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Comprehensive assessment of the decorative value of *Araliaceae* Juss. woody species in the collection plantations of botanical gardens of Kyiv

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Abstract. Features of decorative plants within urban ecosystems can be used to create highly decorative plantings with a long-lasting aesthetic effect that interacts harmoniously with urban systems. The study aims to determine the degree of decorativeness of dendrosozoexotics of the family *Araliaceae* Juss. Represented in the collection plantations of botanical gardens in Kyiv. A comprehensive assessment of the decorative effect of 8 species of woody plants of the *Araliaceae* family was conducted. The results of the assessment of the degree of decorativeness of the studied plant species were presented, noting that 2 species have a high degree of decorativeness (*Aralia. elata* (Miq.) Seem. and *Eleutherococcus lasiogyne* (Harms) S.Y.Hu), 5 species are characterised by a high degree of decorativeness (*Kalopanax septemlobus* (Thunb.) Koidz, *Eleutherococcus senticosus* (Rupr. & Maxim.) Maxim., *Eleutherococcus sessiliflorus* (Rupr. & Maxim.) S.Y. Hu, *Eleutherococcus trifoliatus* (L. f.) S.Y. Hu, Eleutherococcus wardii (W.W.Sm.) S.Y.Hu.) Mediocre decorativeness was noted in one species – *Eleutherococcus sieboldianus* (Makino) Koidz. The dynamics of seasonal decorativeness of dendrosozoan exotics of the family *Araliaceae* were analysed, determining a high degree of decorativeness in 87.5 % of the studied plant species. The peak of the decorative effect of dendrosozoexotics occurs in summer and lasts approximately 120 days (from 3 decades of May to 2 decades of September), which is associated with biological characteristics and

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phases of the ontogeny of introductions, in particular, long periods of flowering, fruit formation and ripening. The results obtained are the basis for optimising the species composition of urban and park plantations in megacities and increasing their decorative effect in an urban environment, accounting for the resistance of the studied plant species to anthropogenic load

Keywords: seasonal ornamentation; dendrosozoexotics; phytodesign; introductions; medicinal plants; flowering; fruiting; vegetation

Introduction

In the current conditions of urbanisation and climate change, the conservation and use of ornamental woody plants in green areas of cities is of particular importance. Species of the *Araliaceae* Juss. family are prominent among ornamental plants due to their aesthetic properties, resistance to adverse environmental conditions and ecological value. The collection plantings of botanical gardens are an ideal basis for studying these plants, which can be used to conduct a comprehensive assessment of their decorative and adaptive potential, as well as to develop recommendations for their use in landscaping.

According to V.L. Matviychuk *et al.* (2021), human perception of the environment depends on the features of the terrain and the location of different types of plantations on the territory. Representatives of the plant world are characterised by a wide morphological divergence, featuring certain decorative effects that can be assessed by measuring the strength of the emotional impact on the observer, thus plants are a key component of phytodesign. The decorativeness of plants is manifested in their external morphological features – the size and habit of the crown, the shape of leaves, flowers and fruits, the colour of flowers and leaves, the texture of surfaces, and the aroma. According to S.F. Nilufer *et al.* (2013), an equally important feature of plants is their dynamism throughout the entire period of life.

The evaluation of the decorative qualities of dendrosozophytes is relevant in Ukrainian research, especially in terms of their further implementation in the green space system. Scientists address the use of comprehensive methods for assessing decorativeness, which includes aesthetic, ecological and adaptive components. M. Matusiak *et al.* (2021) assessed the decorative properties of representatives of the *Magnolia* L. genus in the Vinnytsia region using a classical scale that incorporates such indicators as shape, structure, and colour of the main morphological elements. This study not only confirmed the high potential of plants of this genus for landscaping but also contributed to the development of recommendations for their compositional use in urban environments. Another study by T.O. Boiko (2024) addressed representatives of the *Rosaceae* Juss family. The results of this study emphasised the importance of combining species diversity with practical aspects of landscape design aimed at preserving biodiversity and improving the ecological state of the region.

The study of complex and seasonal decorativeness of dendrosophytes based on phenological observations was carried out by N. Demchenko *et al.* (2019). The study analysed the decorative qualities of representatives of the *Magnoliaceae* Juss family. The authors assessed the adaptive capabilities of these plants and their use in landscaping. V.P. Shlapak & N.P. Shpak (2018) presented the results of a study of the complex and seasonal decorative qualities of introduced plants in the Right-Bank Forest-Steppe and Steppe of Ukraine. In particular, the study included an assessment of the adaptation potential and decorative characteristics of the *Ailanthus altissima* (Mill.) species, which can determine its prospects for use in landscaping. The authors analysed the processes of introduction and acclimatisation of

this species, analysing the factors that affect its stability, growth and decorative properties in different seasons of the year.

Turkish scientists B. Mutlu & Ş. Alp (2023), studying the aesthetic characteristics of *Amygdalus* species, evaluated plants according to aesthetic components, where harmony, contrast, balance, and accent affected the perception of the composition. Y. Hu *et al.* (2023) studied the decorative characteristics of plants, in particular morphological characteristics (height and branching of the stem, size and shape of leaves, structure of flowers and fruits), colour characteristics (colour of flowers, fruits, leaves, bark), textural characteristics (bark, leaves, flowers), which are important in assessing the decorative effect of plants.

The study by K. Wang *et al.* (2018), which analysed the complex and seasonal decorative qualities of 12 deciduous representatives of the *Araliaceae* family, was devoted to the establishment of the decorative features and seasonal rhythms of the local flora. Wild ornamental plants of the South China flora, including representatives of the *Araliaceae* family, were evaluated as decorative and capable of covering vertical surfaces (Cong & Han, 2020).

The growing interest in the use of medicinal plants in landscape design is contributing to the combination of the decorative and practical value of such plantings. According to L. Ning & M. Quanfa (2020), out of 11,146 species of medicinal plants characteristic of the Chinese flora, 112 representatives of the *Araliaceae* family demonstrate high decorative properties and have significant potential for implementation in landscape compositions. They can be efficiently used in landscaping due to the combination of aesthetic and environmental functions.

A. Hangan *et al.* (2020) confirmed the potential of integrating medicinal and ornamental plants into the concept of suburban gardens to protect the environment. These gardens can create harmonious spaces that combine aesthetics with environmental benefits. Notably, researchers primarily focus on the biochemistry and pharmacology of *Araliaceae* plants, leaving aside their decorative value. Based on the literature review, most publications address the ornamental value of native species of the *Araliaceae* family in South Asia, while the issues of assessing the ornamental value of woody species of the *Araliaceae* family introduced to Ukraine remain poorly understood.

The study aimed to establish a complex of decorative qualities of dendrosozoexotics of the *Araliaceae* family for their further introduction into the system of green building in Ukraine, in particular, in Kyiv.

Materials and Methods

The assessment of the decorative effect of 8 representatives of the *Araliaceae* family was carried out visually during phenological observations (vegetation period 2018-2021) on the territory of collection plantations of unprotected soil in 3 botanical gardens of Kyiv: M.M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine (NBG), Botanical Garden of the National University of Life and Environmental Sciences of Ukraine (NUBiP), and Fomin Botanical Garden of Taras Shevchenko National University of Kyiv (Fomin Botanical Garden). The objects of research were dendrosozoexotics of the family *Araliaceae*, in particular, *A. elata*, *K. septemlobus*, *E. senticosus*, *E. sessiliflorus*, *E.lasiogyne*,*E.trifoliatus*,*E.wardii*,*E.sieboldianus*.The study of the complex decorativeness of plants was conducted based on the results of in-house field and experimental studies (Morozko *et al.*, 2018).

The seasonal decorativeness of representatives of the *Araliaceae* family was determined by the traditional method of N.V. Kotelova & O.N. Vinogradova (1974), which was adapted for the representatives of the studied family. To correctly reflect the indicators of decorativeness of the studied plant species, use two additional separate criteria were proposed: flowering and fruiting due to the partial overlap of their terms. Each of these metrics has been assigned with conversion factor of 2.

The decorativeness of the crown, leaves, inflorescences, fruits, colour and texture of the bark of the trunk, branches and shoots of 8 woody species of plants of the *Araliaceae* family was assessed monthly on a 5-point scale and the indicators were calculated using the following formula:

$$Poverall. = \sum_{i=1}^{5} AiPi / \sum_{i=1}^{5} Pi, \quad (1)$$

where: A_1 – assessment of the architectonics of the trunk and crown; A_2 – assessment of the decorativeness of leaves; A_3 – assessment of inflorescences; A_4 – assessment of fruits; A_5 – assessment of the colour and texture of the bark of the trunk and crown; P_1, $P_{2...}$ P_5 – conversion factors that reflect the importance of each trait based on the strength and duration of emotional impact, where the coefficient of trunk and crown architectonics (P_1) is 4; for leaves (P_2) – 3; inflorescences (P_3) – 2; fruits (P_4) – 2; texture and colour of trunk bark (P_5) – 1.

The decorative qualities of the plants were assessed using a 5-point scale by Kalinichenko (2003): 1 – negative decorativeness (the appearance of plants is not attractive); 2 – zero (decorative properties are not expressed or plants do not have expressiveness on the general background of plantations); 3 – insignificant (decorative properties are noticeable, but not too expressive); 4 – sufficient (decorative properties are expressive, plants stand out well against the general background of plantations); 5 – high (decorative properties give plants significant attractiveness, cause a strong emotional feeling, admiration in the mass observer). Based on the calculations obtained, graphs of the dynamics of seasonal decorativeness of the studied plant species of the *Araliaceae*family were constructed.

To determine the decorativeness of representatives of the *Araliaceae* family, a complex methodology by A.S. Vlasenko (2016) developed for dendrosozoexotics, was used. According to the methodology proposed by the author, the assessment of decorative traits of woody plants was carried out in four main blocks: the first one is the assessment of the overall decorativeness of the plant, which includes the period of decorativeness, decorative traits of the crown (shape, density, texture) and the duration of flowering and foliage; the second one is the assessment of the decorativeness of the bark, its texture and colour; the third one is the assessment of the decorativeness of the leaves in terms of their shape, size, colour and seasonality of their changes; the fourth block is the assessment of the decorativeness of the generative organs of the plant, which is based on the results of the study. According to this methodology, the degree of decorativeness of plants ranges from 13 to 90 points with a gradation into four groups of decorativeness: IV (13-40 points) – low decorativeness, III (41-50 points) – mediocre, II (51-64 points) – high, I (65-90 points) – very high (Vlasenko, 2016). The study was conducted following the Convention on Biological Diversity (1992) and the Convention on the Trade in Endangered Species of Wild Fauna and Flora (1973).

Results and Discussion

One of the most important decorative features of plants is the architecture of the trunk and crown. For the most part, the maximum expressiveness of these traits of deciduous plants is manifested in the autumn-winter period. Since the studied representatives of the *Araliaceae* family are low-branched plant species, the architectonics of their trunks and crowns were assessed at 3 points during the leafless state. Notably, the use of regular formative pruning of the crown of *E. lasiogyne* and *E. trifoliatus* in the collection plantations of the NBS named after M.M. Hryshko and the BS named after A.V. Fomin ensured high decorativeness of the aboveground part due to its orderliness, density, texture and compactness: the decorativeness of crowned specimens in autumn and winter was estimated at 4 points (Fig. 1).

Leaf decorativeness is a substantial component that forms the longest-lasting and most stable overall decorative effect of plants. In an assessment of leaf decorativeness, such qualitative

attributes as the shape and size of the leaf blade, colour and its change in autumn, the venation system, surface texture, and the method of attachment to the shoots are central.

a  b 

Figure 1. *Crown and trunk architecture of experimental plants in a leafless state in autumn and winter*

Note: *a – E. lasiogyne; b – E. sessiliflorus*

Source: photos taken by the authors

With the beginning of the growing season and budding, the overall decorative effect of *Araliaceae* increases due to the appearance of leaves. Large double-pinnate leaves of *A. elata* reach a length of more than 1 m and develop on the tops of branches. At the time of blooming, the leaves have a crimson hue, which eventually transforms into a dark green colour. In the 3rd decade of August – 1st decade of October, the green colour scheme of *A. elata* leaves is replaced by autumn colour with the predominance of warm shades from yellow to purple-red (Fig. 2). Thus, the leaves of *A. elata* are attractive, with a maximum score of 5 points for their decorative effect.

Figure 2. *Autumn leaf colour of A. elata*

Source: photos taken by the authors

The studied representatives of the genus *Eleutherococcus* are characterised by palmate and ternate leaves of different size ranges, which in autumn acquire yellow shades. Thus, the decorativeness of the leaves of 3 studied species of *Eleutherococcus* (the largest in size) was estimated at 5 points (*E. senticosus*, *E. sessiliflorus*, *E. wardii*). In turn, the leaves of *E. lasiogyne* and *E. trifoliatus* are ternary compounds, and those of *E. sieboldianus* are palmate, small (up to 10 sizes), and their decorative effect was assessed at 4 points.

In 4 plant species under study, the leaves retain their decorative effect for more than 6 months (*E. trifoliatus*, *E. wardii*, *E. lasiogyne*,

E. sieboldianus). The flowers of the studied representatives of the *Araliaceae* family are inconspicuous, small (3-4 cm in diameter), white to yellowish-green in colour, collected in inflorescences that differ in size, complexity of structure and duration of flowering (Fig. 3).

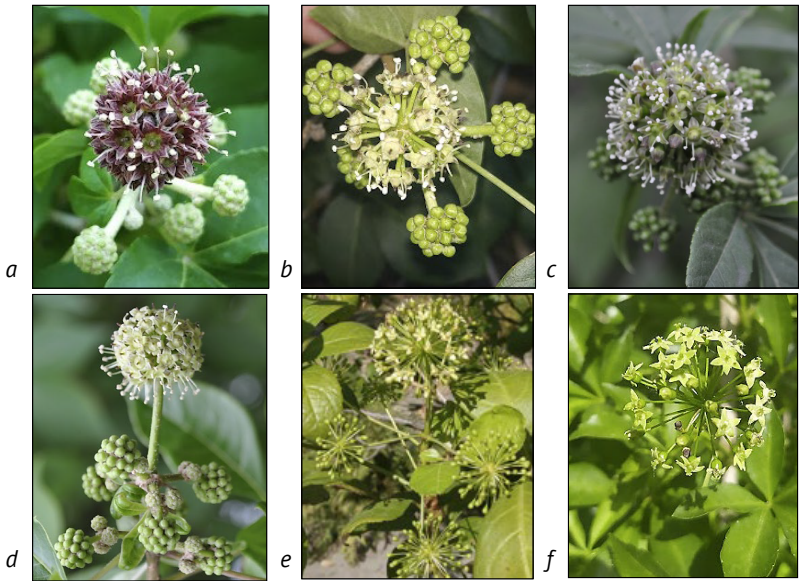

Figure 3. *Generative organs of representatives of the Araliaceae family at different stages of development*

Note: a – *E. sessiliflorus*; *b* – *E. trifoliatus*; *c* – *E. wardii*; *d* – *E. lasiogyne*, e – *E. senticosus*, *f* – *E. sieboldianuss*

Source: photos taken by the authors

It is worth noting the peculiarities of flowering and fruiting of plants of the genus *Eleutherococcus* (*E. sessiliflorus*, *E. lasiogyne*, *E. trifoliatus*, *E. wardii*, *E. senticosus*), which are characterised by the partial overlap of terms and stages of development of generative organs (Fig. 4).

Figure 4. *Generative organs of Eleutherococcus representatives at different stages of development (from flowering to fruiting)*

Note: *a – E. sessiliflorus; b – E. trifoliatus; c – E. wardii; d – E. lasiogyne*

Source: photos taken by the authors

Among the representatives studied, the largest inflorescences – panicles – are those of *A. elata* (up to 50 cm in diameter, with one individual fruit 3-4 mm in size), its primary axis has 5 to 12 lobes 20-35 cm long (Fig. 5) and *K. septemlobus* (up to 30 cm in diameter) with a similar structure.

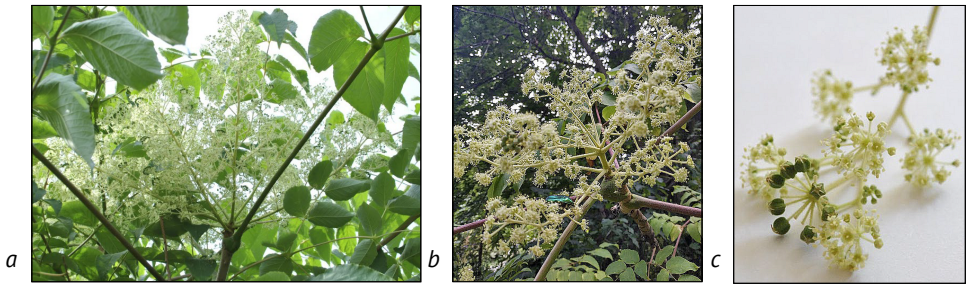

Figure 5. *Inflorescences of A. elata*
Note: *a* – general view of the inflorescence; *b* – terminal axis of the panicle
Source: photos taken by the authors

In plants of *A. elata*, flowering begins on the umbels located at the tops of the terminal panicle axes, with further records of fruit formation, while the umbels located below the inflorescence axes begin to enter the flowering phase. Thus, the timing of flowering and fruiting phases in the above representatives of the *Araliaceae* family occur simultaneously. The high decorativeness of *A. elata* fruits is observed during their ripening (III decade of August – III decade of September). During this period, the openwork axes of the inflorescences become pink, and the small spherical fruits are distinguished by a purple-black colour (Fig. 6).

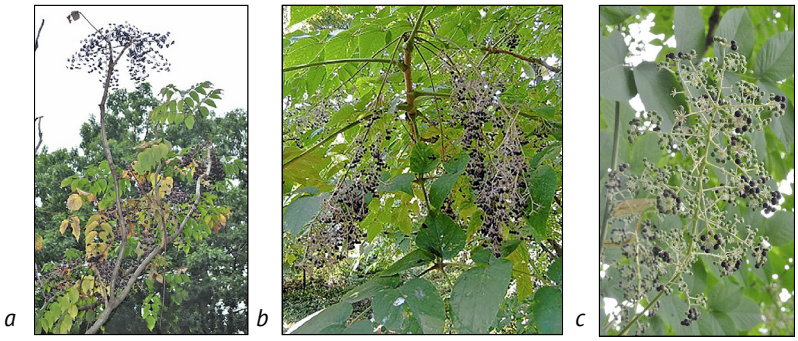

Figure 6. *Fruiting of A. elata*
Note: *a* – nature of the placement of tassels on the plant; *b* – single inflorescence; c – secondary axis of the panicle, showing the nature of fruit ripening
Source: photos taken by the authors

The results of the current study revealed that plants of all studied species of the *Araliaceae* family growing in unprotected soil of Kyiv bloom, but fruit forming is inherent only in some species. Given that *E. sieboldianus* is a monoecious plant and is represented only by single female specimens in the study areas, the fruit decorative effect was not assessed.

In the studied species of plants of the *Araliaceae* family, the fruit is a juicy drupe, which changes colour from greenish to purple and then almost black as it ripens (Fig. 7).

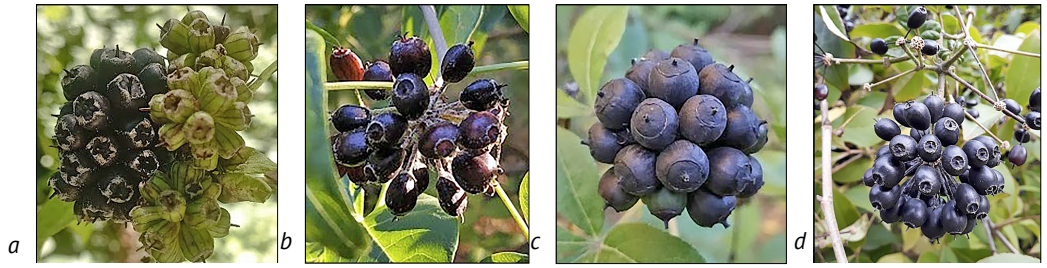

Figure 7. *Ripe fruits of plants of the Araliaceae family*
Note: a – E. *sessiliflorus*; *b – E. trifoliatus*; *c – E. wardii*; *d – E. lasiogyne*
Source: photos taken by the authors

In *E. wardii* and *E. senticosus*, only those fruits located on the tops of the main axis of the panicle reach the stage of ripeness. The fruits on the umbels of the lateral axes mostly do not ripen and fall off. In plants of *E. trifoliatus*, *E. sessiliflorus*, *and E. lasiogyne*, successful fruit ripening occurs on all inflorescence orders. When determining the decorative effect of plants, the aforementioned features of the development of generative organs are expressed in the quantitative assessment of fruiting abundance.

Members of the *Eleutherococcus* genus are characterised by long flowering and fruiting. The fruits of *E. senticosus* are the first to ripen, but they do not remain in the bushes. Fruits of *E. sessiliflorus*, *E. lasiogyne*, *E. trifoliatus*, and *E. wardii* are decorative for more than 3 months: dark purple, almost black – they are visible in winter. Notably, the plants of the *Araliaceae* family are zoo species, their fruits are the food base of some bird species, which is a positive phenomenon in the context of biocenosis in the anthropogenic environment. The colour and texture of the trunk bark of *K. septemlobus* plants varies with age from grey fine-cracked to grey-brown longitudinally deeply cracked. Young shoots are covered with green thorns with a wide base, and old branches become grey-brown in colour, with sickle-shaped leaf scars visible on them. The decorative score of the trunk bark and crown of *K. septemlobus* plants was 3 points.

The trunk bark of *A. elata* plants at a young age is light brown in colour and densely covered with thorns, later it acquires a grey-brown hue and becomes finely fissured (Fig. 8). On light brown branches, wide sickle-shaped leaf scars with a system of conductive bundles surrounding the downwardly directed thorns are visible. The decorative qualities of the colour and texture of the crown and trunk of *A. elata* plants in winter were rated at 4 points.

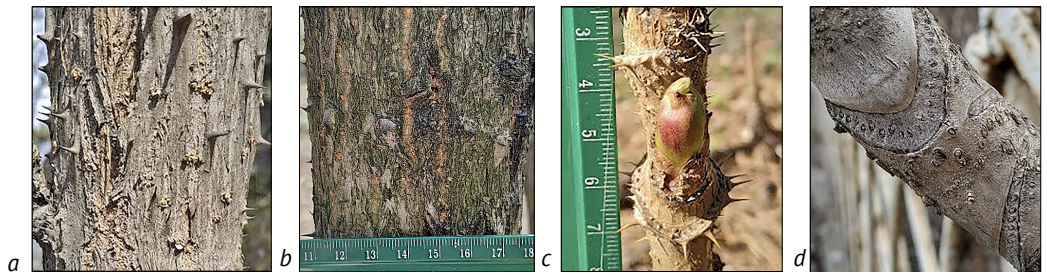

Figure 8. *Colour and texture of trunks and branches of A. elata*
Note: *a* – trunk bark of a young specimen; *b* – trunk bark *of a mature specimen*; *c* – annual shoot *A. elata*; *d* – four-year-old branch *A. elata*
Source: photos taken by the authors

Representatives of the genus *Eleutherococcus* have decorative qualities – the colour and texture of the bark and trunk are not very expressive, and the surface is covered with emergences of different structures, sizes and densities (except for *E. sessiliflorus*).

The bark of the branches of *E. senticosus* is light brown and densely covered with spines 4-8 mm long. The bark of *E. sessiliflorus* has a dark grey colour and single spines 5-10 mm long. Plants of *E. lasiogyne* and *E. trifoliatus* have light grey bark and single short spines 3-4 mm long. The branches of *E. wardii* and *E. sieboldianus* have light grey bark and a moderate number of spines up to 4 mm and 7 mm long, respectively (Fig. 9).

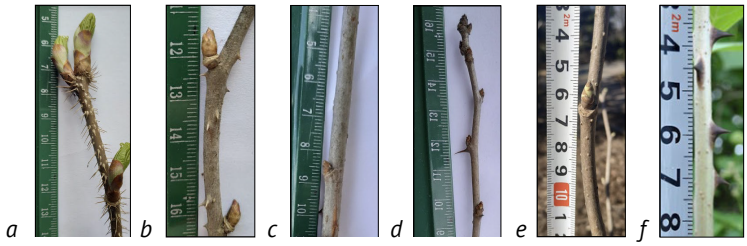

Figure 9. *Colour and texture of branches of representatives of the genus Eleutherococcus*
Note: *a – E. senticosus; b – E. wardii; c – E. trifoliatus; d – E. sieboldianus; e – E. sessiliflorus; f – E. lasiogyne*
Source: photos taken by the authors

The sequence and duration of the phenological phases of seasonal growth and development of the studied plant species are reflected in the phenospectrum (Fig. 10).

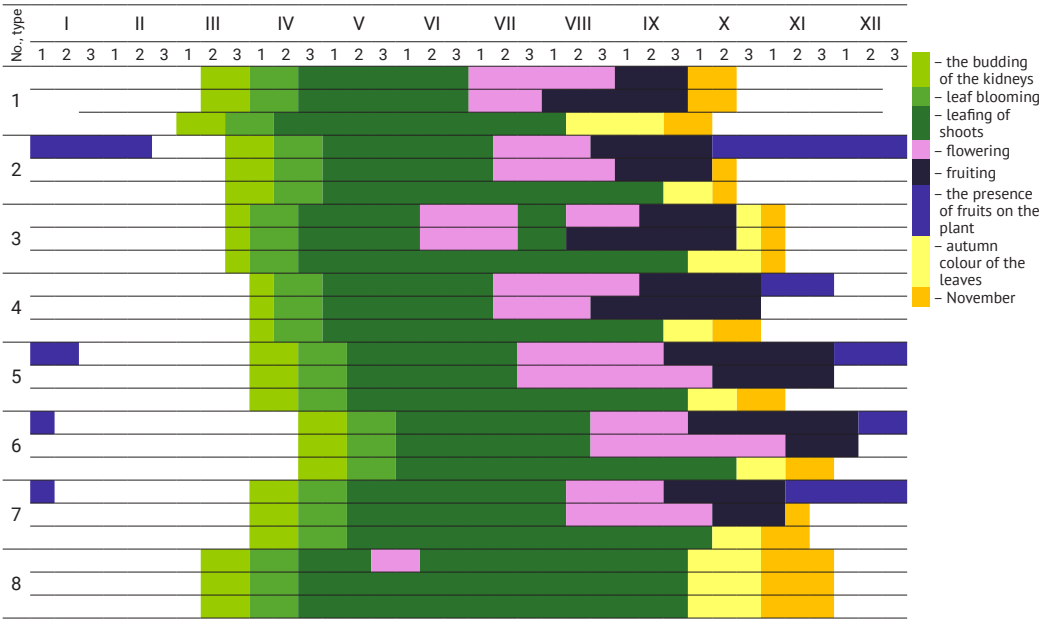

Figure 10. *Phenomenology of seasonal growth and development of dendrosozoan exotics of the family Araliaceae in the territory of botanical gardens of Kyiv (on the example of the vegetation period of 2019)*
Note: *1 – A. elata; 2 – K. septemlobus; 3 – E. senticosus; 4 – E. sessiliflorus; 5 – E. lasiogyne; 6 – E. trifoliatus; 7 – E. wardii; 8 – E. sieboldianus*
Source: compiled by the authors based on own research

The results of calculations of the total decorativeness of representatives of the *Araliaceae* family during 12 months by 5 traits for each plant species studied are provided in Table 1.

Table 1. *The decorative effect of Araliaceae throughout the year*

Species name	Month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
A. elata	3.20	3.20	3.63	4.75	4.75	4.75	4.80	4.80	4.80	3.80	3.20	3.20
K. septemlobus	2.86	2.86	3.00	3.50	4.38	4.38	4.30	4.30	3.90	2.86	2.86	2.86
E. senticosus	3.00	3.00	3.00	3.88	4.40	4.60	4.60	4.80	4.80	4.10	3.40	3.00
E. sessiliflorus	3.00	3.00	3.00	3.80	4.25	4.75	4.80	4.80	4.30	3.70	3.58	3.00
E. lasiogyne	3.80	3.80	3.80	3.88	4.38	4.38	4.38	4.50	4.59	3.92	3.80	3.86
E. trifoliatus	3.80	3.80	3.80	3.88	4.38	4.38	4.38	4.50	4.59	4.09	3.92	3.50
E. wardii	3.00	3.00	3.00	3.50	4.10	4.75	4.80	4.80	4.50	4.10	3.40	3.00
E. sieboldianus	3.00	3.00	3.50	3.50	4.10	4.30	4.38	4.38	4.38	3.88	3.50	3.00

Source: compiled by the authors based on own research

Graphs of the seasonal dynamics of the overall decorative effect (Figs. 11, 12) were constructed based on the data in Table 1, reflecting changes in the scores of each of the studied species of plants of the *Araliaceae* family during the year.

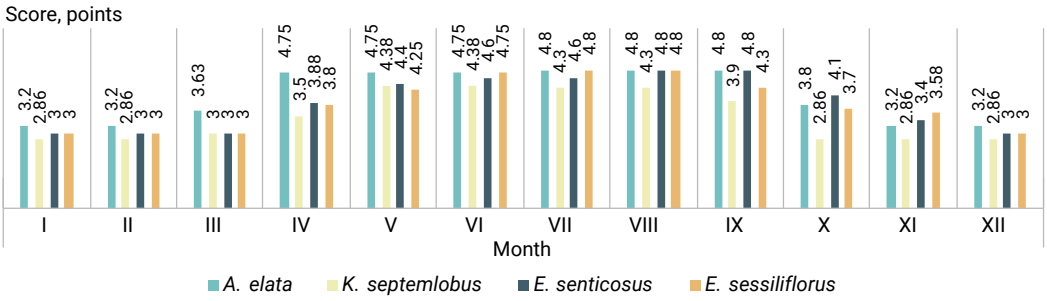

Figure 11. *Seasonal dynamics of the overall decorative effect of plant species: A. elata, K. septemlobus, E. senticosus, E. sessiliflorus*

Source: compiled by the authors based on own research

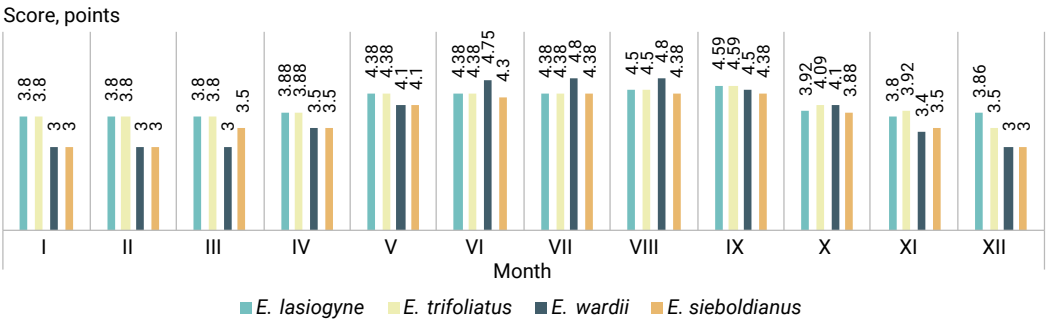

Figure 12. *Seasonal dynamics of the total decorative effect of plants of E. lasiogyne, E. trifoliatus, E. wardii, E. sieboldianus*

Source: compiled by the authors based on own research

Based on the generalised research results, plants of 8 species of the *Araliaceae* family growing in the collection plantations of three botanical gardens in Kyiv have a decorative value of 45-65 points and therefore can be divided into 3 groups according to these indicators (Table 2).

Table 2. *Quantitative assessment of the decorative value of dendrosozoexotics of the family Araliaceae in the botanical gardens of Kyiv*

	General decorativeness of plants						Evaluation of the decorative quality of the crust	Assessment of leaf decorativeness				Assessment of the decorative effect of generative organs									
		crown				longevity						flowers/ inflorescences			fruits						
Plant species by number	decorative time	form	density	structure	blooming	foliage	structure	colouration	size	form	colouration	colour changes	size	colouration	abundance	form	size	colouration	abundance	**Overall score**	**Decorative group**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
1	3	3	3	5	5	1	3	3	5	5	3	5	5	5	3	3	1	3	1	65	I
2	3	3	3	3	3	1	3	3	5	3	3	3	5	3	1	1	1	3	1	51	II
3	3	3	3	3	3	5	3	3	5	5	3	5	3	1	3	3	1	3	3	61	II
4	3	3	3	3	3	3	3	3	5	5	3	3	3	3	1	3	1	3	3	57	II
5	3	5	3	3	5	5	1	3	3	5	3	3	3	3	5	5	1	3	5	67	I
6	3	3	3	3	5	5	3	3	3	5	3	3	3	5	3	3	1	3	3	63	II
7	3	3	3	3	3	5	3	3	5	5	3	3	3	3	3	3	1	3	1	59	II
8	3	3	3	3	1	5	3	3	3	5	3	3	3	1	3	0	0	0	0	45	III

Note: 1 – *A. elata;* 2 – *K. septemlobus;* 3 – *E. senticosus;* 4 – *E. sessiliflorus;* 5 – *E. lasiogyne;* 6 – *E. trifoliatus;* 7 – *E. wardii;* 8 – *E. sieboldianus*

Source: compiled by the authors based on own research

Thus, the study revealed that a mediocre degree of decorativeness (group III) is inherent in *E. sieboldianus* plants, whose low score among the other studied species is due to the lack of points for fruiting. Five plant species were classified as having a high degree of decorativeness (group II): *K. septemlobus*, *E. senticosus*, *E. sessiliflorus*, *E. trifoliatus*, *and E. wardii*. A high degree of decorativeness (group I) is observed in plants of 2 species – *A. elata* and *E. lasiogyne*. The high quantitative indicators of the degree of decorativeness are due to the unique biological and morphological features of the studied plant species (large and complex leaves, as well as their bright autumn colour, long flowering and fruiting period).

The assessment of the decorative qualities of the *Araliaceae* family and their prospects for use in landscape design is a relevant topic that is reflected in numerous scientific studies. Representatives of this family are known for their high decorative qualities, economic value and medicinal properties, which makes them promising objects for implementation in the green building system.

Several publications indicate that the decorative characteristics of the *Araliaceae* depend on their morphological characteristics, including

habit, size, colour and texture of leaves, and colour of fruits and flowers. The study by A. Abdelnaby *et al.* (2021) in Egypt highlighted the aesthetic value of *Araliaceae* woody plants, in particular their use in urban landscapes. The authors noted that certain species of this family have significant potential for creating decorative compositions due to their high adaptability to urban conditions. C. Thakur & R. Parajuli (2024) investigated the ornamental qualities of wild plants on the Tribhuvan Highway in Nepal. The study emphasises that *Araliaceae* species growing naturally can be integrated into urban landscapes as part of sustainable design concepts. In particular, the study demonstrated that these species are well adapted to new ecotopes and contribute to biodiversity in urban environments.

The biological and genetic features of the *Araliaceae* family also attracted the attention of researchers. K. Kim *et al.* (2017) conducted a phylogenetic and evolutionary analysis of the *Araliaceae* family using complete chloroplast genomes and 45S nrDNA. The results of the study showed a significant level of genetic diversity among species and determined the mechanisms of speciation and adaptation to different environmental conditions. T. Yi *et al.* (2004) studied chromosomal evolution within the *Araliaceae* family, emphasising its importance for understanding genetic and morphological divergence that affects decorative properties.

Other publications focus on the practical use of *Araliaceae*, in particular in landscaping. V.H. Heywood (2015) and T. Rajendran *et al.* (2020) described the cultivation of certain species in container culture, which in the conditions of Kyiv makes them promising for use in interior phytodesign.

In general, representatives of the *Araliaceae* family demonstrate significant potential for use in urban landscaping due to their decorative effect, environmental adaptability and medicinal properties. Further research in this area will facilitate the integration of these plants into the green building system, ensuring their rational use and biodiversity conservation.

The analysis of the source base has shown that the principles, approaches and methods for assessing the decorative effect of plants differ significantly between researchers from different countries. V. Kokhanovskyi *et al.* (2020) developed a transformed methodology for determining the decorative value of woody plants of the *Pinorhynchia* division and tested an integrated assessment of the decorative value of woody plants of the *Magnoliophyta* division. V.A. Vitenko *et al.* (2019) presented a methodology for a comprehensive assessment of the condition of woody plants Morus alba L., and researchers V.P. Shlapak & N.P. Shpak (2018) developed a comprehensive scale for assessing the decorative value of the species *Sorbus torminalis*.

To determine the decorative effect of plants, B. Sulistyantara & N. Mentari (2017) and P. Boycheva *et al.* (2021) used sociological survey methods, where visual criteria for plant decorativeness were determined by questioning 50 respondents (students of the course "Landscape Plants"). Indicators of the external attractiveness of plants were assessed according to four criteria: colour, shape, texture and scale, and then the overall score was calculated using the appropriate formulas. When assessing the decorativeness of 150 plant species, including representatives of the *Araliaceae* family, 60 of them scored above the average level, so, as the authors of the study emphasise, these species have the potential to be used in landscape design. The results of the assessment of 8 species of plants of the *Araliaceae* family in Kyiv indicate that they are highly decorative and can be implemented in the system of green spaces of urban and park areas.

An increase in ethnobotanical publications was identified, where the study of aspects of the use of ornamental plants, in particular in landscaping, is a priority (Natchathiram *et al.*, 2023). Given the economic value of various types of medicinal plants, researchers are studying the possibility of using them as ornamental plants, including for creating medicinal gardens. According to Y. Wang *et al.* (2020), native plant species of the

Araliaceae family are characterised by a long flowering period (beginning in the second half of the year), and the fruiting phase of some members of the family can last until the following spring, which significantly increases the potential of their decorative value. In the conditions of introduction (Kyiv), species of plants of the *Araliaceae* family bloom in the second half of the year until the first decade of October inclusive (*E. sieboldianus*).

Notably, the flowering of *K. septemlobus* plants does not occur every year, even within the natural habitat, and they bear fruit only in the most favourable years (Fujimori *et al*., 2006). In the city, the flowering of *K. septemlobus* plants was recorded twice during the study period (2018-2021). *K. septemlobus* plants form racemes 25-30 cm in diameter, which are localised at the tops of branches, but some of their fruits remain until the beginning of the next growing season. It has been established that representatives of the *Araliaceae* family have a high decorative value and are used to create gardens in southeastern Tibet (Wang *et al*., 2018).

Caprophagous birds function as seed dispersers: *Zosterops japonicus* Temminck & Schlegel disperse of *A. elata* seeds locally in central Japan (Kamei & Ohkawara, 2022). In the UK, nine species of birds feed on the fruits of *Hedera helix* L. (Morozko *et al*., 2021), of which *Turdus merula* L., *Sturnus vulgaris* L. and *Passer domesticus* L. are typical representatives of the avifauna of Ukraine. During the field surveys, individuals of *T. merula* and *P. domesticus* were observed in the experimental plots with *Araliaceae* species, which potentially feed on the fruits of these plants. Thus, monitoring of carpophagous birds feeding on the fruits of *Araliaceae* plant species is another promising area of research in the family's autecology.

Conclusions

The study of decorative qualities and the degree of decorativeness of representatives of 8 species of woody and shrubby plants of the family *Araliaceae* growing in the collection plantations of three botanical gardens in Kyiv was carried out, the dynamics of their decorativeness during the growing season was analysed. The study revealed that plants of *A. elata* species acquire the most attractive appearance in the period from April to September; plants of *E. senticosus* and *E. wardi* – from June to September; high decorativeness of plants of *E. lasiogyne*, *E. sessiliflorus*, *E. trifoliatus* and *E. sieboldianus* is observed in the period from May to September, and of *K. septemlobus* – from May to August. High decorativeness of plants of woody species of the *Araliaceae family* is noted with the passage of flowering, formation to fruit ripening.

The results obtained indicate a high degree of plant decorativeness and the prospects and feasibility of their further use not only within the collection plantings of botanical gardens but also to improve the architectural and artistic appearance of urban and park areas by using the natural aesthetics of plants. Accounting for the experience of foreign scientists, the studied species of plants of the *Araliaceae family* may be promising for the creation of medicinal gardens. Considering the biomorphological features, it is recommended to involve representatives of the *Araliaceae* family in the formation of Kyiv plantations, namely: for ordinary plantings – *K. septemlobus*; as a tapeworm – *A. elata, K. septemlobus, E. senticosus, E. sessiliflorus, E. lasiogyne, E. trifoliatus, E. wardii, E. sieboldianus*; formation of hedges – *E. sieboldianus*; decorative groups – *A. elata, K. septemlobus, E. senticosus, E. sessiliflorus, E. lasiogyne, E. trifoliatus, E. wardii, E. sieboldianus;* curtains – *A. elata, E. lasiogyne, E. trifoliatus, E. wardii*; for slope stabilisation – *E. senticosus*.

The prospect of further research is a comprehensive assessment of the decorative characteristics of woody species of the family *Araliaceae* Juss., in particular, the study of their adaptive properties to changing climatic conditions and urban environments. The assessment of the decorative qualities of these plant species should include not only the study of their ecological and biological characteristics but also the study of

the influence of agronomic conditions on their growth and decorative parameters. It is necessary to address the resistance of woody species of the family *Araliaceae* Juss. to stress factors such as air pollution, temperature and humidity changes.

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Conflict of Interest

None.

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Комплексна оцінка декоративності деревних видів родини *Araliaceae* Juss. на території колекційних насаджень ботанічних садів м. Києва

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Анотація. Знання декоративних особливостей рослин у межах урбоекосистем дозволяє створювати високодекоративні насадження з тривалим декоративним ефектом, які гармонійно взаємодіють із міськими системами. Метою дослідження було встановлення ступеня декоративності дендросозоекзотів родини *Araliaceae* Juss., представлених на території колекційних насаджень ботанічних садів м. Києва. Здійснено комплексну оцінку декоративності 8 видів деревних рослин родини *Araliaceae*. Наведено результати оцінювання ступеня декоративності досліджуваних видів рослин і встановлено, що 2 види мають дуже високий ступінь декоративності (*Aralia. elata* (Miq.) Seem. та *Eleutherococcus lasiogyne* (Harms) S.Y.Hu.), 5 видів характеризуються високим ступенем декоративності (*Kalopanax septemlobus* (Thunb.) Koidz., *Eleutherococcus senticosus* (Rupr. & Maxim.) Maxim., *Eleutherococcus sessiliflorus* (Rupr. & Maxim.) S.Y.Hu, *Eleutherococcus trifoliatus* (L. f.) S.Y. Hu, *Eleutherococcus wardii* (W.W.Sm.) S.Y.Hu.). Посередню декоративність відзначено в одного виду – *Eleutherococcus sieboldianus* (Makino) Koidz. Проаналізовано динаміку сезонної декоративності дендросозоекзотів родини *Araliaceae* та виявлено, що високий ступінь декоративності спостерігається у 87,5 % досліджуваних видів рослин. Пік декоративності дендросозоекзотів припадає на літній період та триває близько 120 діб (з 3 декади травня по 2 декаду вересня), що пов'язано з біологічними особливостями та фазами онтогенезу інтродуцентів, зокрема тривалими у часі періодами квітування, формування плодів та їх дозрівання. Отримані результати є основою для оптимізації видового складу насаджень міських та паркових територій мегаполісів та підвищення їх декоративності в умовах урбанізованого середовища за врахування показників стійкості досліджуваних видів рослин до антропогенного навантаження

Ключові слова: сезонна декоративність; дендросозоекзоти; фітодизайн; інтродуценти; лікарські рослини; квітування; плодоношення; вегетація