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2. As a result of evaluation of the winter triticale collection in terms of grain yield, samples 181, 101, 185, 219 and Aristokrat with parameters 5.01–5.17 t/ha, which are sources of high productivity and a valuable source material for use in breeding practice, were selected as the best.

3. High resistance of collection samples to defeat by the main diseases of grain crops is revealed. For resistance to powdery mildew and septoria leaves, most samples received a score of 9 points.

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PROSPECTS OF USING REPRESENTATIVES OF THE GENUS *COTINUS* MILL. IN THE CONDITIONS OF VINNITSA

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Abstract

Studies have shown that the genus *Cotinus* has 2 species of plants: *C. obovatus* Raf. and *C. coggygria* Scop., are mainly deciduous trees and shrubs. As a result of phenological observations of the genus *Cotinus* in the conditions of Vinnytsia, it was found that the dates of phenological phases in sumac depend on the accumulation of the sum of effective temperatures (SET). Vegetation of the genus *Cotinus* began with the budding of generative buds in the first decade of April at the sum of effective temperatures of 80-96 °C. Introduced in Vinnytsia, *C. obovatus* is characterized by a full degree of acclimatization (acclimatization number – 88), and is a promising species for introduction into culture (prospect index – II).

A comprehensive assessment of the decorativeness of the genus *Cotinus* (*C. coggygria*, *C. obovatus*, *C. coggygria* «Purpurea», *C. coggygria* «Royal Purple»), which assessed the decorative architecture of the trunk and crown, color and texture of leaves, color and size of flowers, color and texture of bark, trunk, branches and shoots. The peak of decorative plants reach in June-July. On average, the decorativeness of sumac is high and is 4 points.

Keywords: *Cotinus* Mill., rhythms of development, stability, introduction, perspective, decorativeness, use.

Introduction. An important fundamental problem today is the conservation of biodiversity and the rational use of plant resources. Its solution is possible under the conditions of enrichment of the range of plants with valuable economic features, due to the introduction of new species and their introduction into the culture. These include the little-known and little-studied genus *Cotinus* Mill. (stingy), which unites plant species whose natural habitats are located in temperate regions

of Eurasia, the Mediterranean, Asia Minor, China, the Himalayas and North America. In Ukraine, of course, members of the genus are common in the forest-steppe and steppe zones, in the foothills and mountains of the Crimea.

Plants of the genus *Cotinus* Mill. are valuable ornamental, medicinal, phytomeliorative plants. Due to their decorative properties, they are one of the most spectacular plants for solitary and group plantings

when creating gardens and parks. Of particular note are their decorative forms with red and yellow panicles and leaves, as well as weeping form, which are widely used abroad in ornamental horticulture.

The purpose and objectives of the study. To study the prospects of using introduced species of the genus *Cotinus* Mill. in the conditions of Vinnytsia. In accordance with the purpose, the following research objectives were set:

- to substantiate the prospects for the rational use of the genus *Cotinus* Mill. in landscaping of Vinnytsia;
- to analyze the process of introduction of new species of the genus *Cotinus* Mill. in the conditions of Vinnytsia.

The object of research is the decorative properties of species of the genus *Cotinus* Mill. and features of their use in landscaping.

Materials and methods of research. The success and forecast of the introduction was carried out by the

method of «integrated numerical assessment of the viability and prospects of the introduction of trees and shrubs» by P.I. Lapin and S.V. Sidneva [2]. The decorativeness of the species was evaluated according to the method of N.V. Kotelova and O.N. Vinogradova in the modification of I.V. Taran, A.M. Agapova, according to which on a five-point scale decorativeness consists of four components: the architecture of the trunk and crown, decorative value leaves, decorative inflorescences, flowers and fruits, color and texture of the bark of the trunk, branches and shoots [5]. Statistical processing of experimental data was performed using the Microsoft Excel 2007 software package.

Results and discussion. According to the results of the analysis of literature data on the history of study and cultivation of species of the genus *Cotinus* in Ukraine and abroad, we found that in the natural flora of the world grow two species of the genus *Cotinus*: *C. coggygria* and *C. obovatus*. The most common leather sumac, which is found in all natural areas of Ukraine.

Table 1

Species of the genus *Cotinus* cultivated in Ukraine

Taxon	Cultivation area				
	Polissya	Forest-steppe	Steppe	Carpathians	Southern coast of Crimea
<i>C. obovatus</i>	–	–	+	–	–
<i>C. coggygria</i>	A	A	+	A	A
<i>C. coggygria</i> «Purpureus»	–	+	–	–	–

One of the natural factors that determine the success or failure of the introduction of plants is their ability to rhythms of life that reflect the interaction of the genotype of plants with the natural environment. The course of historical development of species, the peculiarities of their growth in areas of modern distribution determine the success of the onset and passage of phenological phases. Rhythmically changing the dynamics of metabolism and morphogenesis, plants in different climatic zones can effectively use the favorable growing season and survive in severe winters and hot summers. At the same time, natural selection constantly fixes progressive changes in biorhythms, so indigenous plants have a greater potential for viability than introducers [3].

When introducing plants to new climatic conditions, it is necessary to study their reaction to environmental factors and to conduct an analytical assessment

of the condition of plants in conditions of existence not peculiar to their genetic nature. The cycle of seasonal development of plant species reflects their evolution, ecological properties and ability to respond to changes in environmental conditions [2]. The study of the rhythms of seasonal development is carried out by long-term phenological observations. Their results determine the success of adaptation of plants to certain natural and climatic conditions, give an economic assessment of the studied species, develop recommendations for their reproduction and cultivation. The most important factor for the growth and development of plants during the growing season, according to A. Humboldt (1936), is the sum of temperatures. In the course of our phenological studies, the amount of heat was determined – the sum of effective temperatures (above +5 °C), necessary for the onset of certain phases of the vegetation of the genus *Cotinus* [93] (table 2).

Table 2

Influence of the sum of effective temperatures (above +5 °C) on the passage of the main phases of development of plants of the genus *Cotinus* Mill. in the conditions of Vinnytsia

Phases of development	<i>C. coggygria</i>		<i>C. obovatus</i>		<i>C. coggygria</i> «Royal Purple»		<i>C. coggygria</i> «Purpureus»	
	дата	\sum t, °C	дата	\sum t, °C	дата	\sum t, °C	дата	\sum t, °C
Drumming buds	08.04± 3	81,7±3, 8	10.04± 5	95,3±3, 3	09.04± 2	91,3±2, 8	12.04± 5	82,0±3, 7
Blooming leaves	15.04± 4	102,0± 3,9	18.04± 4	120,8± 3,5	16.04± 4	103,9± 4,2	18.04± 5	120,8± 4,2
The beginning of shoot growth	21.04± 4	144,7± 2,8	25.04± 2	182,7± 2,8	26.04± 3	189,4± 1,8	24.04± 2	174,9± 3,1

End of shoot growth	21.07± 3	1285,4 ±4,1	18.07± 3	1233,4 ±21,1	21.07± 5	1285,4 ±20,8	22.07± 4	1300,8 ±22,2
Beginning flowering	16.05± 2	352,0± 5,9	22.05± 2	428,8± 6,1	17.05± 3	363,3± 1,7	18.05± 3	372,9± 7,4
End flowering	30.05± 3	555,6± 6,3	08.06± 3	678,8± 6,9	03.06± 3	601,6± 4,1	05.06± 4	627,8± 7,3
Maturation fruits	15.07± 5	1177,9 ±28,8	18.07± 6	1233,4 ±7,3	20.07± 3	1268,6 ±24,2	19.07± 6	1251,4 ±28,9
Change the color of the leaves	05.10± 3	2256,2 ±31,1	08.10± 4	2265,6 ±28,1	15.10± 2	2297,2 ±27,4	12.10± 2	2280±2 5,8
Defoliation	24.10± 8	2293,0 ±29,9	20.10± 8	2317,2 ±30,1	24.10± 7	2293,0 ±26,2	25.10± 9	2298,1 ±30,1

Kidney drumming of all studied members of the genus *Cotinus* Mill. occurred at the end of the first – beginning of the second decade of April, when the sum of effective temperatures above +5 °C was 81.7-95.3 °C. Blooming of leaves began in 8 ± 2 days after the beginning of vegetation at the sum of effective temperatures of 102,0-120,8 °C. Simultaneously with the mass blooming of the buds began their intensive growth shoots, which are located flower buds. Flowering members of the genus *Cotinus* Mill. started: in *C. coggygria* 16.05 at the sum of effective temperatures 352 °C, in *C. obovatus* in 6 days at the sum of effective temperatures 428.8 °C, and in *C. coggygria* «Royal Purple» and *C. coggygria* «Purpureus» May 17 and 18, respectively, at the sum of effective temperatures of 363.3 °C and 372.9 °C. It is determined that over the years of study of flowering members of the genus *Cotinus* Mill. lasted 15-19 days at the sum of effective temperatures of 555.6-678.8 °C. This period is the shortest in *C. coggygria*.

Flowering members of the genus *Cotinus* Mill. occurred before the full blooming of the leaves, which is typical for wind- and insect-pollinated plants. Fruits of the genus *Cotinus* Mill. ripened during July and kept on the inflorescences until winter. Fruit ripening took place at the sum of effective temperatures of 1177.9-1268.6 °C, depending on the species. According to our observations, sumac leaves begin to change color in early October. The phase of autumn coloring lasts 15-20 days. Thus, the analysis of long-term data from the results of phenological observations revealed that the seasonal rhythms of development of the genus *Cotinus* Mill. meet the natural and climatic conditions of the Right-Bank Forest-Steppe of Ukraine. An important place in the seasonal rhythm of development of woody plants is the period of rest, which consists of two stages: organic (deep) and forced. It arose in the process of

evolution as an adaptation to seasonal adverse environmental conditions, and the winter hardiness of plants largely depends on the time of passage and its depth [1].

We determined the duration of the dormancy period in plants *C. obovatus*, *C. coggygria* and *C. coggygria* «Royal Purple» in the park Gorky, Vinnytsia. The need for such studies is due to the rather limited amount of data on the onset and duration of dormancy in plants. Determining the start date and duration of the dormancy period, we conducted during 2019-2020 by the method of cut shoots Y.S. Nesterova. To do this, starting from October 30, cut shoots every 10 days were transferred into flasks with water at a temperature of 18-20 °C. During the experiment, it was found that deep or organic dormancy in *C. obovatus*, *C. coggygria* and *C. coggygria* «Royal Purple» occurs after yellowing of the leaves. This phase is characterized by physico-biological changes in plant tissues, during which a mechanism of resistance to adverse conditions is formed. Awakening of the buds was observed 60-70 days after pruning, which indicated the presence of plants and, consequently, the cut shoots in a state of deep or organic dormancy. After deep dormancy, under favorable conditions, the plant becomes able to restore vegetation. In our experiments, the onset of bud awakening was observed on January 12-20, which indicated the release of plants from a state of deep dormancy and the beginning of a period of forced dormancy. Thus, the results of our research show that the phase of organic dormancy, in the conditions of Vinnytsia, in plants of *C. coggygria* ends 13.01 ± 2, and in *C. obovatus* and *C. coggygria* «Royal Purple» 19.01 ± 1., And lasts 60-70 days after that, the plants enter a period of forced dormancy, which, depending on temperature conditions, lasts 75-85 days. The dormancy period of plants is a guarantee of their frost resistance and a mandatory phase during which growth processes are renewed in the spring.

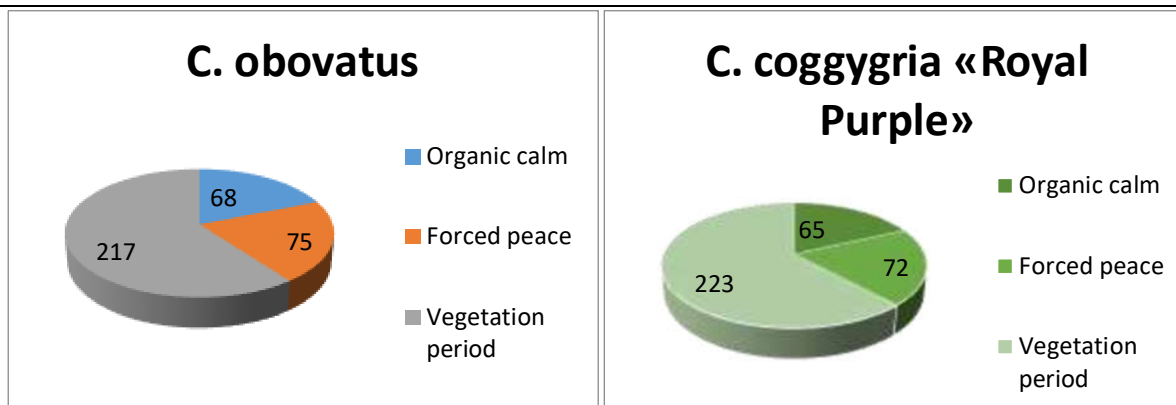


Fig. 1. Duration of the period of rest and vegetation

Perspective of introduction was determined by the method of integrated numerical assessment of viability and prospects of introduction of trees and bushes on the basis of visual observations of P.I. Lapin and S.V. Sidneva [2] according to which seven main indicators were taken: the degree of annual maturation of shoots, winter

hardiness, preservation of plant habit, ability to form shoots, regular growth of shoots, ability to generative development, methods of reproduction of studied plants in the area of introduction. The results of research on seven main indicators are given in table 3.

Table 3

Evaluation of the success of the introduction of *C. obovatus* (by P.I. Lapin and S.V. Sidneva)

Indicators	<i>C. obovatus</i>	
	Adult plants	Young plants
The degree of annual maturation	20	15
Winter hardiness	20	20
Habitus of the plant	10	10
Formation of shoots	3	1
Regular growth of shoots	5	5
The ability of plants to generative development	25	1
Possible ways of reproduction	3	3
The sum of points	86 (Promising)	55 (Promising)

Analyzing the data in table 3 we can conclude that *C. obovatus* is a very promising plant for introduction in the conditions of Vinnytsia. Decorative species of the genus *Cotinus* Mill. evaluated according to the method of N.V. Kotelova and O.N. Vinogradova in the

modification of I.V. Taran, A.M. Agapova. A general idea of the dynamics of decorativeness of the genus *Cotinus* throughout the year, give its calculations separately for each month (table 4).

Table 4

Dynamics of decorativeness of the genus *Cotinus* during the year (average for 2019-2020)

Month	Decorative, points			
	<i>C. coggyria</i>	<i>C. obovatus</i>	<i>C. coggyria</i> «Purpurea»	<i>C. coggyria</i> «RoyalPurple»
January	1,7	1,8	2,0	2,0
February	1,7	1,8	2,0	2,0
March	1,7	1,8	2,0	2,0
April	2,9	2,6	3,0	3,0
May	3,3	3,4	4,0	4,2
June	3,8	3,8	4,3	4,4
July	4,2	4,0	4,5	4,8
August	3,7	3,8	4,5	4,8
September	4,1	4,0	4,5	4,6
October	3,8	3,6	4,0	4,0
November	1,7	1,8	2,0	2,0
December	1,7	1,8	2,0	2,0
Area, conventional units	34,3	34,2	38,8	39,8

According to the results of the calculation, a quantitative indicator of the annual decorative value of the genus *Cotinus* Mill. is in the range of 34.2-9.8 conventional units, on a 5-point scale I.V. Taran, A.M. Agapova, we received an annual decorative – 4 points, which indicates the high decorativeness of the genus *Cotinus* Mill. Analysis of the dynamics of decorative members of the genus *Cotinus* Mill. by months makes it possible to say that the highest rates of plants had in the period from May to October. For the use of orna-

mental plants in green construction, the general decorativeness of plants is important. In our work, the study was conducted on four grounds: the architecture of the trunk and crown, the decorative value of the leaves, the decorative inflorescences, flowers and fruits, the color and texture of the bark of the trunk, branches and shoots. According to the indicators of general ornamental plants, the species of *C. coggygia* «Purpurea» and *C. coggygia* «Royal Purple» have the highest score, *C. coggygia* has a slightly lower score, and *C. obovatus* was the least decorative (fig. 2).

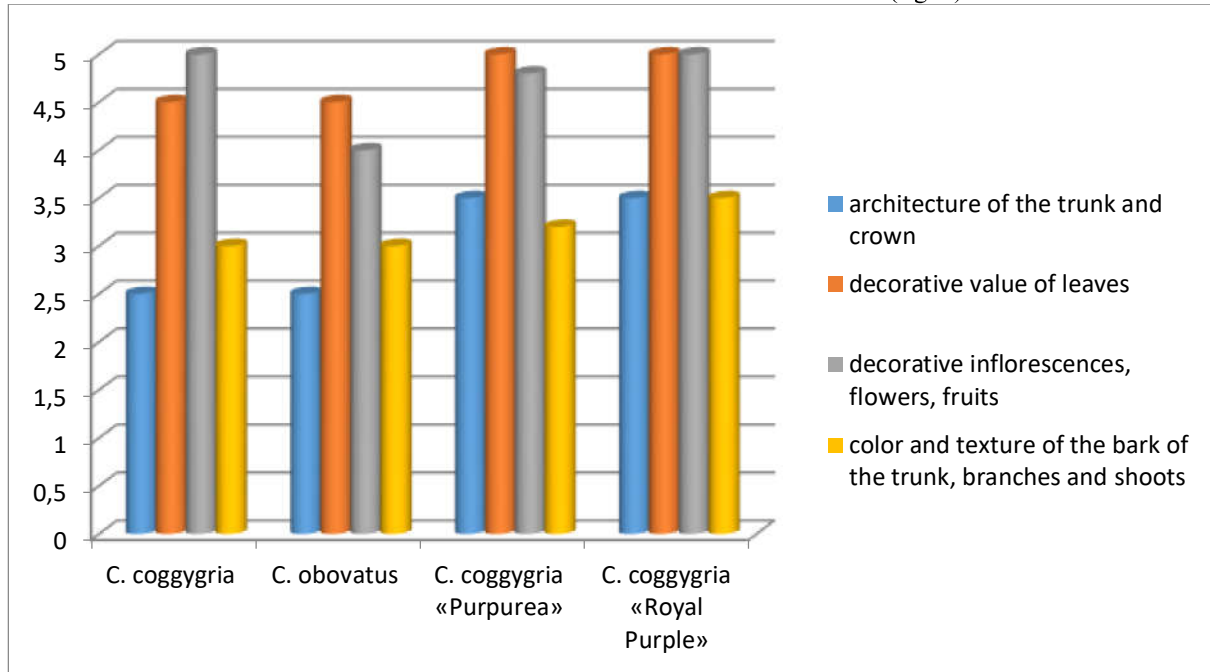


Fig. 2. General decorative plants of the genus *Cotinus* Mill.

However, all studied taxa have high decorative values, which allow them to be widely used in landscaping as tapeworms, and in combination with other woody and shrubby plants.

Conclusions. When decorating gardens and parks of regular and landscape types create a high decorative effect of sumac plantings on the slopes, slopes, terraces, especially since the conditions of such habitats correspond to the ecological conditions of their growth in natural areas. Such plantings create pictures of fluffy spots on the background of coniferous and deciduous trees. Small groups and tapeworms on trimmed lawns, flat open glades, at the foot of small elevations acquire an extremely impressive appearance.

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