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CHRONICLE

The Department of Floriculture and Ornamental Plants of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine as a leading scientific center in the field of floriculture in Ukraine

Yurii Buidin *, Tetiana Scherbakova, Svitlana Mashkovska, Vasyl Gorobets, Hanna Horai, Oksana Pereboichuk, Olga Tymchenko, Larysa Kykot, Nataliia Andrukh, Ludmyla Zavidova

M.M. Gryshko National Botanical Garden, National Academy of Sciences of Ukraine, Sadovo-Botanichna str. 1, 01014 Kyiv, Ukraine;
* buidin@nbg.kyiv.ua

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Abstract

The article highlights the long-standing work (with a focus on the last few decades) of the Department of Floriculture and Ornamental Plants of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine (NBG), which serves as the leading scientific center for floriculture in Ukraine. In particular, it provides a detailed account of the history of the country's largest collection, comprising over 5,000 specimens.

The scientific work of the Department of Floriculture and Ornamental Plants at the NBG combines plant introduction, in-depth biological and ecological research, and in-house breeding to create resilient domestic cultivars. Breeding is one of the Department's top priorities. Before being included in the breeding process, plants undergo a comprehensive study, including morphobiological traits, growth and development patterns, and disease resistance (for example, fusarium wilt in asters or powdery mildew in phlox). In the long-term perspective, this enables the creation of ecologically sustainable and competitive domestic cultivars. To create new cultivars, scientists use hybridization of parent pairs with predefined traits, as well as interspecific and distant hybridization. For example, the use of distant hybridization methods has enabled the development of unique peony cultivars with extremely early flowering.

The practical results of the breeding work include the creation, over the past two decades, of more than 150 cultivars– both those traditional to the Department (e.g., peonies, small-flowered chrysanthemums, gladiolus, and annual asters) and the active development of cultivars of ornamental plants new for the NBG and Ukraine (e.g., daylilies, lilies, astilbes, oriental poppies, heuchera, and primroses). Another significant practical achievement is the development by the Department's scientists of methods for evaluating cultivars for distinctness, uniformity, and stability (DUS test). Such methodologies have already been developed for astilbe, peony, phlox, heuchera, oriental poppy, and other crops, which is a prerequisite for the state registration of new domestic cultivars. All of them are based on many years of experience in introductions and cultivar investigations.

Keywords: ornamental plants, gene pool, cultivars, species, introduction, breeding

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of genetic resources of flower and ornamental plants for optimization of ecosystems of various hierarchical levels in the post-war period" (2024–2028).

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Introductory work with floriculture and ornamental plants in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine (NBG) began back in 1944 in the Department of Ornamental Horticulture and Floriculture headed by P.S. Chaban (Klymenko & Chuvikina, 2009). At that time, plants from German nurseries were actively imported to the botanical garden, purchased by employees (including those under the leadership of the Head of the Department of Cultural Flora, D.F. Lykhvar) with funds received from reparations. A significant part of the purchased plants belonged to ornamental. In 1967, the Department of Floriculture and Greenhouse Plants was established, including a laboratory of tropical and subtropical plants (headed by S.M. Prykhodko). In April 1974, the Department of Protected Cultivation was established based on this laboratory and was headed by T.M. Cherevchenko (Gorobets et al., 2005). In 1974, the group of greenhouse plants was separated into an independent unit under the leadership of T.M. Cherevchenko, the Department of Tropical and Subtropical Plants. Since then, the Department of Floriculture and Ornamental Plants has borne the name it bears to date. Until 1998, the Department operated a laboratory of genetics and intensive selection of floriculture plants, headed by M.P. Yashchenko.

Today, the Department of Floriculture and Ornamental Plants of the NBG is Ukraine's leading research center for the introduction, breeding, and application of major groups of herbaceous ornamental plants in landscape architecture. Over the years of the Department's existence, through the collection of ornamental plant species from the wild and the most valuable cultivars from global breeding programs, as well as the development of its own cultivars, a collection of ornamental and decorative plants has been established. As of the end of 2025, this collection comprises 5,221 specimens, represented by 4,210 cultivars, 1,011 species (including subspecies, cultivars, and forms), 440 genera, 92 families, four classes, three divisions (Magnoliophyta, Pinophyta, and Polypodiophyta), and approximately 500 promising breeding specimens. The Department's collections are among the leading not only in Ukraine, but also, for some of them (e.g., annuals, peonies, and astilbes), the largest among botanical gardens in Europe.

The Department's gene pool encompasses two aspects of introduction activities:

1) enriching and updating the assortment of ornamental plants by introducing new genera, species, or cultivars whose use has already been proven in other regions;

2) the creation of a gene pool of species and cultivars that are of particular interest in terms of their potential use in breeding as donors of especially valuable or fundamentally new ornamental and agronomic traits.

The Department's collection is constantly changing and depends on the arrival of new specimens, the viability of the plants, their adaptability to the conditions of the region where they are introduced, and other factors (e.g., including the research interests of the curators), but the collections are characterized by a steady upward trend. Thus, annuals make up the largest percentage of the Department's collection (20% of the total number of specimens), followed by the peony collection (16.0%), and rare perennials (12%). The collections with the fewest specimens currently are those of cannas and paniculate phlox (ca. 1% each) (Fig. 1). Thanks to introductory research activities, over the past 17 years (2008–2025), the collection has acquired 188 species, 871 cultivars, 79 genera, and ten families, one class, and one division (Table 1).

Over the past ten years, a comprehensive introduction assessment that accounted for biological and ecological characteristics has established the level of introduction resilience of the collection at the Department of Floriculture and Ornamental Plants. The promising introduced species have been screened and preselected for further incorporation into the breeding process

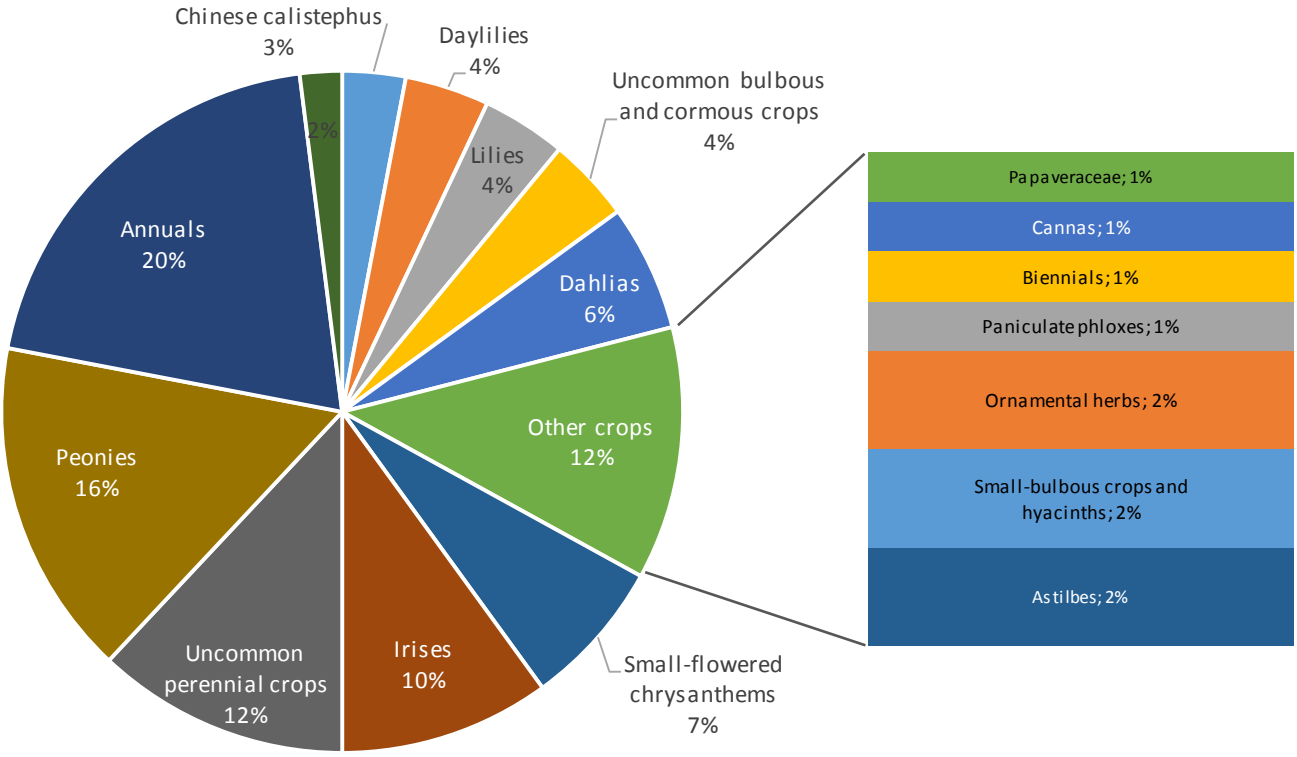

Figure 1. Plant collections of the Department of Floriculture and Ornamental Plants of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine as of the end of 2025.

and adoption in Ukraine's ornamental horticulture. The breeding stock has been substantially updated. The competitive, ecologically stable domestic cultivars adapted to local soil and climate conditions have been developed.

The assembled collections serve as a basis for a comprehensive study of introduced plants, their morphological and biological characteristics, growth and development patterns, and adaptation traits under introduced conditions. These collections also serve to select the most promising species and cultivars for practical use, to replenish and expand the collections of regional botanical gardens, and to provide planting stock for horticulture and landscaping. They are also used for educational and cognitive purposes, e.g., by students majoring in biology and agriculture, as well as by amateur gardeners and landscapers. The NBG's peony collection is designated as National Heritage (Rakhmetov et al., 2019).

Collections of monocultures (e.g., peonies, daylilies, irises, dahlias, chrysanthemums, paniculate phlox, heuchera, gladioli, daffodils, and lilies) reflect the major Department's achievements in plant breeding both historically and in the recent context. They serve as a source of immense genetic diversity and new ornamental traits for breeding work in Ukraine, as well as important agronomic characteristics for their adoption. Based on the collected gene pool, methods for cultivar evaluation and cultivation technologies are developed. The collections also serve as a benchmark for conducting state cultivars trials.

Climate change in Ukraine results in increased water deficits for plants against the backdrop of rising average annual temperatures. The increase in the frequency of extreme weather events, caused by longer dry spells, higher maximum temperatures, greater temperature variability, and extremely uneven precipitation distribution, both over time and across regions, is also observed. The amount of ineffective precipitation in the form of downpours is increasing, too. As a result, climatic zones are gradually shifting northward and westward. Soil moisture deficit is becoming the main limiting factor

Table 1. Comparative characteristics of the quantitative taxonomic composition in the recent history of the Department of Floriculture and Ornamental Plants of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine.

Taxa	Number of specimens					
	2008	2013	2018	2023	2025	Acquisition since 2008
Divisions	2	2	3	3	3	1
Classes	3	3	4	4	4	1
Families	75	77	85	85	85	10
Genera	364	334	436	440	443	79
Species	823	907	999	1029	1011	188
Cultivars	3339	3904	4157	4167	4210	871
Total	4162	4811	5156	5196	5221	1059

in agriculture, particularly in floriculture, in Ukraine (Adamenko, 2019; Khokhlov et al., 2020).

Hence, the optimization of the structure of collection holdings in response to climate aridification, aimed at preserving the existing gene pool and supplementing it with ornamental and valuable drought-tolerant species with a pronounced xeromorphic structure. Such species originate from various botanical-geographic regions of the world, in particular the Neotropical and Cape kingdoms, which are characterized by significant species diversity, as well as the flora of Asia, the Mediterranean, and the Irano-Turanian floristic regions. They are promising sources of xerophytes and xeromesophytes, as well as ornamental plants of the local flora that are better adapted to the new region's edaphic and climatic conditions and highly resilient in cultivation.

Collections of annuals, rare perennials, and ornamental grasses represent the immense species diversity of the natural flora of various regions around the globe. They serve as a foundation for studying the adaptive characteristics of plants, a significant source for enriching Ukraine's cultivated flora in the face of climate change, and a means of discovering new plants with medicinal properties.

The global market for ornamental plants is extremely volatile and competitive. Diversifying cultivars and increasing their resistance to various pathogens are of great commercial interest and are addressed through genetic modification of ornamental plants (Boutigny et al., 2020). Other factors contributing to the expansion of the floriculture industry include the introduction of new plant propagation strategies, the regulation of plant growth and development, the adaptation of production technologies in line with the principles of sustainable development, and the optimization of supply chain management (Gabellini & Scaramuzzi, 2022; Salachna, 2022).

Scientific research is increasingly focusing on the ecological consequences of introducing ornamental plants. The ornamental plants are an important component of urban spaces and, at the same time, a significant source of invasive species. Most naturalized ornamental plants originate from populations that are already adapted to local conditions. Introduction and invasion issues are particularly acute in the era of climate change (Bayón & Vilà, 2019; Petřík et al., 2019). Assessing potential candidates for plant collections for their invasive potential is a priority in introduction efforts, especially for collections of annuals, rare perennials, and ornamental grasses.

Studying the characteristics of individual growth and development, which depend on both internal and environmental factors, across various cultivation conditions enables the development of optimal agronomic practices for growing the crop, thereby helping the plants fully express their ornamental qualities. In recent years, the Department of Floriculture and Ornamental Plants has conducted a series of biomorphological studies on various crops, focusing on ontomorphogenesis, seasonal rhythms and development, and

the morphology of fruits and seeds. It was shown that, based on their phenorhythm and seasonal growth patterns, the 12 species of the genus *Verbena* L. introduced into the NBG belong to the group of spring-summer-fall evergreens. In terms of flowering time, they belong to the group of summer-fall bloomers. In terms of plant height, they are classified as low-, medium-, and tall-growing. In terms of habit, they are columnar, spreading, or transitional between the two. Considering the biological characteristics, the ability to change in life form, and high quality in terms of the combination of traits that determine their ornamental value (combined with the plants' resistance to drought, diseases, and pests), these plants were ascertained as valuable candidates for introduction and for enriching the assortment of ornamental crops in Ukraine (Mashkovska & Pereboichuk, 2019).

Based on a study of the ontogenesis of six introduced species of the genus *Salvia* L. (three monocarpic and three polycarpic), it was found that when seeds of these species are sown in June, seedlings emerge in July. By the end of the growing season, only annual species manage to flower and set seeds. Plants of perennial species still have time to enter the generative stage of ontogenesis. Given that the soil and climatic conditions of the Forest-Steppe zone of Ukraine are quite favorable for planting seedlings that were initially grown in a greenhouse during the second ten-day period of May. Hence, it was recommended to shift the sowing dates for the studied species to the second or third ten-day period of March in a greenhouse. This can facilitate the complete ontogenesis of the plants, extend the duration of the ornamental effect of flowering, and ensure full seed set and maturation. The study of inflorescence morphology in some introduced *Salvia* species showed that inflorescence characteristics have diagnostic significance at the species level and can be used as additional criteria for plant identification (Perboichuk & Mashkovska, 2021).

The characteristics studied in the seeds of species in *Salvia* and *Verbena* expand our understanding of the morphology of these plants in general. The results of this study can be used in systematics and phylogeny, as well as in developing keys for species identification. Besides this, it was shown that seed morphometric characteristics are important criteria that must be taken into account when developing cultivation technologies for the studied plant species (Mashkovska et al., 2021).

It was found that *Arundo donax* var. *versicolor* (Mill.) Aiton plants do not complete a full seasonal development cycle in the NBG. Their growing season lasts 182–189 days. They belong to the late-growing-season group. The onset of the corresponding phenological phases requires a certain cumulative effective temperature. The timing of the onset and progression of the phases of spring shoot regrowth and the beginning of leaf unfolding in *A. donax* var. *versicolor*, as well as their dependence on the sum of effective temperatures upon introduction to the NBG, were established. A relationship was found between the rate of accumulation of effective temperatures and the rate of shoot regrowth in these plants. The optimal period for the growth of aboveground plant biomass was determined to be July–August. Since *A. donax* var. *versicolor* plants did not enter the panicle formation and flowering phases, they can be used exclusively as ornamental foliage plants in landscape gardening and greening projects in our region. The main growth of the aboveground shoots was observed in July–August. Therefore, in landscaping, *A. donax* var. *versicolor* plants should be used for late-summer and fall compositions. Under Kyiv conditions, these plants can overwinter in open ground with or without light mulch (Shcherbakova, 2021).

It was found that under natural conditions, the plants of *Koeleria glauca* (Spreng.) DC. and *K. pyramidata* (Lam.) P.Beauv. form short-rhizome vegetative and vegetative-generative shoots, which create dense, compact turf. Spring shoot regrowth begins in the third decade of March. The onset of heading in *K. glauca* was recorded in the third decade of May, and in *K. pyramidata* – at the end of the second decade of May. These plants are late-spring bloomers – they enter the flowering phase at the end of the third decade of May. Their flowering is regular and abundant, lasting 12–18 days. It has been found that the main ornamental characteristics of *Koeleria* Pers. species are: the length and width of the panicles and their ratio, the number of spikelets, their size, the length and width of the

leaves, their color, and flowering productivity. *Koeleria pyramidata* plants form panicles with 60–90 spikelets and narrow, 0.8–1.5 mm leaves that are greenish-gray. In *K. glauca*, the panicle has 100–120 spikelets, and the leaves are shorter and bluish-gray. Based on a synthesis of the literature and our own research on their bioecological characteristics, these species are recommended for use in ornamental horticulture and various elements of landscape design in the Forest-Steppe zone of Ukraine (Shcherbakova, 2020).

A study of the seasonal growth rhythm of *Cenchrus alopecuroides* (L.) Thunb. demonstrared that spring shoot regrowth begins in the third decade of April through the first decade of May. The onset of heading was recorded in the second to third decade of July, and flowering in the first to second decade of August. The plants are late-summer bloomers. Flowering productivity depends on the level of solar radiation and increases nearly twofold under fully sunlit conditions. Fruiting occurs in the second decade of September. *Cenchrus alopecuroides* retains all its ornamental characteristics under the NBG's conditions (Shcherbakova, 2017).

Under the NBG's conditions, *Tripidium ravennae* (L.) H.Scholz plants form short-rhizome vegetative and vegetative-generative intravaginal shoots, which create dense, compact clumps up to 100 cm in diameter in 15-year-old plants. The plants are thermophilic: in spring, they begin their growing season only in the second ten-day period of May. In July–August, the summer heat promotes active leaf growth and the formation of panicle inflorescences, which the plant produces in September. A fully sunlit growing site is essential for plants to flower under introduced conditions (Shcherbakova & Rakhmetov, 2018).

Leymus arenarius (L.) Hochst. and *L. racemosus* (Lam.) Tzvelev are characterized by a mid-season (second ten-day period of April) regrowth period. Both species introduced into the NBG reacted as early-summer bloomers (Shcherbakova & Rakhmetov, 2018).

It was established that *Stipa capillata* L. is characterized by an early (first ten days of April) regrowth period, while *S. pulcherrima* K.Koch and *S. ucrainica* P.A.Smirn. have a mid-seasonal (second ten days of April) regrowth period. *Stipa pulcherrima* and *S. ucrainica* begin to flower in early summer. They enter the fruiting phase between days 56 and 85 (Shcherbakova & Rakhmetov, 2018).

Investigations of the seed productivity of the introduced plants *Heuchera chlorantha* Piper, *H. grossulariifolia* Rydb., *H. sanguinea* Engelm, and *H. villosa* Michx. in protected-soil conditions revealed that these plants can be propagated by seed. These findings ensure the success of their introduction and their potential for use in breeding programs (Andrukh, 2019).

Ontomorphogenetic studies of a distant hybrid of lily cultivar 'Fusion' (belonging to the LP cultivar group) showed that, as early as the first year of vegetation, several specific traits appear in the morphogenesis of this cultivar that bring it closer to its parental species, *Lilium pardalinum* Kellogg. In particular, a noticeably elongated base, a large number of bulbous roots and scales, their distinctive features, and the lateral and distant formation of renewal buds appeared. At the same time, other characteristics (i.e., accelerated development, the presence of stem roots, the size and shape of the scales and the bulb as a whole, and the number of renewal buds) bring these plants closer to *L. longiflorum* Thunb. (Kykot, 2021).

To improve the selection of plants for landscaping cities and towns in the Forest-Steppe zone, the scientists of the NBG have in recent years been studying the influence of biotic and abiotic factors on the resilience of introduced species in cultivation and the maximum preservation of their ornamental qualities. In particular, the results of laboratory studies on the drought tolerance of 15 species of herbaceous vines showed that they are consistent with the data from visual assessments and indicate that the plant with the highest drought tolerance is *Ipomoea lobata* (Cerv.). Thell., *I. hederacea* Jacq., *I. tricolor* Cav., and *Tropaeolum majus* L. The least drought-tolerant plants were *Cardiospermum halicacabum* L., *Phaseolus coccineus* L., and *Thunbergia alata* Bojer ex Sims. (Mashkovska et al., 2021).

The results of long-term studies on the visual assessment of the resistance of *Callistephus chinensis* (L.) Nees plants to *Fusarium* wilt showed that, among the 164

cultivars, 64 were relatively resistant or only slightly affected by the pathogens causing this disease (infection rate did not exceed 10 % over the five years). Seventy-eight cultivars were classified as moderately affected, with an infection rate not exceeding 30 % in any given year under severe infection conditions. Twenty-two cultivars were classified as highly affected, with infection rates exceeding 30 % in at least one study year. Cultivars of the 'Princess' and 'Laplate' morphotypes were severely affected by the *Fusarium* wilt. It was shown that *Tagetes patula* L. plants performed best against *Fusarium* wilt. An increase in the total microbial pool was observed in the rhizosphere of *Callistephus chinensis* cultivars. Nevertheless, the results obtained are preliminary and require further research, likely involving other methods for utilizing *Tagetes* L. plants, such as composting, mulching, and plowing plant residues into the soil (Ellanska et al., 2018).

Studies on transpiration rates, water deficit, and water-holding capacity in ten *Salvia* species revealed that the highest water-holding capacity is characteristic of the leaves in *S. coccinea* Buc'hoz ex Etl., *S. glutinosa* L., and *S. officinalis* L. Leaves of *S. azurea* Michx. ex Lam., *S. splendens* Sellow ex Nees, and *S. cadmica* Boiss. lose water more rapidly (Mashkovska & Pereboichuk, 2024).

A comprehensive assessment of the environmental resilience of *Iris hybrida* hort. cultivars to subzero temperatures included an analysis of their winter hardiness and frost resistance using instrumental methods (DTA and electrical conductivity measurements) and traditional field methods. These studies confirmed the sufficient resistance of studied cultivars to adverse overwintering factors in the soil and climatic conditions of the Forest-Steppe zone of Ukraine (Skrypka, 2014). However, laboratory studies have shown that the frost resistance of the embryonic generative shoot (the generative part of the renewal bud) in the studied *I. hybrida* cultivars ranged from −9.5 °C to −13.3 °C, posing a risk of freezing during winters with little snow cover. Overall, the frost resistance potential of the vegetative part of the renewal bud was determined by the temperature at which ice formed on the leaves surrounding the embryonic generative shoot (the parenchymatous mass of phloem cells) and ranged from −18 °C to −21 °C (Skrypka, 2014).

It was found that *I. hybrida* plants possess a powerful defense mechanism against dehydration under low temperatures, which explains their high adaptability to overwintering conditions. The high level of adaptation of *I. hybrida* plants to overwintering is ensured by two main mechanisms: the ability to prevent damage from intracellular ice through early ice nucleation in the intercellular space, and the ability to effectively retain residual intracellular and intratissue water, thereby preventing winter desiccation (Skrypka, 2014). Laboratory studies have also confirmed the high drought tolerance of *I. hybrid* plants. The electrical conductivity method modified by O.I. Kitaev, which has recently been widely used to assess the drought tolerance of tree and shrub crops, made it possible to clearly demonstrate differences in drought tolerance among *I. hybrid* cultivars (Skrypka, 2014).

A downward trend in the chlorophyll *a* to chlorophyll *b* ratio was observed in uninfected *Phlox paniculata* L. plants compared to infected ones, which could be used as a marker of cultivar resistance (Levchyk et al., 2023).

The differentiation of Poaceae species by life forms, phenorhythmotype, and biomorphs simplified the versatile use of these plants in landscape compositions with varying ecological and microclimatic conditions. The studies conducted also demonstrated the hardiness of the introduced species in cultivation. Expanding the cultivated ranges will contribute to conserving Ukraine's plant biodiversity, particularly that of rare and endangered species (Shcherbakova et al., 2022).

The first results of flower plant breeding were obtained in the 1960s. Over the next 40 years, scientists from the Department of Floriculture and Ornamental Plants created more than 150 plant cultivars valuable to the flower industry of that time (Shcherbakova et al., 2025). These included seven cultivars of irises, eight cultivars of chrysanthemums (bred by K. Kharchenko), 12 cultivars of milk-flowered peonies (bred by K. Kharchenko and I. Tiran), 14 cultivars of paniculate phlox (bred by K. Kharchenko and V. Gorobets), 24 cultivars of dahlias (bred by M. Yashchenko), 27 cultivars

of chrysanthemums (bred by V. Gorobets and L. Zavidova), the Lactiflora group (bred by V. Gorobets), 13 cultivars of annual aster (bred by L. Yaremenko and N. Cherednichenko), 14 cultivars of gladiolus (bred by M. Yashchenko and O. Tymchenko), four cultivars of lominos (bred by M. Orlov, Y. Voychenko, and G. Samayda), and 11 cultivars of lawn grasses (bred by O. Laptev, O. Kotik, F. Perederii, I. Kustashvili, B. Grinchenko, and T. Tomko).

The traditional breeding methods used in the Department of Floriculture and Ornamental Plants have been, and continue to be, the mobilization and preservation of germplasm, the selection of promising genotypes, and the hybridization of parent pairs with predetermined traits. Interspecific hybridization plays a particularly important role in the creation of cultivars with new combinations of qualitative and quantitative traits. Breeding programs for most of the Department's crops are aimed at incorporating cultivars that are as representative as possible of all existing horticultural groups, inflorescence and leaf colors, and plant sizes. These programs also cover the preservation of historic cultivars and the incorporation of cultivars from leading breeders to represent different breeding approaches. Identification of reference cultivars for the objective and reliable assessment of the expression levels of morphological traits, creating cultivars with new and original ornamental traits (e.g., with vibrant inflorescence and leaf colors, compact habit, etc.), developing cultivars with improved agronomic and biological characteristics (e.g., improved vegetative propagation efficiency, resistance to abiotic and biotic environmental factors) is also in focus of the Department's research.

The remote hybridization methods were applied by V. Gorobets in a breeding program to develop peony cultivars with early and very early flowering times. Herbaceous *Paeonia peregrina* Mill., *P. wittmanniana* Hartwiss ex Lindl., and *P. arietina* G.Anderson served as a source of early flowering breeding material. The sources of high floral ornamental value and productivity were the cultivars of *P. lactiflora* Pallas and *P. officinalis* L. Analysis of the resulting double and triple interspecific hybrids allowed identification of the combinations producing fertile offspring. Among the 40 cultivars obtained, six cultivars (i.e., 'Spring Parade', 'Stozhary', 'Cupid's Arrows', 'Coral Cup', 'Blondin', 'Bayraktar', and 'Dudaryk') begin blooming as early as the second ten-day period of May. A true innovation was the application of *P. officinalis* 'Rubra Plena' in the crossing program of V. Gorobets. With the involvement of this old hybrid, 29 cultivars were developed.

The rich and diverse gene pool established by the Department of Floriculture and Ornamental Plants has enabled the launch of breeding programs and innovative research on new crops, as well as the development of methodologies for comparative cultivar testing and state registration. In particular, H. Horai initiated breeding work on the Oriental poppy (*Papaver orientale* L.) aimed at developing cultivars resistant to fluctuations in winter temperatures, spring and summer drought, and pathogens. This resulted in the creation of four cultivars of the Oriental poppy in 2019 and four more cultivars in 2024. The inflorescences of all cultivars exhibit high color stability and resistance to fading (Shcherbakova et al., 2025). The new cultivars of Chinese callistephus developed by H. Horai are characterized by their unique inflorescence colors: pomegranate, pale apricot, and lilac-purple with a silvery sheen.

The *Heuchera* cultivars bred by N. Andrukh exhibit diversity in leaf color, growth rate, flowering duration, and longevity in cultivation. The use of intergeneric hybridization methods between *Heuchera* and *Tiarella cordifolia* L. made it possible to obtain breeding populations of × *Heucherella* H.R.Wehrh. Given that × *Heucherella* cultivars are not listed in the State Register of Plant Cultivars, the development of domestically adapted forms with modified ornamental characteristics and improved agronomic traits is a Department's nearest priority (Shcherbakova et al., 2025).

The breeding work with the genus *Primula* includes selecting starting material with high ecological adaptability, increased tolerance to drought and heat, and long-lasting ornamental value of the inflorescences. In particular, O. Pereboichuk has developed seven primrose cultivars. Breeding work on small-flowered chrysanthemums enabled L. Zavidova and V. Gorobets to breed over 70 commercially attractive and disease-resistant cultivars that vary in growth habit (spherical,

branched, and cascading), flower form (radial, anemone-like, and spider-like), and inflorescence color (two- or three-colored). Recently, eight cultivars of the genus *Astilbe* Buch.-Ham. ex D.Don have been developed, each with unique growth habits, inflorescence density, and coloration. Four cultivars were bred by Y. Buidin, and four others by Y. Buidin in cooperation with N. Andrukh. Among the 15 registered daylily cultivars, seven hybrids have a valuable double flower form (bred by T. Shcherbakova and T. Shcherbakova, O. Pereboichuk). Targeted crossbreeding of lilies in the Asian hybrids group resulted in L. Kikot's creation of three disease-resistant cultivars.

In recent years, researchers from the Department of Floriculture and Ornamental Plants have participated in developing several methods for evaluating plant cultivars for distinctness, uniformity, and stability. Specifically, *Astilbe* (Buidin, 2008), *Paeonia* L. (Gorobets, 2008), *Phlox paniculata* (Gorobets, 2011), *Heuchera* (Gorobets & Andrukh, 2011, 2016), × *Heucherella* (Andrukh, 2016), *Papaver orientale* (Horai, 2017), and *Primula* L. (Pereboichuk & Kostenko, 2022) served as the basis for the state registration of new cultivars of ornamental garden plants.

Over the past ten years, a comprehensive introduction assessment that accounted for biological and ecological characteristics has established the level of introduction resilience of the NBG's collections. The promising introduced species have been screened and mobilized for further incorporation into the breeding process and introduction into Ukraine's ornamental horticulture. As a result, the breeding stock has been substantially updated. and competitive, ecologically stable domestic cultivars adapted to local edaphic and climatic conditions have been developed. As a result, a total of 165 cultivars of peonies from the Herbaceous Hybrid Group (including both internationally and domestically bred cultivars), 7 species and 3 cultivars of oxalis, 37 cultivars of lilies, 16 highly promising species of sage, 12 *Verbena* species, and 15 plant species listed in the Red Book of Ukraine were recommended for ornamental horticulture in Ukraine. A comprehensive introduction analysis was also conducted on two species and 200 cultivars of daylilies, 45 species and 18 cultivars of the Poaceae family, and 379 species of perennials that overwinter in open ground (Research Report, 2023).

The practical outcome of the Department's research efforts – cultivars (i.e., cultivars developed at the NBG, as well as the best performing cultivars) are continuously introduced into ornamental horticulture, educational institutions, botanical gardens, arboretums, as well as farms and private individuals, through the provision of initial planting material obtained by the primary propagation of species and cultivars intended for introduction.

Another result of the Department's scientific work is that every year it participates in the creation, scientific support, and maintenance of the "Seasons" exhibition and collection area at the NBG. The perennial displays (peonies, bearded irises, perennial poppies), as well as regularly updated displays of annual plants and plants that do not overwinter in open ground (annuals, Chinese callistephus, small-flowered chrysanthemums, dahlias and cannas, and oxalis) are created by the Department's staff.

Over the past 20 years, the Department's staff and graduate students have defended a number of PhD dissertations dedicated to the study of the genus *Lilium* L. (Kykot, 2009) and the family Papaveraceae Juss. (Horai, 2011), the genus *Anemone* L. (Pereboichuk, 2012), *Iris hybrida* (Skrypka, 2014), the genus *Heuchera* (Andrukh, 2016), and ornamental herbaceous vines (Pavlenko, 2016).

The primary challenge facing our country is to overcome the devastating consequences of military operations as quickly as possible, both in environmental terms and in improving the psychological and emotional well-being of Ukrainians, both military personnel and civilians. Therefore, botanical institutions focused on environmental education (including the NBG) play a leading role in overcoming the consequences of the war and restoring civil life in our country. To implement these projects, the Department of Floriculture and Ornamental Plants of the NBG draws not only on its many years of scientific achievements but also on a team of professional researchers capable of successfully carrying out all assigned tasks. The Department recognizes the special role of ornamental plants in these processes.

Hence, in future research, we aim to create synergy between our long-standing

work in plant introduction and breeding and new research directions addressing modern challenges. Therefore, the main objectives for the coming years in the Department's scientific work are to screen the global gene pool of ornamental plants, mobilize, preserve, and enrich the collection, study the biological and ecological foundations of cultivation and the resistance of introduced species to biotic and abiotic factors associated with military operations, replenishing the hybrid stock and creating domestic highly ornamental cultivars resistant to environmental factors, developing assortments to optimize urban landscapes and create sustainable, ornamental flower arrangements, and expanding the range of their applications while taking into account the plants' phytoremediation and phytoncide activity, resistance to modern environmental factors in overcoming the consequences of military operations in Ukraine and their positive impact on human psycho-emotional and physiological well-being.

Conclusions

Thus, the Department of Floriculture and Ornamental Plants of the NBG is a leading scientific center for floriculture in Ukraine, with the largest collection comprising over 5,000 specimens of ornamental plants. The Department's scientific work is a comprehensive process that combines plant introduction, in-depth biological and ecological research, and breeding to create resilient domestic cultivars. The main objective of the plant diversity mobilization program in the Department is to incorporate wild plant species (including those not previously cultivated in Ukraine), as well as new cultivars for floriculture and original cultivars from global breeding programs. This process proceeds along two main lines: updating the assortment for further use in the region's soil and climate conditions, and creating a donor base with valuable ornamental or agronomic characteristics for further breeding. The practical results of the Department's breeding work over the past decades include the creation of more than 150 cultivars that are competitive not only in Ukraine but also on the global stage.

References

Adamenko, T. (2019). Climate change and agriculture in Ukraine: what farmers should know. In *German-Ukrainian political dialogue* (p. 36). (In Ukrainian)

Andrukh, N.A. (2016). The genus *Heuchera* L. in the Right-Bank Forest-Steppe of Ukraine: biological features and introduction [Dissertation of Candidate of Biological Sciences: specialty 03.00.05]. Kyiv. (In Ukrainian)

Andrukh, N.A. (2019). Biological features of seeds of introduced plants of the genus *Heuchera* L. In *Biological Studies – 2019: collection of scientific papers.* Zhytomyr. (In Ukrainian)

Bayón, Á., & Vilà, M. (2019). Horizon scanning to identify invasion risk of ornamental plants marketed in Spain. *NeoBiota, 52,* 47–86. https://doi.org/10.3897/neobiota.52.38113

Boutigny, A.-L., Dohin, N., Pornin, D., & Rolland, M. (2020). Overview and detectability of the genetic modifications in ornamental plants. *Horticulture Research, 7*(11), 1–12. https://doi.org/10.1038/s41438-019-0232-5

Buidin, Y.V. (2008). Methodology for conducting the examination of astilba cultivars for distinctness, uniformity and stability. *Protecting Rights for Plant Cultivars, 2*(2), 5–16. (In Ukrainian)

Ellanska, N.E., Yunosheva, O.P., Mashkovska, S.P., & Horai, H.O. (2018, December 21–22). Microbiocenosis of the rhizosphere of species of the genus marigold (*Tagetes* L.) and *Fusarium*-resistant cultivars of Chinese aster (*Callistephus chinensis* (L.) Nees). In *Proceedings of the Conference "Prospects for the development of natural sciences in EU countries and Ukraine"* (pp. 42–46). Wloclawek. (In Ukrainian)

Gabellini, S., & Scaramuzzi, S. (2022). Evolving consumption trends, marketing strategies, and governance settings in ornamental horticulture: a grey literature review. *Horticulturae, 8*(3), Article 234. https://doi.org/10.3390/horticulturae8030234

Gorobets, V.F. (2008). Methodology for conducting the examination of peony cultivars for distinctness, uniformity and stability. *Protecting Rights for Plant Cultivars, 2*(2), 98–109. (In Ukrainian)

Gorobets, V.F. (2011). Methodology for conducting the examination of panicle phlox cultivars (*Phlox paniculata* L.) for distinctness, uniformity and stability. *Protecting Rights for Plant Cultivars, 1*(2), 96–107. (In Ukrainian)

Gorobets, V.F., & Andrukh, N.A. (2011). *Methodology for conducting the examination of cultivars of geyhera (*Heuchera *L.) for distinctness, uniformity and stability.* Ukrainian Institute of Plant Cultivars Examination. (In Ukrainian)

Gorobets, V.F., & Andrukh, N.A. (2016). Methodology for conducting the examination of cultivars of geyhera (*Heuchera* L.) and geyherella (×*Heucherella* H.R.Wehrh.) for distinctness, uniformity and stability. In S.O. Tkachyk (Ed.), *Methodology for conducting the examination of cultivars of ornamental plants for distinctness, uniformity and stability. 2nd ed.* (pp. 179–212). Korzun D.Y., Vinnytsia. (In Ukrainian)

Gorobets, V.F., Mashkovska, S.P., Tymchenko, O.D., Buidin, Y.V., & Shcherbakova, T.O. (2005). Department of decorative flower plants: past and present. *Plant Introduction, 27,* 43–51. (In Ukrainian). https://doi.org/10.5281/zenodo.2584290

Horai, H.O. (2011). Decorative species of the poppy family (Papaveraceae Juss.) in the conditions of the Forest-Steppe of Ukraine: introductory assessment, morphobiological features, prospects for practical use [Dissertation of Candidate of Biological Sciences: specialty 03.00.05] Kyiv. (In Ukrainian)

Horai, H.O. (2017). Methodology of conducting the examination of cultivars of oriental poppy (*Papaver orientale* L.) for distinctiveness, uniformity and stability. *Protecting Rights for Plant Cultivars, 3,* 205–225. (In Ukrainian)

Khokhlov, V.M., Borovska, G.O., & Zamfirova, M.S. (2020). Climatic changes and their impact on the air temperature and precipitation regime in Ukraine during the transitional seasons. *Ukrainian Hydrometeorological Journal, 26,* 60–67. (In Ukrainian)

Klymenko, S.V., & Chuvikina, N.V. (2009). *They built a garden: biographical guide.* Sugar of Ukraine, Kyiv.

Kykot, L.M. (2009). Biological features and reproductive ability of introducers of the genus *Lilium* L. in the Forest-Steppe of Ukraine [Dissertation of Candidate of Biological Sciences: specialty 03.00.05]. Kyiv. (In Ukrainian)

Kykot, L.M. (2021, March 12–13). Ontomorphogenesis of distant hybrids of lilies of the LA cultivars group (LA hybrids) (Section VIII). In *Proceedings of the Conference "Ideas and innovations in natural sciences"* (pp. 30–32). Baltija Publishing, Lublin. (In Ukrainian)

Levchyk, N.Y., Skrypka, G.I., & Levon, V.F. (2023). Change in the content of photosynthetic pigments in the leaves of *Phlox paniculata* L. plants under the influence of the powdery mildew pathogen in the conditions of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. *Scientific Bulletin of the National Forestry University of Ukraine, 33*(1), 27–33. (In Ukrainian)

Mashkovska, S.P., & Pereboichuk, O.P. (2019). Collection fund of flower-decorative plants of the family Lamiaceae Martinov of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. *Plant Cultivars Studying and Protection, 15*(3), 249–258. (In Ukrainian)

Mashkovska, S.P., & Pereboichuk, O.P. (2024, April 18–19). Assessment of drought resistance of ornamental plants of introduced species of the genus salvia (*Salvia* L.) in the conditions of the Forest-Steppe of Ukraine. In *Proceedings of the VII International Scientific and Practical Conference "Ternopil biological readings – Ternopil Bioscience – 2024"* (pp. 73–75). Vector, Ternopil. (In Ukrainian)

Mashkovska, S.P., Pavlenko, L.L., & Dzhurenko, N.I. (2021, April 2). Prospects for the use of *Cardiospermum halicacabum* L. as a medicinal plant in Ukraine. In *Proceedings of the III International Scientific-Practical Internet Conference "Modern achievements of pharmaceutical science in the creation and standardization of medicines and dietary supplements containing components of natural origin"* (pp. 137–138). Kharkiv. (In Ukrainian)

Mashkovska, S.P., Pereboichuk, O.P., Shaveko, N.S., & Horai, H.O. (2021, February 25). Morphological features of seeds of introduced species of flower and ornamental plants of the genus salvia (*Salvia* L.). In *Proceedings of All-Ukrainian Scientific and Practical Conference "The role of scientific and technical support for the development of the agro-industrial complex in modern market conditions"* (pp. 213–215). State Institute of Grain Crops, Dnipro. (In Ukrainian)

Pavlenko, L.L. (2016). Decorative herbaceous vines in the Forest-Steppe of Ukraine: ontogenesis, reproductive ability, and use [Dissertation of Candidate of Biological Sciences: specialty 03.00.05]. M.M. Gryshko National Botanical Garden of the NAS of Ukraine, Kyiv. (In Ukrainian)

Pereboichuk, O.P. (2012). Morphobiological features and introduction of ornamental species of the genus anemone (*Anemone* L.) in the conditions of Polissya and the Forest-Steppe of Ukraine [Dissertation of Candidate of Biological Sciences: specialty 03.00.05]. Kyiv. (In Ukrainian)

Pereboichuk, O.P., & Kostenko, N.P. (2022). Primrose. In A.V. Andruschenko & K.M. Kryvytskiy (Eds.), *Methodology of conducting the examination of cultivars of ornamental plant groups for distinctiveness, uniformity and stability. Ukrainian Institute of Plant Cultivars Examination* (pp. 712–750). (In Ukrainian). https://sops.gov.ua/uploads/page/Meth_DUS/Method_decors_2022.pdf

Pereboichuk, O.P., & Mashkovska, S.P. (2021). Prospects for the introduction of ornamental plants of the genus sage (*Salvia* L.) to the Forest-Steppe of Ukraine. *Plant Cultivars Studying and Protection, 17*(2), 91–97. (In Ukrainian)

Petřík, P., Sádlo, J., Hejda, M., Štajerová, K., Pyšek, P., & Pergl, J. (2019). Composition patterns of ornamental flora in the Czech Republic. *NeoBiota, 52,* 87–109. https://doi.org/10.3897/neobiota.52.39260

Rakhmetov, D.B., Zaimenko, N.V., & Gaponenko, M.B. (Eds.). (2019). *Scientific objects of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine, which constitute a national heritage.* Palyvoda, Kyiv. (In Ukrainian)

Research Report. (2023). *Report on the research work "Assessment of the adaptive stability of flower and ornamental plants as a basis for the enrichment of cultural phytocenoses of Ukraine".* M.M. Gryshko National Botanical Garden of the NAS of Ukraine, Kyiv. (In Ukrainian)

Salachna, P. (2022). Trends in ornamental plant production. *Horticulturae, 8*(5), 413. https://doi.org/10.3390/horticulturae8050413

Shcherbakova, T.O. (2017). Seasonal rhythm development of perennial ornamental grasses during introduction in Forest-Steppe and Polissya of Ukraine. *Plant Introduction, 75,* 42–49. (In Ukrainian). https://doi.org/10.5281/zenodo.2323821

Shcherbakova, T.O. (2020). Species of the genus Koeleria Pers. in the collection of ornamental grasses of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. In *Proceedings of the International Scientific Conference "Fundamental and applied aspects of plant introduction in conditions of global environmental change"* (pp. 305–307). M.M. Gryshko National Botanical Garden of the NAS of Ukraine, Kyiv. (In Ukrainian)

Shcherbakova, T.O. (2021). Features of seasonal development of *Arundo donax* var. *versicolor* Mill. (Stokes) in the conditions of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. *Plant Cultivars Studying and Protection, 17*(3), 175–182. (In Ukrainian)

Shcherbakova, T.O., & Rakhmetov, D.B. (2018). Biological features of cultivars of ornamental plants of the family of *Heuchera* introduced in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. *Plant Cultivars Studying and Protection, 14*(2), 153–159. (In Ukrainian)

Shcherbakova, T.O., Buidin, Y.V., Andrukh, N.A., Horai, H.O., Gorobets, V.F., Zavidova, L.G., Kykot, L.M., Pereboichuk, O.P., & Tymchenko, O.D. (2025, November 3). Breeding of flower and ornamental plants in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine. In *Proceedings of the VII International Scientific and Practical Conference "World plant resources: status and development prospects"* (pp. 19–21). Ukrainian Institute of Plant Cultivars Examination, Kyiv. (In Ukrainian)

Shcherbakova, T.O., Gorobets, V.F., Buidin, Y.V., & Pereboichuk, O.P. (2022). Innovative approach to the formation of the gene pool of flower and ornamental plants based on the mobilization of new for the agroclimatic conditions of Ukraine promising ecologically plastic species and cultivars. In D.B. Rakhmetov & N.V. Zaimenko (Eds.), *Stability of introduced and rare plants under climatic changes in Ukraine* (pp. 205–228). Lira-K., Kyiv. (In Ukrainian)

Skrypka, G.I. (2014). Morphological features of hybrid iris cultivars (*Iris hybrida* hort.) during introduction to the Forest-Steppe of Ukraine [Dissertation of Candidate of Biological Sciences: specialty 03.00.05]. Kyiv. (In Ukrainian)

Відділ квітниково-декоративних рослин НБС імені М.М. Гришка НАН України як провідний науковий центр в галузі квітникарства в Україні

Юрій Буйдін *, Тетяна Щербакова, Світлана Машковська, Василь Горобець, Ганна Горай, Оксана Перебойчук, Ольга Тимченко, Лариса Кикоть, Наталія Андрух, Людмила Завідова

Національний ботанічний сад імені М.М. Гришка НАН України, вул. Садово-Ботанічна, 1, Київ, 01103, Україна; * buidin@nbg.kyiv.ua

У статті висвітлено багаторічну діяльність, з акцентом на останні десятиріччя, відділу квітниково-декоративних рослин Національного ботанічного саду імені М.М. Гришка НАН України (НБС), який є головним науковим осередком квітникарства в Україні. Зокрема, детально описано історію формування найбільшої в країні колекції, що налічує понад п'ять тисяч зразків.

Наукова діяльність відділу квітниково-декоративних рослин НБС поєднує інтродукцію, глибокі біолого-екологічні дослідження та власне селекцію для створення стійких вітчизняних сортів. Селекційний напрям є одним з пріоритетних у науковій діяльності відділу. Перед залученням

у селекційний процес рослини проходять всебічне вивчення: від морфобіологічних ознак до ритмів росту і розвитку та стійкості до хвороб (наприклад, фузаріозу у айстр чи борошнистої роси у флоксів). В перспективі це дозволяє створювати екологічно стійкі та конкурентоспроможні вітчизняні сорти. Для створення нових сортів науковці застосовують гібридизацію батьківських пар із запрограмованими ознаками, а також міжвидову та віддалену гібридизацію. Наприклад, використання методів віддаленої гібридизації дозволило отримати унікальні сорти півоній із надранніми термінами цвітіння.

Практичні результати селекційної роботи включають створення за останні два десятиліття понад 150 сортів, як традиційних для відділу культур – півонії, хризантеми дрібноквіткової, гладіолусів, айстри однорічної, так і активне створення нових у селекційному плані для установи (та переважно для України) сортів квітниково-декоративних рослин – лілійника, лілій, астильби, маку східного, гейхери та примули. Ще одним вагомим практичним надбанням є розробка науковцями відділу методик проведення експертизи сортів на відмінність, однорідність і стабільність (ВОС-тест). Такі методики вже створені для астильби, півонії, флокса, гейхери, маку східного та інших культур, що є необхідною умовою для державної реєстрації нових вітчизняних сортів. Всі вони базуються на результатах багаторічного інтродукційного сортовивчення.

Ключові слова: декоративні рослини, генофонд, сорти, види, інтродукція, селекція