

Collection of plants of the genus *Nigella* L. at the M. M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine

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Purpose. To justify the stages of formation, maintenance and use of a collection of various species of *Nigella* plants for a test of distinctness. **Methods.** Field (phenological observations, study of biological yield, productive properties of seeds); laboratory (determination of sowing properties of seeds); descriptive (identification of plant diversity by biological and morphological characteristics); determination of quantitative parameters of morphological and economically valuable characteristics; statistical (to assess the reliability of the research results obtained). **Results.** Following introduction and breeding studies, the Department of Cultural Flora at the M. M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine has established a valuable collection of 70 taxa of the *Nigella* genus, including representatives of six species: *N. damascena* L. (32 taxa); *N. sativa* L. (17 taxa); *N. orientalis* L. (4 taxa); *N. nigellastrum* L. (1 taxon); *N. hispanica* L. (3 taxa); and *N. arvensis* L. (4 taxa). Studying the gene pool of the *Nigella* genus allowed us to identify a set of morphological characteristics that can be used as diagnostic and grouping criteria when testing for distinctness, uniformity, and stability. The morphological and biological characteristics of *Nigella* plants have been determined, and the most valuable genotypes with significant economic and breeding attributes have been identified. Enriching the collection with new varieties, lines and wild forms provides more comprehensive coverage of phenotypic and genotypic diversity. This creates a scientific basis for improving the system of morphological criteria and increasing the effectiveness of breeding and genetic research within the *Nigella* genus. **Conclusions.** Samples of varieties have been identified and recommended that clearly represent the decorative morphological characteristics of flowers and fruits, such as the colour and number of sepals and the shape of the fruit. These varieties have important prospects for use in breeding practice with the aim of creating new decorative varieties.

Keywords: plants of the genus *Nigella* L.; varietal, species and morphological diversity; collections; samples; phenological phases; biometry; morphological descriptions; characteristic.

Introduction

Conserving plant resources is one of the key tasks of modern biological science. This is because the plant world forms the basis of the biosphere, determines the stability of ecosystems, and ensures the vitality of humanity. However, under the influence of anthropogenic factors and climate change, biodiversity is declining rapidly, including rare, endemic and economically valuable plant species. It is crucial to pay special attention to conserving both natural populations and cultivated plants, as they con-

stitute the phylogenetic fund for breeding, biotechnology and sustainable development in all areas of economic activity [1].

Modern strategies for protecting the plant world integrate *in situ* and *ex situ* approaches, applying biotechnological methods and creating genetic resource banks. They also involve implementing programmes for the introduction and repatriation of species. In this context, research aimed at evaluating the status, reproduction and sustainable use of plant resources to ensure ecological safety, food security and the preservation of plant diversity is particularly relevant [2].

For around 80 years, the Department of Cultural Flora at the M. M. Gryshko National Bo-

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tanical Garden of the NAS of Ukraine has been working to introduce, acclimatise and breed new, lesser-known and non-traditional crops for agricultural production. A valuable collection of over 2,500 taxa of promising introductions has been assembled, and over 150 varieties have been created for introduction into cultivation to meet the needs of the population [3, 4]. Over the past 20 years, research has developed significantly, becoming more diverse in line with global scientific trends and the challenges facing humanity. This has led to a significant increase in the quality and quantity of the living plant collection and the creation of specialised collections [4, 5]. The collection focuses on species, genera and families of plants, categorised by their properties (e.g. food, medicine, energy, oil, sugar and aromatics). Currently, there are 236 gene banks in Europe. A significant amount of research on these collections is carried out within the European Cooperative Programme on Plant Genetic Resources [8]. In Ukraine, scientific principles for conserving and enriching the diversity of useful plants have been developed [1, 2]. Several domestic scientific centres, including botanical gardens, are involved in preserving and maintaining collections of cultivated plant seeds. The M. M. Gryshko National Botanical Garden of the NAS of Ukraine is one of the leading institutions in this regard, with a significant collection of living plants and seed stock. Along with conservation, an important task of botanical plant collections is to search for and mobilise new, little-known and rare plants in order to expand the range of valuable plant resources and meet important societal needs [9].

The development of the concept of biotic intensification is a pressing task. This concept involves improving crop rotation structures by taking into account allelopathic interactions and plant compatibility, as well as introducing new and uncommon phytoenergetic, aromatic, medicinal, fodder and technical cultivated species [10]. Representatives of the *Nigella* genus are well-known aromatic plants native to the Mediterranean and Central Asia. They possess a wide range of biologically active compounds and are important to the agricultural, food, pharmaceutical, perfume and cosmetics, and ornamental horticulture industries. They are widespread in the natural flora of Europe, Asia, the Caucasus and India. They are widely distributed and cultivated in France, Belgium and the Netherlands. In Ukraine, some species can be found in a feral state in the Forest-Steppe, Steppe and Crimea [11].

Both domestic and foreign scientists have determined that the tribe *Nigelleae* belongs to

the *Ranunculaceae* family and is a small group within it. According to POWO data (2025), the *Nigella* genus comprises 25 plant species. Five species are widespread in Ukraine: *N. segetalis* Bieb.; *N. arvensis* L.; *N. damascena* L.; *N. sativa* L.; and *N. nigellastrum* (L.) Willk. (syn. *Garidella nigellastrum* L.). *Nigella* occupies an important place among promising niche plants. Six species are being studied in Ukraine. Some *Nigella* species are valuable sources of medicinal, essential oils and spices with a wide range of therapeutic properties. The seeds of *N. sativa* and, more recently, *N. damascena* are widely used in the food, pharmaceutical and decorative industries. The plants have economic and practical cultivation prospects [1].

One of the richest collections of *Nigella* in Ukraine is currently housed in the Department of Cultural Flora at the M. M. Gryshko National Botanical Garden of the NAS of Ukraine. The collection comprises 70 specimens representing six species of *Nigella* genus [2].

It should be noted that the geographical and climatic region in which the seeds are cultivated plays an important role in shaping their chemical composition, leading to changes in pharmacological activity [10, 13, 14]. Species of the *Nigella* genus are good nectar producers. Turkey (Burdur) and Egypt have the highest levels of honey production from these plants [13]. Black cumin honey is a well-known source of antioxidants, containing polyphenols, flavonoids and vitamin C. Thanks to these components, black cumin honey has antibacterial, antiviral, antioxidant and antifungal properties, and can be used to enhance the quality of food products and medicines [11].

The flowers of various species in the *Nigella* genus are distinguished by their wide range of colours and shades. This morphological feature is key to creating ornamental species for gardening and landscaping purposes [12, 15].

Today, several varieties are widespread in Ukraine, including 'Demetra', 'Berehynia', 'Zaporizka Zoria' and 'Diana', among others [16]. For a variety to be disseminated, it must comply with the criteria of distinctness, uniformity and stability [17]. The collection of *Nigella* plants at the NBG allows us to identify varieties with reference characteristics for testing uniformity and stability based on morphological features. Morphological identification of different *Nigella* species requires scientific justification, study and analysis, and is highly relevant.

The aim of the research is to substantiate the stages involved in forming, maintaining and using a collection of different species of *Nigella* plant for testing purposes.

Materials and research methods

The research material consisted of various species, varieties and forms of *Nigella* plants of different ecological and geographical origins, collected between 1999 and 2025 from the M. M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine Department of Cultural Flora collection fund. The study focused on the biological and morphological characteristics of the development of various *Nigella* species during the vegetation period, covering all stages of organogenesis. The study focused on the vegetative and generative organs of the species of *Nigella* examined. Comparative studies of around 70 introduced and cultivated specimens of this genus were conducted in the field and in laboratories at the National Botanical Garden. The location and layout of the experimental plots met the requirements of the research.

Seeds were sown annually in the second or third week of April using the row method, with a row spacing of 45 cm, a seeding rate of 1.0–1.5 g/m², and a planting depth of 2–3 cm. Seeds usually germinate at temperatures between 4 and 10 °C, with seedlings appearing 10–12 days (up to 23 days) after sowing. When the plants had 1–2 true leaves, they were thinned for the first time by 4–5 cm in a row. The second thinning was carried out when the plants have 5–6 leaves, leaving 10–12 cm between them. The seeds were harvested when the leaves and stems turned yellow and the pods turn brown. The plants are then mown, dried and threshed. During phenological observations, the following were noted: emergence and full emergence; the beginning and full flowering; the beginning of ripening; and full seed ripeness. The following were also taken into account: the height of the plants, their density and evenness, the uniformity of flowering and seed ripening, the degree of damage to the plants caused by harmful organisms, and their resistance to lodging and seed shedding [18, 19].

The following observations and assessments were made during the study of the collection samples:

Phenological: emergence of seedlings, full emergence, onset (10%), full flowering, onset of seed ripening and full seed ripening.

Morphological: anthocyanin colouration of seedlings, leaf position, number of rosette leaves, plant height, stem position and colour, branching, leaf colour intensity, flower size and type, petal colour and fruit size. Leaves were examined before stem formation; stems, flowers and fruits were examined during flowering and fruit formation (on the main shoot and first-order shoots, respectively). Plant height and habit were determined during full flowering [20, 21].

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The main phenological phases of plants of the *Nigella* genus according to the BBCH scale:

(Biologische Bundesanstalt, Bundessortenamt i Chemical Industrial Federal Agency for the Environment and Chemical Industry)

• 0 (Germination):

- o 00: Dry seeds.
- o 03: Seeds begin to swell.
- o 05: First root appears.
- o 07: Hypocotyl appears.
- o 09: Seedlings appear (cotyledons appear above the soil surface).

• 1 (Leaf development):

- o 11: First pair of true leaves.
- o 13: Three pairs of true leaves.
- o 19: Number of leaves increases.

• 2 (Stem formation):

- o 21: Start of stem elongation (appearance of the first node).

- o 29: Flowering stem formed.

• 3 (Shoot formation / branching):

- o 31: Start of branching.
- o 39: Branching.

• 5 (Appearance of inflorescences):

- o 51: Appearance of buds.
- o 59: Budding.

• 6 (Flowering):

- o 61: Beginning of flowering (appearance of the first flowers).

- o 65: Full flowering.

- o 69: End of flowering.

• 7 (Fruit development / Fruiting):

- o 71: Start of fruit formation.
- o 79: Fruit reaches final size.

• 8 (Fruit and seed ripening):

- o 81: Beginning of ripening.
- o 89: Full ripening.

• 9 (Ageing, beginning of dormancy):

- o 91: Leaves begin to turn yellow.
- o 99: End of the growing cycle (plant dies).

According to the BBCH scale, the phenological phases of plant development in the *Nigella* genus describe the main stages of their ontogeny, from seed germination to fruit and seed ripening. The BBCH scale uses a two-digit code to define each phase (micro- and macrostages), where the first digit indicates the main stage and the second digit indicates a more specific stage within it [20, 21].

The BBCH scale enables the precise determination of the stage of plant development, which is crucial for the implementation of agronomic practices such as fertilisation and protection

against pathogens and pests. Varieties, forms and lines of *Nigella* were identified using morphological descriptions in phenological phases (see Table 1).

Table 1

Codes for plant growth and development phases in which phenological observations and biometric measurements are recommended

Codes	Growth and development phase
09	Sprouting
61	Start of flowering
65	Full flowering
79	Fruit reaches final size
89	Full ripeness

Favourable soil, climate and agrotechnical conditions allowed the plants of the *Nigella* genus to grow and develop well during the growing season, enabling a full assessment of their potential based on morphological characteristics, plant productivity indicators, seed quality and the varieties adaptive characteristics. A good moisture supply enabled the plants to develop their characteristic growth habit and realise their potential in terms of plant height. During the research period, July was dry and hot. August and September were favourable for seed formation, but the ripening period was prolonged.

Research methods: Field (phenological observations, study of biological yield, productive properties of seeds); laboratory (determination of seed sowing properties); descriptive (identification of plant diversity based on biological and morphological characteristics); determination of quantitative parameters of morphological and economically valuable characteristics; statistical (to assess the reliability of the research results obtained).

Research results

The collection of plants of the *Nigella* genus of the M. M. Gryshko National Botanical Garden of the NAS of Ukraine includes representatives of six species: *Nigella damascena* L. (Nd); *N. sativa* L. – (Ns); *N. orientalis* L. – (No); *N. nigellastrum* L. – (Nn); *N. hispanica* L. – (Nh); *N. arvensis* L. – (Na) (Table 2).

Table 2

Taxonomic composition of the collection fund of plants of the *Nigella* genus

Species	Number of taxa
<i>Nigella damascena</i> L.	32
<i>Nigella sativa</i> L.	17
<i>Nigella orientalis</i> L.	4
<i>Nigella nigellastrum</i> L.	1
<i>Nigella hispanica</i> L.	3
<i>Nigella arvensis</i> L.	13
Total	70

The *Nigella* genus collection fund comprises breeding varieties, local varieties and forms, breeding lines and wild related forms. Collection samples are stored in an electronic database containing information about their origin, Ukrainian and Latin names, place of collection, biological status, originator, variety authors and sample collectors. Each sample is assigned a corresponding number.

To identify material with stable, economically valuable morphological characteristics, seeds from collection samples were selected for initial study. The algorithm for forming a collection of *Nigella* species, varieties and forms with reference characteristics involves compiling a list of samples to be studied, forming a seed fund, studying plant phenotypes, identifying morphological characteristics, and comparing and analysing them. It also involves selecting varieties with reference characteristics and including them in the DUS testing methodology, as well as maintaining the collection fund.

Based on scientific research into the enrichment, preservation, maintenance and study of the *Nigella* plant collection, as well as its proper functioning, it was possible to identify and supplement groups of morphological characteristics for testing for distinctness and uniformity. A number of valuable economic characteristics were also identified in representatives of the *Nigella* genus.

A visual and measurement-based description of 27 morphological characteristics (qualitative, quantitative and pseudo-qualitative) of the vegetative and generative organs of various *Nigella* species was carried out (Table 3).

Table 3

Number of morphological characteristics described during the identification of plants of the *Nigella* genus

	Subject of study	Number of features
	Seedling	2
	Plant	2
	Leaf	5
	Stem	4
	Flower	7
	Fruit	6
	Seed	1

Morphological description is an important element in the work of breeders and seed scientists for identifying varieties, and is traditionally carried out on the basis of characteristics observed during field inspection. Additionally,

most characteristics vary significantly depending on growing conditions.

The plants in the *Nigella* genus collection were divided into groups to facilitate the assessment of variety characteristics. Characteristics that either do not vary or vary very little within a variety were used for grouping.

The following characteristics are recommended for grouping:

- plant: height (characteristic 3);
- sepals: colour (characteristic 14);
- sepals: number of rows (characteristic 15);
- fruit: shape (characteristic 21);
- plant: time of flowering onset (characteristic 25).

It is quite difficult to identify plant varieties of the *Nigella* genus at the initial stage of their growth and development. Therefore, only characteristics that vary slightly, are almost independent of growing conditions and are considered genetically determined were used for this purpose. These characteristics were included in the grouping of varieties for the distinctness test.

The results of the studies determined the upper height limits of *Nigella* plants in the flowering phase and established reference varieties for this trait – Plant: height (QN – quantitative trait, VG – single measurement of unmarked plants, 65 – full flowering phase) (Table 4).

Table 4

Codes of manifestation of signs of *Nigella* plants by height in the full flowering phase

Low (up to 30 cm)	3	'Baby Blue' (Nd), 'Dwarf Moody Blue' (Nd)
Medium (31–59 cm)	5	'Miss Jekyll Rose' (Nd), 'Ivolga' (Nd), 'Charivnytsia' (Nd)
High (over 60 cm)	7	'Cambridge Blue' (Nd), 'Berehynia' (Nd)

The flower is one of the important generative organs of plants of the genus *Nigella*, whose formula is $*K5C5-8A\infty G2-10$. The flowers are actinomorphic (radially symmetrical) or zygomorphic (hemicyclic), solitary or gathered in cymose inflorescences, with a double perianth and a calyx (in Nd) consisting of five long pinnately

dissected into bristle-like segments. The calyx consists of five petal-like sepals narrowed to the base. The corolla consists of 5–8 nectary petals, darker than the sepals and much shorter than them, bilabiate with short claws. The stamens are numerous, longer than the petals, but shorter than the sepals, with long anthers. Depending on the plant species, the flowering period lasts from May to September (late-flowering species – until October). For different genotypes of *Nigella*, a gradation of the period from full germination to the beginning of the flowering phase was established. The time of flowering onset (QN, MG, 65) for *Nigella* plants was determined: early, medium and late (Table 5).

Table 5

Duration of the interphase period between seedling and the beginning of flowering in black cumin plants

Early (up to 45 days)	3	'Baby Blue' (Nd)
Medium (46–50 days)	5	'Ivolga' (Nd), 'Charivnytsia' (Nd)
Late (over 50 days)	7	'Cambridge Blue' (Nd)

Flowering began when 15% of the plants had at least one bud with one row of sepals bent back. Full flowering was recorded when 50% of the plants had at least one open flower with the sepals in a horizontal position and the stylodes bent into a loop. Figure 1 shows areas of *Nigella* in the full flowering phase.

During the flowering period, varieties of species within the *Nigella* genus with high decorative characteristics were identified, particularly with regard to the colour of the sepals and the number of rows of petals. The colour of the sepals of the *Nigella* flower was included in the group of traits for the distinctness test. To determine the correct colour and shade, the international biological colour scale RHS was used: (group number). The colour of the sepals (PQ – pseudo-qualitative trait, VS – visual assessment, 65 – full flowering phase) is shown in Figure 2.

The varieties with the best decorative characteristics were selected to most fully meet production requirements and user needs. The assort-



Fig. 1. Experimental breeding plots of *Nigella* genus representatives during the generative development period



1 – white
'Albina' (Nd)



2 – blue
'Cambridge Blue' (Nd),
'Berehynia' (Nd), 'Ivolga' (Nd)



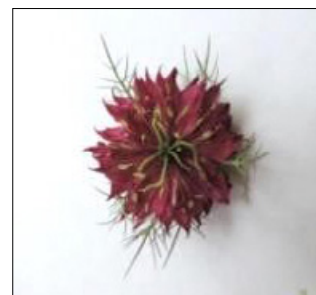
3 – navy blue
'Rizdviana Zirochka' (Nd)



4 – purple



5 – 'Shahrezada' (Nd)



6 – red 'Miss Jekyll Rose' (Nd)



7 – yellow
ЧСр-4 (No)

Fig. 2. Colour of sepals of flowers of different species and varieties of *Nigella* genus

ment was formed to cover all typical colours and shades, and to include early, medium and late ripening varieties, in order to extend the flowering period as much as possible. The number of petals is one of the most important morphological characteristics of decorative plants in floriculture, phytodesign and landscape construction [22]. The number of rows of sepals (QN, MS, 65) is one of the characteristics included in the group for testing for distinctness (Fig. 3).

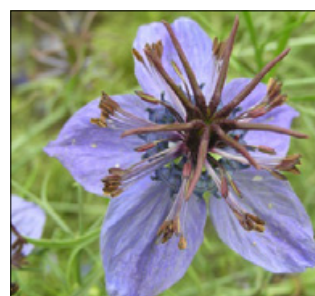
For decorative purposes, flower growers and designers use the fruits of *Nigella damascena*. This is a hemisyncarpous, five-leaved plant with smooth, swollen leaves and long stylodia that open along the midribs and abdominal sutures. The different shapes of *Nigella* fruits are reflected in the 'fruit' attribute: by shape (QL, VS, 79) in Figure 4.

Using a working collection of ecotype diversity of *Nigella* representatives provides

optimal conditions for testing the distinctiveness of *Nigella* varieties. The morphological code formula of the variety (the official description used for state registration), entered by the examination institution into a special database in the examination software for the DUS, allows for comparison of the codes of morphological characteristic manifestation of the candidate variety, enabling the distinctive characteristics to be established during testing.

A variety meets the condition of distinctiveness if, by the identification of characteristics, it is clearly distinguishable from any other variety that is common knowledge before the date on which the application is deemed to have been filed [18]. The examination for distinctiveness is carried out after receiving the results of the morphological description of the first year. If the candidate variety can be distinguished from the common knowledge varieties by comparing their descriptions, then it is distinct. When it is impossible to clearly distinguish the candidate variety from the common knowledge varieties by the morphological code formula, it must be compared in a field experiment the following year.

Thus, the results of the research show that weather conditions during the growing season enabled the plants of the *Nigella* genus to develop optimal growth habits and inflorescence architecture. This allowed the source of the genetically marked morphological traits



3 – small 'Ivolga' (Nd)



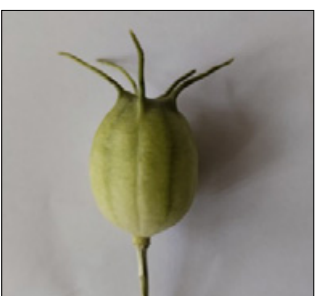
5 – medium 2–4 rows,
'Cambridge Blue' (Nd), 'Miss Jekyll Rose'

7 – large > 4 rows, 'Berehynia' (Nd),
'Charivnytsia' (Nd)

Fig. 3. Number of sepal rows in the *Nigella* flower



1 – spherical 'Diana' (Ns), 'Faraon' (Ns)



2 – oval 'Charivnytsia' (Nd)



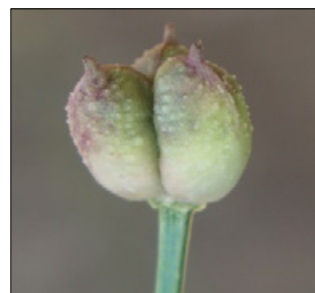
3 – oval-elongated
'Rizdviana Zirochka' (Nd)



4 – ovoid 'Miss Jekyll Rose' (Nd)



5 – obovate ovoid 'Demetra' (Nd)



6 – heart-shaped *N. nigellastrum*



7 – funnel-shaped CHPU-1 (Na), 4Cp-1 (No)

Fig. 4. The shape of the fruits of different *Nigella* varieties

of the different species and varieties of *Nigella* to be isolated, and codes to be formed for the manifestation of these traits in the test for distinctness. Ultimately, modern breeding research aims to deepen our understanding of the inheritance of quantitative and qualitative traits, increase the resistance of plants to environmental stress factors and use the results obtained and new scientific knowledge to create source material for selecting highly productive plant varie-

ties adapted to specific growing conditions. Testing new varieties for distinctness ensures the quality of state registration and integrity in breeding practice.

Conclusions

Following many years of introduction and breeding research, the Department of Cultural Flora at the M. M. Gryshko National Botanical Garden of the NAS of Ukraine has formed a valuable collection of 70 taxa of the *Nigella* genus, including representatives of six species: *N. damascena* (32 taxa); *N. sativa* (17 taxa); *N. orientalis* (4 taxa); *N. nigellastrum* (1 taxon); *N. hispanica* (3 taxa); and *N. arvensis* (4 taxa).

Comprehensive research is being conducted on the basis of the *Nigella* collection fund to study the biological, ontomorphological and biochemical features of the plants, their seasonal growth and development rhythm, the dynamics of aboveground and underground organ formation, yield and productive potential, and their relationship with the growing season conditions. As part of a scientific object that constitutes the National Heritage, this collection fund is enriched and maintained annually to guarantee the preservation of the genetic diversity of plants. Significant research is being conducted into the seed fund of *Nigella* plants in order to preserve important varietal characteristics, serve as a source for their further reproduction and create new valuable breeding specimens with high ecological and productive potential.

Studying the gene pool of the *Nigella* genus enabled us to identify a set of morphological characteristics that can be used for diagnosis and grouping when testing for distinctiveness, uniformity and stability. Expanding the collection fund to include new varieties, lines and wild forms provides more comprehensive coverage of phenotypic diversity. This creates a scientific basis for improving the morphological criteria system and increasing the efficiency of *Nigella* breeding and genetic research. Samples of varieties that clearly exhibit the decorative morphological characteristics of the flower and fruit (colour of sepals, number of sepals and fruit shape) have been identified and recommended for further breeding practices, with the aim of creating new decorative varieties.

References

1. Zaimenko, N. V., & Rakhmetov, D. B. (Eds.). (2022). *Fundamental and applied aspects of plant introduction and conservation in the M. M. Gryshko National Botanical Garden of the NAS of Ukraine*. Lira-K. https://files.nas.gov.ua/PublicMessages/Documents/0/2023/01/NBG_garden_plants_monograph_2022.pdf [In Ukrainian]
2. Rakhmetov, D. B., & Zaimenko, N. V. (Eds.). (2022). *Resistance of introduced and rare plants under conditions of climate change in Ukraine*. Lira-K. https://files.nas.gov.ua/PublicMessages/Documents/0/2023/01/NBG_plants_resistance_monograph_2022.pdf [In Ukrainian]
3. Rakhmetov, D. B., Korablova, O. A., Stadinchuk, N. O., Smilianets, N. M., Hlabets, V. Kh., & Moroz, P. A. (2003). *Catalog of completed scientific developments of the Department of New Crops*. Nora-Druk. [In Ukrainian]
4. Rakhmetov, D. B. (Ed.). (2015). *Catalog of plants of the Department of New Crops*. Fitosotsiotsentr. [In Ukrainian]
5. Rakhmetov, D. B. (Ed.). (2020). *Collection fund of energy, aromatic and other useful plants of M. M. Gryshko National Botanical Garden of the NAS of Ukraine*. Palyvoda A. V. [In Ukrainian]
6. Novak, Zh. M., & Kotsiuba, S. P. (2017). History of creation and current status of genetic banks of plants. *Plant Genetic Resources*, 21, 116–122. <http://genres.com.ua/assets/files/21/12.pdf> [In Ukrainian]
7. Riabchun, V. K., & Bohuslavskiy, R. L. (2007). Plant genetic resources and their role in breeding. In *Theoretical foundations of field crop breeding* (pp. 363–398). Yuriev Plant Production Institute of NAAS. [In Ukrainian]
8. Food and Agriculture Organization. (n.d.). *International treaty on plant genetic resources for food and agriculture*. <https://www.fao.org/plant-treaty/en/>
9. Drozdova, A. A., & Moisiienko, V. V. (2023). Fatty acid composition of *Nigella* (*Nigella* L.) seeds depending on species and varietal characteristics. *Taurian Scientific Herald*, 129, 79–86. <https://doi.org/10.32851/2226-0099.2023.129.11> [In Ukrainian]
10. Korablova, O. A., Rakhmetov, D. B., Shanaida, M. I., Svydenko, L. V., Hazniuk, M. O., & Bahatska, T. S. (2023). Importance of the introduction of spicy-aromatic plants in enriching the cultivated flora of Ukraine. In *Plant Breeding and Genetic Science and Education. Pariiev Readings: Materials of the XII International Scientific and Practical Conference* (pp. 99–104). Uman. <https://genetics.udau.edu.ua/assets/files/01.01.2021-2022-konferen-parievi-chitannya/parievi-chitannya-10.05.2023.pdf> [In Ukrainian]
11. Svitelskyi, M. M., Fediuchka, M. I., & Rybalchenko, S. L. (2009). Introduction *Nigella sativa* L. under Botanical nursery Zhytomyr National Agroecological University. *Bulletin National University of Water and Environmental Engineering*, 1, 10–17. <http://ir.znau.edu.ua/handle/123456789/3637> [In Ukrainian]
12. Royal Botanic Gardens, Kew. (n.d.). *Plants of the World Online*. <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:33199-1>
13. Holovash, L. M., Bondus, R. O., Bahan, A. V., & Shakalii, S. M. (2024). Formation and maintenance of *Nigella* L. collection at Ustymivka Experimental Station of Plant Production. *Plant Genetic Resources*, 35, 65–78. <https://doi.org/10.36814/pgr.2024.35.06> [In Ukrainian]
14. Rakhmetov, D. B., Kovtun-Vodianytska, S. M., & Bondarchuk, O. P. (2024). *Fundamental aspects of adaptation of new crops in Ukraine*. Lira-K. <https://doi.org/10.59647/978-617-14-0283-6/1> [In Ukrainian]
15. Ford, B. A. (2003). *Nigella* Linnaeus. In *Flora of North America*. Missouri Botanical Garden & Harvard University Herbaria. <https://www.worldfloraonline.org/taxon/wfo-4000026121>
16. Honcharskyi, I. L., & Landar, O. I. (2018). Studying the productivity of Devil-in-the-bush species depending on the farming practices of cultivation in the South of Ukraine. *Taurian Scientific Herald*, 100(1), 30–34. [In Ukrainian]
17. Korablova, O., Rakhmetov, D., Shanaida, M., Bondarchuk, O., & Vakulenko, T. (2024). Collection fund of species and cultivars of plants *Nigella* L. genus in M. M. Gryshko National Botanical Garden of NAS of Ukraine. In *Genetics, Physiology and Plant Breeding: Materials Proceedings of International Scientific Conference* (pp. 364–369). [In Ukrainian]
18. Nikolova, N. C., & Danyliv, S. I. (2022). Analysis of fatty oil *Nigella sativa* L. produced in Ukraine and Bulgaria. *Bulletin*

- of Medical and Biological Research, 4(1), 80–83. <https://doi.org/10.11603/bmbr.2706-6290.2022.1.12831> [In Ukrainian]
19. Drozdova, A. A., & Moisiienko, V. V. (2023). Peculiarities of the growth and development of nigella plants (*Nigella* L.) depending on the elements of cultivation technology. *Taurida Scientific Herald*, 132, 59–65. <https://doi.org/10.32782/2226-0099.2023.132.8> [In Ukrainian]
 20. Kryvets, D. O., & Pozniak, O. V. (2016). Methodology for conducting examination of *Nigella sativa* L. varieties for distinctness, uniformity and stability. In S. O. Tkachyk (Ed.), *Methodology for conducting an examination of plant varieties of the medicinal and essential oil group for distinctiveness, uniformity and stability* (pp. 813–822). Nilan-LTD. [In Ukrainian]
 21. Kryvets, D. O., Pozniak, O. V., Kutsenko, N. I., Demianiyuk, O. S., Hlushchenko, L. A., Kutsenko, O. O., Kostenko, N. P., & Likar, S. P. (2024). Methodology for conducting examination of *Nigella* (*Nigella* L.) varieties for distinctness, uniformity and stability. In *Methodology for conducting examination of plant varieties of the medicinal and essential oil group for distinctness, uniformity and stability* (pp. 820–840). Ministry of Agrarian Policy and Food of Ukraine. [In Ukrainian]
 22. Kutsenko, N. (2016). Prospects for the selective investigations of medicinal and essential oil plants in Ukraine. *Agroecological Journal*, 2, 85–92. <https://doi.org/10.33730/2077-4893.2.2016.248700> [In Ukrainian]

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Мета. Обґрунтувати етапи формування, підтримання та використання колекції рослин різних видів чорнушки (*Nigella*) для тесту на відмінність. **Методи.** Польовий (фенологічні спостереження, вивчення біологічної врожайності, продуктивних властивостей насіння); лабораторний (встановлення посівних властивостей насіння); описовий (ідентифікація різноманіття рослин за біолого-морфологічними ознаками); визначення кількісних параметрів морфологічних і господарсько-цінних характеристик; статистичний (для оцінювання достовірності отриманих результатів). **Результати.** За результатами інтродукційних і селекційних досліджень у відділі культурної флори НБС імені М. М. Гришка НАН України сформовано цінну колекцію рослин роду *Nigella* (70 таксонів), яка складається з представників шести видів: *Nigella damascena* L. – 32 таксони; *N. sativa* L. – 17; *N. orientalis* L. – 4; *N. nigellastrum* L. – 1; *N. hispanica* L. – 3; *N. arvensis* L. – 4 таксони. Внаслідок вивчення генофонду цього роду виокремлено комплекс морфологічних ознак, що можуть бути використані як

діагностичні та групувальні за тестування на відмінність, однорідність і стабільність. Встановлено морфолого-біологічні особливості досліджуваних рослин і виділено найбільш цінні генотипи з важливими господарськими та селекційними ознаками. Збагачення колекційного фонду новими сортами, лініями та дикими формами забезпечує повніше охоплення фенотипового та генотипового різноманіття, що створює наукову основу для вдосконалення системи морфологічних критеріїв і підвищення ефективності селекційно-генетичних досліджень роду *Nigella*. **Висновки.** Визначено та рекомендовано сортозразки, які чітко репрезентують декоративні морфологічні ознаки квітки та плодів (забарвлення чашолистків, кількість їхніх рядів і форма плоду) і мають значні перспективи для застосування в селекційній практиці з метою створення нових сортів декоративного напрямку.

Ключові слова: рослини видів роду *Nigella* L.; сортове, видове та формове різноманіття; колекція; зразок; фенологічні фази; біометрія; морфологічний опис; ознака.

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