresponds to a high level of drought tolerance.

Conclusions

As a result of long-term observations of the studied plants in the field during the growing season, a high degree of their actual drought tolerance was revealed. It was determined that in the anatomical structure of the leaves of woody vines of the genus *Ampelopsis*, the signs of xeromorphy were more pronounced in comparison with representatives of the genus *Parthenocissus*. This may indicate their higher adaptive capacity and resilience in the conditions of introduction. It was determined that under conditions of water stress, changes in the ionic balance of the leaf cells of the studied plants occurred uniformly, which indicates their high adaptability to growing conditions. The leaves of the woody vines of the Vitaceae family have a high water storage capacity. This reduces the risk of dehydration and damage to the internal structures of their leaves, which ensures normal functioning even in conditions with inadequate moisture supply. It was revealed that woody vines of the Vitaceae family are capable of quickly turgor restoration and reducing water deficiency of leaves when a source of water supply appears. In conditions of water stress, the bulk of the water was accumulated within two hours. For a six-hour period, full leaf water saturation occurred in *A. aconitifolia* f. *glabra*, *P. tricuspidata* 'Veitchii', *P. quinquefolia*, *P. quinquefolia* f. *engelmannii*, *P. inserta*, and in plants *A. brevipedunculata*, *A. aconitifolia* and *A. heterophylla* – in 4 hours.

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Маковський В. В.*, **Вахновська Н. Г.** Посухостійкість деревних ліан родини Vitaceae Juss. за умов інтродукції в Правобережному Лісостепу України. *Plant Varieties Studying and Protection*. 2019. Т. 15, № 1. С. 51–58. https://doi.org/10.21498/2518-1017.15.1.2019.162482

Національний ботанічний сад імені М. М. Гришка НАН України, вул. Тімірязєвська, 1, м. Київ, 01014, Україна,
**e-mail: vitaliimakovskyi10@gmail.com*

Мета. Дослідити посухостійкість інтродукованих у Правобережний Лісостеп України деревних ліан родів *Ampelopsis* Michx. і *Parthenocissus* Planch. за специфікою анатомо-морфологічної будови листкової поверхні, особливостями водного режиму листків та показниками фізико-хімічних процесів усередині їх тканин у процесі зів’янення. **Методи.** Польові, морфометричні, фізіологічні, статистичні. **Результати.** Досліджено посухостійкість деревних ліан родів *Ampelopsis* і *Parthenocissus* колекції родини Vitaceae експозиційно-колекційної ділянки «Виткі рослини» Національного ботанічного саду ім. М. М. Гришка НАН. За візуальними спостереженнями, у періоди з низьким рівнем вологозабезпечення, пошкодження листків зафіксовано не було, тургор не знижувався. Основні відмінності будови абаксіальної поверхні епідерми листків деревних ліан родів *Ampelopsis* і *Parthenocissus* полягають у формі епідермальних клітин та кількості продихів. Електропровідність листків усіх досліджуваних рослин у процесі в’янення зменшувалася стабільно (у середньому на 0,12–0,19 mcS за дві години зів’янення). Утрата води листям у результаті зів’янення становить 10,05–25,63%. В умовах недостатнього вологозабезпечення водний дефіцит листків перебуває на рівні 6,16–8,87%. **Висновки.** Згідно з величиною середньої багаторічної оцінки фактичної посухостійкості, досліджувані рослини мають високий ступінь посухостійкості. Продиховий апарат деревних ліан роду *Ampelopsis* відрізняється більшою виразністю ознак ксероморфності порівняно з представниками роду *Parthenocissus*. Установлено високу адаптованість досліджуваних рослин до умов вирощування. Визначено високий рівень водоутримувальної здатності листків. Виявлено, що в період з низькою вологозабезпеченістю дефіцит води в листках перебуває на низькому рівні. Досліджувані представники відзначаються високим ступенем посухостійкості завдяки наявності ознак ксероморфізму в анатомо-морфологічній будові листкової поверхні, а також особливостям водного режиму та фізико-хімічних процесів усередині тканин листків, що дає можливість їх широкого використання в умовах інтродукції.

Ключові слова: *продиховий індекс; електропровідність листків; водоутримувальна здатність; водний дефіцит.*

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Национальный ботанический сад имени Н. Н. Гришко НАН Украины, ул. Тимирязевская, 1, г. Киев, 01014, Украина,
**e-mail: vitaliimakovskyi10@gmail.com*

Цель. Исследовать засухоустойчивость интродуцированных в Правобережной Лесостепи Украины древесных лиан родов *Ampelopsis* Michx. и *Parthenocissus* Planch. по специфике анатомо-морфологического строения листовой поверхности, особенностям водного режима листьев и показателям физико-химических процессов внутри их тканей. **Методы**. Полевые, морфометрические, физиологические, статистические. **Результаты**. Исследована засухоустойчивость древесных лиан родов *Ampelopsis* и *Parthenocissus* коллекции семейства Vitaceae экспозиционно-коллекционного участка «Вьющиеся растения» Национального ботанического сада имени Н. Н. Гришко НАН Украины. По визуальным наблюдениям, в периоды с низким уровнем влагообеспеченности, повреждения листьев растений зафиксировано не было, тургор не снижался. Отличия в строении абаксиальной поверхности эпидермиса листьев древесных лиан родов *Ampelopsis* и *Parthenocissus* заключаются в форме эпидермальных клеток и количестве устьиц. Электропроводность листьев в процессе увядания уменьшалась стабильно (в среднем

на 0,12–0,19 mcS за 2 часа увядания). Потеря воды листьями в результате увядания составляет 10,05–25,63%. В условиях недостаточной влагообеспеченности водный дефицит листьев находился на уровне 6,16–8,87%. **Выводы**. Согласно величине средней многолетней оценки фактической засухоустойчивости, растения обладают высокой степенью засухоустойчивости. Устьичный аппарат древесных лиан рода *Ampelopsis* отличается большей выраженностью признаков ксероморфности по сравнению с представителями рода *Parthenocissus*. Установлено, что растения хорошо адаптированы к условиям выращивания. Определено высокий уровень водоудерживающей способности листьев. Выявлено, что в период с низким уровнем влагообеспеченности, дефицит воды в листьях находился на низком уровне. Исследуемые представители обладают высокой степенью засухоустойчивости благодаря наличию признаков ксероморфизма в анатомо-морфологическом строении листовой поверхности, а также особенностям водного режима и физико-химических процессов внутри тканей листьев, что дает возможность их широкого использования в условиях интродукции.

Ключевые слова: *устьичный индекс; электропроводимость листьев; водоудерживающая способность; водный дефицит.*

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