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DECORATIVE FEATURES OF MAHONIA AGUIFOLIUM AND PROSPECTS FOR ITS USE IN GREENING OF UZBEKISTAN CITIES

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Annotation

The article highlights the findings of research on the study of ornamental features and varietal diversity of Mahonia aquifolium (Pursh) Nutt, introduced to Uzbekistan as an ornamental plant. Mahonia can be found in nature both in Asia and North America. An analysis of the results obtained in 2021 made it possible to find out that the average sheet dimensions are 14.38 ± 0.36 mm by 8.93 ± 0.18 mm. We designated No. 13 as having the highest dimensions, measuring 22.13 ± 10.69 mm in length and 13.27 ± 4.86 mm in width, exceeding the average length by 7.75 mm and the average width by 4.34 mm.

Key words: mahonia, introduction, alkaloid, phenology, ascorbic acid, ontogeny, ornamental features, mahonia varieties

INTRODUCTION.

Agriculture has developed over the past millennia on the basis of a strategy, which represents the introduction of new species of useful plants into crops in our country**.** Interest in plants having multiple uses, including food, medicine, and ornamentation, is linked to the growth of ornamental horticulture in Uzbekistan and the rise of landscaping. Mahonia aquifolium (Pursh) Nutt is considered a non-traditional ornamental plant, due to which it is possible to expand the range of cultivated plants.

An evergreen shrub that can grow up to 1.5 m height and has beautiful leathery, big, shiny odd-pinnate leaves that are scarlet when they bloom, dark green in the summer, and reddish-golden-bronze in the fall. Fruits in the autumn period give the bush a unique identity. Jam, compotes, and jelly are made with mhonia berries. Berries have a high monosaccharide, pectin, and vitamin C content, which enhances the body's metabolism. This plant's roots also have therapeutic qualities (medicinal properties) [1,3,6].

They contain alkaloids such as berberine, yatrorricin, palmatin, berbamine, and others that are highly biologically active and "function" as choleretic and hemostatic agents. The natural actives from the bark of the Mahonia aquifolium plant are used in homeopathy to treat psoriasis and other dry, scaly skin diseases [5,8].

Known as mahonia the plant is grown commonly as an ornamental shrub in Northern Europe and other regions. According to its biological and ecological properties, Mahonia aquifolium exhibits high levels of frost resistance, drought resistance, soil tolerance, shade tolerance, and resilience to anthropogenic influences. Although the plant can tolerate some shade, it only grows into dense, attractive bushes in sunny locations. To protect the leaves over the winter in open places, shelter is required. It is well suited for borders, low, uncut hedges, group plantings, and for tamping tall shrubs [4].

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The fruits are sweet and sour, and they can be used to color wine and in the confectionery sector. The composition of mahonia berries is what gives them their advantages. Ascorbic acid, berberine, alkaloids, tannins, organic acids, copper, sodium, zinc, and manganese are all abundant in berries. Fruits are frequently used in homeopathy to treat skin diseases and enhance the function of the digestive system because of their composition, which also allows them to improve blood composition. Berries have a powerful choleretic impact and are beneficial for hemorrhoids, gallbladder disorders, and constipation [6, 10].

Good early spring honey plant. According to research done on plants in their natural habitats, a flower's daily sugar content might range from 0.281 to 0.705 mg. Additionally, it was discovered that the nectar's sugar content was highest at the start of mass flowering and the smallest - at the end of flowering, when smaller flowers of the apical part open. According to two-year data, the total nectar reserve in terms of honey ranges from 97.4 to 128.6 kg/ha [8].

MATERIALS AND METHODS.

The object of the study was Mahonia aquifolium (Pursh) Nutt plants in various ontogenic states, which was introduced into Uzbekistan in the last century as an ornamental and medicinal plant. The studies were carried out in the conditions of the Tashkent Botanical Garden of the Academy of Sciences of the Republic of Uzbekistan and in the landscaping objects of Tashkent. The selection of promising forms of mahonia was carried out according to the results of assessing the yield and decorativeness. Phenological observations were carried out in accordance with I.N. Beideman method (1954). We followed the methodological guidelines provided by N.N. Kaden and S.A. Smirnova, I.A. Ivanova, and N.M. Dudnik (1974) for examining the morphological characteristics of fruits and seeds (1974). Seed productivity was determined by the methods of A.A. Korchagin (1960) and I.V. Vainagiy (1974).

The method proposed by T.A. Rabotnov and the same updated method by A.A. Uranova (1975) was used to describe the ontogenetic states of the describing the ontogenetic states of the mahonia mahonia. Drought resistance, winter tolerance, yield rate and assessment of disease vulnerability and pest damage were determined by the field method based on “Program and Methodology for the Study of Fruit, Berry and Nut Crops” (Michurinsk, 1973; Orel, 1999).

The prospects of the introduction were conducted using a modified version of the scale created by P.P. Lapin in the Main Botanical Garden's Department of Dendrology in 1973. Using EXCEL software (Microsoft Office Professional Plus 2010), experimental data were analyzed using the dispersion analysis approach proposed by B.A. Dospekhov (1985) and G.N. Zaitsev (1991).

RESULTS AND DISCUSSION:

Mahonia can be found in nature considerably further south than our borders, from the Himalayas to eastern China and south to the island of Sumatra. Mahonia can also be found in nature in North America and Asia. Although several East Asian species are currently quite

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popular as attractive plants in Western Europe, the Nordic nations cannot support their growth due to their excessive thermophilia.

Mahonia is a plant that is rarely grown in the northern regions of Russia; its lack of winter hardiness is the greatest obstacle to its growth. In this regard, a comprehensive ecological and biological assessment of the variability of the Mahonia aquifolium species in the conditions of the sharply continental climate of Uzbekistan is relevant, to identify features during cultivation, to study a complex of valuable economic and biological traits, to identify valuable forms for the selection of mahonia as an ornamental and berry crop [7].

In the wild, magonia grows up to 1 m tall and forms thickets as a result of the development of root progeny. Young shoots have bark that is pinkish-gray, while older shoots have bark that is brown-gray with longitudinal stripes.

The apical flower bud is ovoid, up to 1 cm long, with external membranous, strongly pointed scales that stay on the stems for 1-2 years, and internal herbaceous and blunt, breaking off; lateral buds are 3-5 mm long, with ovate, slightly pointed scales, and oblong-ovate [5].

Compound, pinnate leaves range in size from 5 to 9 leaflets, are up to 15-20 cm long, and typically have a reddish petiole. Leaflets are leathery, dark green above, glossy, and have a depressed network of veins. Below, they are dull and pale green with notched-sharp-toothed edges, and they are 3 to 9 cm long and 1.5 to 2.5 cm wide. Lateral divisions are unequal and are on reddish petioles. Stipules bristly, 2-5 mm long.

The light yellow, brilliant, and frequently lemon-tinted blooms are about 8 mm in diameter and clustered in many-flowered panicles or brushes in the axils of the outer scales of the apical bud. Greenish yellow petals and stamens with nine sepals apiece. Berries with profuse bluish bloom that are oblong-elliptical in shape and up to 10 mm long and 8 mm broad, with abundant bluish bloom, covered with fluff, with 2-8 seeds, sweet and sour.

Oblong, chestnut, lustrous seeds measure 4.5 mm long, 2.3 mm diameter, and 1.5 mm thick. There are 5,000 berries or 100,000 seeds per kilogram; each 1,000 seeds weigh between 7.5 and 11.5 g. blooming from April through May. Fruits ripen in September in Uzbekistan due to its climate [9].

According to I.G. Serebryakova (1962), a plant's life form is a peculiar habit that develops in ontogeny as a result of growth and development under specific environmental conditions. Historically, this habit evolved in specific soil-climatic and coenotic conditions as an expression of the plant's adaptability to these conditions. This classification of life forms is based on the lifetime of the entire plant and its skeletal axes, which serve as the best indicators of how environmental factors affect a plant's growth and morphogenesis. Without knowledge of the structural characteristics of plants during various stages of ontogeny and in various ontogenetic states, understanding of plant biology is difficult [2].

The overall habitus of the plant and the morphometric characteristics are two crucial factors for evaluating the prospects of introducers when they are introduced into crops. By identifying plants with the largest leaves, which enhance the bush's aesthetic appeal, leaf parameters are

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determined. In the years 2020-2022, we examined 22 specimens of Mahonia aquifolium from different genesis that were growing on the grounds of the Tashkent Botanical Garden of the Academy of Sciences of the Republic of Uzbekistan, the Tashkent State Agrarian University, the Research Institute of Forestry, and in landscaping features in Tashkent.

In October 2020–2021, shoots with leaves and fruits were harvested from bushes along the perimeter of each plant's crown. It was feasible to get the average sheet dimensions by analyzing the results from 2021: 14.38 ± 0.36 mm by 8.93 ± 0.18 mm. We noted the maximum dimensions of form No. 13 with a length of 22.13 ± 10.69 mm and a width of 13.27 ± 4.86 mm, which exceeds the average length by 7.75 mm and the average width by 4.34 mm.

Figure 1: Mahonia aquifolium (Pursh) Nutt

The minimum size was typical for form No. 10 and was 9.00 ± 8.54 mm long and 6.07 ± 6.71 mm wide, which is less than the average by 5.38 mm and 2.86 mm, respectively. Thus, the variation in the width of the leaves of Mahonia aquifolium reaches 13.3 mm in length and 7.2 mm in width, which exceeds the minimum dimensions of the studied samples. The number of leaves does not exceed 9 pieces.

The average sheet measured 7.6 ± 1.5 mm in width and 13.2 ± 3.2 mm in length in 2021. Form No. 12 recorded the sheet's maximum measurements, which are 20.1 ± 8.9 mm long and 10.9 ± 3.7 mm wide, exceeding the average length by 6.90 mm and the average width by 3.30 mm. The smallest size was for form No. 8 and was 8.7 ± 3.0 mm long and 5.8 ± 2.2 mm wide, which is 4.50 mm and 1.80 mm, respectively, less than the norm.

In 2022, the variation in the width of the leaves of the Mahonia aquifolium reaches 11.4 mm in length and 7.2 mm in width, which also exceeds the minimum dimensions of the studied samples. The number of leaves also did not exceed 9 pieces. Having considered the quantitative indicators of the parameters of the Mahonia aquifolium between the length, width of the leaf and the number of leaflets, it was found that the correlation is not significant.

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Analysis of the study of the morphometric parameters of the leaves of the Mahonia aquifolium in 2020–2022 revealed that it reaches the maximum development of the leaf, regardless of the conditions of the area. In the course of studying the forms of mahonia, we attributed the degree of serration of the leaf edge to the most reliable indicator of the diagnostic feature of the forms of these plants. With varied degrees of serrated leaf margins, we have discovered 4 categories of plants. To describe and define the plant, leaves from mature growth shoots' central portions were used. When planted alone under introduction conditions (Tashkent) at the age of 5–6 years, Mahonia aquifolium grows to a height of 70-110 cm.

When planting bushes every 0.5 m, magonia hedges are 10 years old when they have the following characteristics: stem diameter 7-10 cm, bush width 130-240 cm, and bush height 90-160 cm. With several vivid yellow inflorescences that show out against the deep green foliage in the spring, it is extremely stunning. Mahonia has an evergreen aspect, but it also has a decorative impact in the fall and winter when the leaves turn from dark green lustrous to reddish and the berries become blue-violet with a waxy coating.

Mahonia is a common evergreen shrub used in landscaping and landscape design in Uzbekistan. Mahonia has been bred to produce a wide range of decorative and berry-oriented variants both domestically and overseas. Mahonia variants currently in existence can be separated into two categories. One of them will contain magonia, whose fruits can and should be consumed, while the other will contain ornamental plants whose berries should not be consumed.

Mahonia aquifolium decorative variations are frequently utilized in landscaping and landscape design around the world. Decorative features of the bush are purple evergreen leaves, yellow-golden flowers and berries. The most common mahonia variety is Atropurpurea'. The mahonia cultivar mentioned above is very well-liked by landscape architects. The leaves Atropurpurea are, in actuality, always purple throughout the year. The shrub blends seamlessly into the garden's design in the fall, and in the spring and summer, it takes on the role of its flaming accent.

"Aurea" variety. The foliage, which is painted in a yellow-green tone, and the flowers, which are gathered in golden inflorescences, are distinguishing characteristics.

"Compact" variety. Dutch breeders were responsible for its development. Due to the fact that it has a little, compact crown, the object received its name. The bush can grow up to 0.7 meters tall. However, it rarely exceeds half a meter. In the off-season, the foliage is painted dark green, and with the advent of autumn it turns bronze.

"Smaragd" variety. The elegant, glossy leaves of this species have a vivid green color. Also deserving of special consideration are inflorescences. They are quite luxuriant and golden yellow.

"Apollo" variety. Botanists from the Netherlands are the breeders of this plant. It is only a few centimeters tall and produces fruits that are dark blue in color. The berry has a diameter of no more than one centimeter.

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"King Ransom" variety. In the spring and summer, the foliage of this shrub is painted blue-green - quite rare even for mahonia. But with the advent of autumn, the color changes dramatically: green clothes with a blue tint turn into bronze-red, even more spectacular.

"Monsieur" variety. The young foliage of the shrub of this variety has a distinctly noticeable red tint. At the time of vegetative flowering, the leaves, like chameleons, change color and turn green. With the advent of autumn, the shrub changes clothes again and turns into bronze-yellow.

"Orange Flame" variety. The same thing happens with this variety. At the time of the appearance of the first foliage on the shrub, it has a bronze-orange hue. Then this color turns into green. And closer to autumn, in some mysterious way, it changes to the color of red wine - thick and rich.

Completes our selection of decorative varieties of Mahonia aquifolium:

"Meykhan Stremi" variety - there are more foliage on this type of shrub than on any other member of this family. The leaves are lush and thick. In the middle of the growing season they are green. But by the end of the vegetative period, they turn red.

'Versicolor' variety - it is a low evergreen shrub with a spreading crown. Leaves with pink, cream and orange spots, reddish when blooming, bronze-purple in autumn and after wintering

'Orange Flame' variety - fiery leaves in spring, wine-red after frost [4]

'Compacum grade' variety - compact, powerful bush, dense and low.

In Uzbekistan's cities, landscaping can therefore successfully use Mahonia aquifolium and its different variations. It is currently the most well-liked and suited species for Central Asia's climatic conditions. These evergreen shrubs grow up to 1 m tall, swiftly forming lovely thickets of grayish-brown sprouts in gardens. The leaves are complicated pinnate and can reach a length of 15–18 cm. Each sheet consists of 5 - 9 leathery plates of dark green color, glossy with a matte lighter underside.

Young leaves start out being a pale green color before becoming a distinctive hue. Autumn sees the leaves become bronze-purple. Mahonia is a flower that is cultivated in the garden and is sown singularly, in groups, and on an alpine slope. It complements bushes well. As a result, you can construct a mixed hedge. For example, with undersized Thunberg barberries.

CONCLUSION

1. An analysis of the results obtained in 2021 made it possible to find out that the average sheet dimensions are 14.38 ± 0.36 mm by 8.93 ± 0.18 mm. We designated No. 13 as having the highest dimensions, measuring 22.13 ± 10.69 mm in length and 13.27 ± 4.86 mm in width, exceeding the average length by 7.75 mm and the average width by 4.34 mm.
2. Mahonia variants currently in existence can be separated into two categories. One of them will contain magonia, whose fruits can and should be consumed, while the other will contain ornamental plants whose berries should not be consumed.

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3. Mahonia has an evergreen aspect, but it also has a decorative impact in the fall and winter when the leaves turn from dark green lustrous to reddish and the berries become blue-violet with a waxy coating.

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