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EVALUATION OF FLOWER DECORATIVE PLANTS CULTIVARS OF *NEMESIA VENT* IN THE CONDITIONS OF PODILLIA

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Abstract. Due to the lack of information about biomorphological features and cultivation technology of species of the genus *Nemesia Vent* they are still rarely found on the territory of Ukraine and thus are of great interest for cultivation and use for the design of flower beds. The purpose of the scientific work was to analyse the current world assortment of the genus *Nemesia Vent*, as well as to study the features of flowering, reproductive ability, agrotechnics of growing cultivars of *nemesia strumosa*, and assess the prospects of their use in decorative gardening in Ukraine. During the research of *nemesia strumosa* cultivars, laboratory and field research methods were used. It was proved that all the studied cultivars received high ratings of their decorativeness, since the plants under the experimental conditions had well-developed inflorescences, abundant and long-lasting flowering. The plants retained the brightness of their colour throughout the entire period of the flower's life, adapted well to growing conditions, were practically not affected by diseases, and in general were quite resistant to unfavourable conditions. The Orange Prince cultivar proved to be the best of all the cultivars studied in terms of the duration and intensity of flowering, which reached its maximum values on the 60th day from the beginning of the phase with the number of 35 flowers per plant. The studied cultivars can be used in greening health complexes, recreation areas, office territories, adjacent territories, as well as in the design of various types of flower beds. The results of the obtained research are primarily necessary when choosing use cases, developing agricultural technology and breeding programmes, and for carrying out research work aimed at meeting the needs of horticulture. Considering that they are grown both for the needs of the protected ground and open gardening, the study of these issues is a significant contribution for botanical science in general, primarily for decorative gardening in Ukraine, as well as for practical floriculture and landscape design

Keywords: *Scrophulariaceae Juss*, *Nemesia strumosa*, world assortment, introduction, cultivars, floriculture, landscaping



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INTRODUCTION

The current stage of ornamental plant industry development and the solution of practical problems relevant for Ukrainian horticulture requires the increasing attraction of new types and cultivars of flower-decorative cultures for mass and individual gardening, as well as for the design of collection funds. The creation of large industrial centres and the growth of the urban population cause environmental degradation. In this regard, the need for mass recreation of the population in conditions that favourably affect health and psychophysical state increases [1; 2].

Among a wide range of flower-decorative cultures, plants of the genus *Nemesia Vent* family *Scrophulariaceae Juss* are among the most promising for introduction to Ukraine [3; 4]. They occupy one of the leading places in the world assortment of ornamental plants of the world flora. These include approximately 50 species of shrubs, subshrubs, annual and perennial plants with concolorous and variegated flowers with different shades. Unfortunately, flower-decorative plants of the genus *Nemesia Vent* at this stage of floriculture development are rare and are found only in private collections and as a seed material in a commercial offer, but based on the decorative qualities of these species and the variety of options for their use, these plants can be used to replenish the variety of flower-decorative cultures in Ukraine [3].

According to the author's opinion, decorative gardening in Ukraine is at a new stage, which requires attracting new types and cultivars of ornamental cultures since their available range in our country is still insufficient compared to the leading countries of the world. This approach is necessary both when solving issues in the field of direct use of ornamental plants in mass and individual gardening, and when solving problems related to the development of collection funds. Some of the most promising decorative species for landscaping various objects in Ukraine are species of the genus *Nemesia Vent L.*

From the author's point of view, the results of experiments allow assessing the level of adaptation of plants to the soil and climatic conditions of the selected zone and a specific area. That is why this work is the first stage on the way to creating source material for various areas of their subsequent practical implementation. The family of *Scrophulariaceae*, as a highly developed group of dicotyledon plants, is characterised by many progressive features, is included in the subclass of *Asteridae*, and takes a central position in order *Scrophulariales*; moreover, *Scrophulariaceae* received this position not only because this family is the largest in terms of the number of species, but also because it shows how close generic connections are with many families of the order, the border between which is often quite difficult to establish. *Scrophulariaceae* are common in warm and temperate areas of both hemispheres. The world assortment of decorative species of the *Scrophulariaceae* family is very wide – more than 1000 species. Among

them are pond plants, trees, shrubs, herbaceous annuals and perennials. In the flora of Ukraine, approximately 162 species are known, united in 26 genera. *Herbaceous Scrophulariaceae* are characterised by a wide variety of life forms. Annuals make up approximately 30% of all species. Some of the genera of *Scrophulariaceae*, whose species are introduced into culture as garden plants, belong to hydrophytes and hygrophytes, and there are also a number of genera that belong to hemiparasites [2; 5; 6].

In Ukraine, the genus *Nemesia Vent* has been studied relatively little on both theoretical and applied aspects of botanical science. The most significant development of Ukrainian scientists is the study of the species composition, geography, and eco-coenotic aspects of this genus in Ukrainian flora. The second important aspect of Ukrainian authors' research is the introduction of certain species of the genus, generalisation of the world experience of their use in culture, and elaboration of cultivation features in certain climatic conditions on the territory of the state. The terms and individual requirements for growing certain cultivars of *nemesia strumosa* are determined based on a generalisation of the experience of their use in culture. There are data from phenological observations of these plants during their cultivation in the Polissia and Forest steppe areas. This information is an important basis for further development of research works and for the development of a pattern of experiments with these plants [1; 4].

Due to the needs of practice, the question of studying the techniques of growing ornamental species of this genus arises. In literary sources, the issue about genus *Nemesia Vent* is little covered. There are only data, mainly of popular scientific content, on the peculiarities of growing *nemesia*. Regarding Ukraine, only general recommendations for the care of certain species of *Nemesia Vent* are proposed [4; 7].

The purpose of the research was to evaluate the adaptability of *nemesia strumosa* cultivars for growing flowers in soil and climate zone of Ukraine, as well as the selection of options for their use for greening the Podillia area.

THEORETICAL OVERVIEW

The family *Nemesia Vent* includes more than 50 herbaceous and subshrub annuals and perennials, most of which grow wild in South Africa. In floriculture, *nemesia strumosa* (*Nemesia strumosa Beth*) and *nemesia versicolour* (*Nemesia versicolor E.Mey*) are most commonly used. A large number of garden hybrids have been obtained from *nemesia strumosa* and *nemesia versicolour* (*Nemesia x hybrida hort*), which are grown as annuals, seedlings [8-10].

Brief description of the most common species of the genus *Nemesia Vent*:

❖ *Nemesia strumosa* – an annual herbaceous plant with upright quadrangular stems, glabrous below and slightly pilose above, 10-40 cm high. The flowers are

unstandard, swollen, irregular in shape, up to 2.5 cm in diameter, collected in raceme inflorescences at the ends of the stems (Fig. 1). The flower colour is white, yellow, orange, red, purple, blue, they can be one- and two-coloured, often with a purple tint on the outer side. It is better to plant seeds for seedlings in the third decade of April, and it is necessary to make sure that soil does not dry out in the containers. In favourable conditions plants bloom at 40-45 day after the emergence of sprouts. They develop well in light, moderately fertile ground. The plant blooms from June to September, sometimes until mid-October in sunny areas [11-13].

Best cultivars: *Aurora*, up to 30 cm high, the flowers are large, scarlet-white, bicoloured, *Fire King*, up to 30 cm high, the flowers are of various colours, and *Orange Prince* – the flowers are orange. It is used for decorating flowerbeds, ridges, borders, as borders for flower beds, for decorating bowls, vases, baskets, and mini-flower beds, for floral arrangement, and as a container plant.

❖ *Nemesia versicolour* is an annual herbaceous plant. The stems are very branched, thin (Fig. 1). In a number of features, it resembles *nemesia strumosa*, although its flowers are slightly smaller and have a clearly visible spur. The maximum height of the plant is 25 cm. Propagated by seeds. Sprouts emerge on the eighth day. This is a light-demanding, cold-resistant, and rather low maintenance plant. Although most *nemesias* love the sun, they do not tolerate very hot weather. When the air is too hot, their greenery wilts, and if the soil dries up, plants die. Therefore, for their cultivation, one should choose places that are blown by the wind and make sure that the soil does not completely dry out. The distance between plants should be 5 cm. It is necessary to provide protection in case of frost return. Removal of flowers that lost their decorativeness prolongs the flowering

period. It is recommended for flowerbeds, ridges, borders, for floral arrangement, and as a pot plant [14].

❖ *Nemesia x hybrida* – this includes cultivars of hybrid origin obtained from crossing *Nemesia stromosa* and *Nemesia versicolor* [9; 10]. An annual plant, branched from the base, 30-60 cm high. The leaves are oblong, almost lanceolate, serrated along the edge. Flowers are irregular in shape, rather large, with a double corolla up to 2 cm in diameter, collected in raceme inflorescences. Have a variety of flower colours (Fig. 1). It grows well in light, moderately fertile soils with a pH of 5.5. The flowering period is from June to August. It is used in flowerbeds, ridges, borders, for floral arrangement and as a pot plant [11].

❖ *Nemesia caerulea*=*Nemesia foetens*– flowers in *nemesia* are small – their diameter does not exceed 1.5 cm. The stems are approximately 40 cm high, initially upright, but later begin to bend under the weight of inflorescences. The colour of the petals can be varied: blue, dark blue, orange, pink, or almost white. They always have a bright yellow spot on the lower petal (dorsal sepal). This plant is propagated by seeds or stem cuttings. They love sunlight and fresh air. The soil should not be constantly moist. After the seed propagation, the flowering period lasts from July to September (Fig. 1).

❖ *Nemesia floribunda*– the sprouts of these plants reach a height of 40 cm and their flowers are much smaller than those of other species of this botanical genus, their diameter is 1.5 cm. The flower colour can be different: purple, blue, dark blue, pink, white. The flowering period of *nemesia floribunda* is from June to August (Fig. 1). *Nemesia floribunda* has a very delicate appearance. It is popular with flower growers who prefer the beauty of field flowers. Unfortunately, the seeds of these plants are almost impossible to find [3; 6].

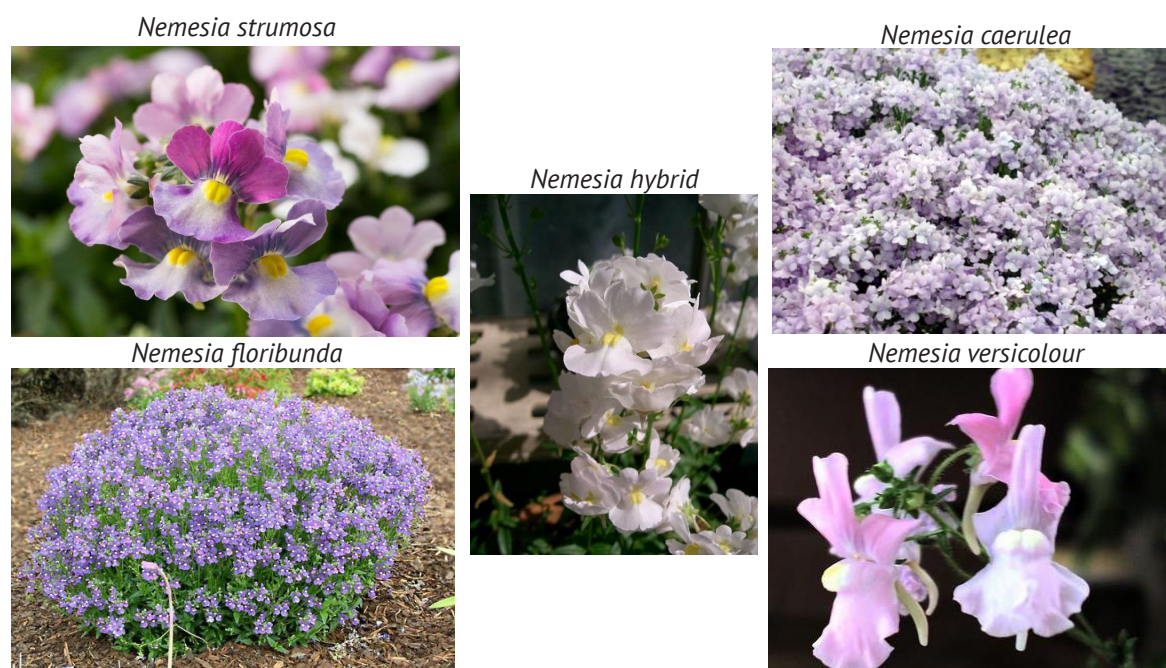


Figure 1. Flower-decorative species of the genus *Nemesia* Vent in the flowering

Despite a wide range of research on the morphobiological features of the studied species and the implementation of their practical introduction, many issues of biology of these species, especially those of interest for seed production and selection, that is, the creation of new highly decorative cultivars, adapted to local conditions, that are absent in Ukrainian floriculture.

MATERIALS AND METHODS

The research on the cultivation of ornamental species and cultivars of the genus *Nemesia Vent* in Podillia was held during 2019-2020. Seeds and vegetatively propagated planting material of these plants were obtained from the collection of the Department of flower-decorative plants of M.M. Hryshko National Botanical Garden in Kyiv, as well as from private collections. The study of cultivars of the genus *Nemesia Vent* were held on collection sections in the Botanical Garden "Podillia" of the Vinnytsia National Agrarian University.

The object of research was phenology, morphometry, a number of aspects of reproductive biology, namely the intensity of flowering in different periods of the generative period, the reproductive ability of different cultivars within the species, the biomorphological and systematic structure of the genus in the cultivated flora of Ukraine and the world. During phenological observations, the main phenophases, their calendar dates, and duration were recorded. Morphometry data were used to study the morphobiological features of growth and development, primarily the formation of plant structure under the influence of soil and climate conditions of Podillia.

The complex of obtained indicators is used as a scientific basis for the development of agricultural technology frameworks of the studied species and cultivars for various practical use in decorative gardening of Podillia as objects of seed production or components of decorative groups of flower beds of various types with the participation of these plants and determination of the place and role of each of them as factors of enriching the assortment and improving the quality of mass and individual gardening.

As the subject of research, 1 species and 5 cultivars of foreign selection were used, which differ primarily in the colour of flowers and the size of plants, in particular:

1. The Orange Prince cultivar. The height of the plants is 35-40 cm, the size of the flowers is 2-3 cm, collected in loose racemes at the ends of the stems, the colour of the flowers is orange, the fruit is a many-seeded box.

2. The White Knight cultivar. The height of the plant is 30-40 cm, the size of the flowers is 3 cm, collected in loose racemes at the ends of the stems, the colour of the flowers is white, the fruit is a many-seeded box.

3. Red and White cultivar. The height of the plant is 30-40 cm, the size of the flowers is 2.5 cm, collected in loose inflorescences at the ends of the stems, the colour of the flowers is variegated (the upper lip is red, the lower lip is white), the fruit is a many-seeded box.

4. The Fire King cultivar. The height of the plant is 30-40 cm, the size of the flowers is 2-3 cm, collected in loose inflorescences at the ends of the stems, the colour of the flowers is red, the fruit is a many-seeded box.

5. The Blue Treasure cultivar. The height of the plant is 18-30 cm, the size of the flowers is 2.5 cm, collected in loose inflorescences at the ends of the stems, the colour of the flowers is blue, the fruit is a many-seeded box.

The territory of the "Podillia" Botanical Garden, where plant cultivars of the *Nemesia strumosa* species were studied is part of the Podilske Pobuzhia area of the Forest steppe of Ukraine. According to the agroclimatic directory and Atlas of Ukraine, this territory belongs to the Vinnytsia-Nemirovsky agro-soil subdistrict of the Central Soil District of the Right-bank Ukraine. The climate conditions of this area are favourable for agriculture. The studies were conducted on grey forest soils typical of this area, middle loamy in mechanical composition. A valuable quality of the soil is the high content of calcium and magnesium carbonates (from 1.45 to 14.5%), which contribute to the accumulation and consolidation of nutrients, which leads to the formation of soils with a stable absorption complex. The loess capillarity provides a rise in moisture to the upper horizons, where the root system of plants is located.

The humus content is in the range of 2.2-2.4%, the reaction of the soil solution is slightly acidic pH (salt) is at the level of 5.2-5.4. In general, the soil and climatic conditions of the experimental site were favourable for growing flower-decorative plants of *nemesia strumosa*.

During the research of flower-decorative species of the genus *Nemesia Vent*, methods of field and laboratory experiments were used. The cultivation of plants of the studied species was carried out in a generally accepted way – seedling culture. The feeding area was 20x30 cm. The number of plants of each cultivar grown ranged from 15 to 50 plants. To obtain seedlings, the seeds were planted in seed boxes in a greenhouse, at a temperature of 16-20°C, the transplanting was carried out in seedling pots. The mixture for planting and transplanting consisted of 3 parts humus, 1 part peat and 1 part sand (3:1:1) with a pH of 5.5-7. Care consisted of fertilising (during the growth of hoots and during the formation of inflorescences, with an NPK norm of 15-20 g per 10 liters of water) and maintaining sufficient soil moisture in dry periods (with a norm of 12-15 l/m²). Seedlings were planted in the soil in early May, when the threat of frost passed. Harvesting of plants for seeds was carried out as they matured.

During the research, the author conducted a morphological description of *nemesia strumosa* cultivars (determined the shape of leaves, stems, roots, flowers, inflorescences), a comparative analysis by development phases, determined the real and potential seed productivity, duration, and intensity of flowering. The intensity of flowering was determined by the number of fully opened flowers that occurred during the daytime of one 24-hour period. A comparative cultivar assessment of

ornamental plants of *nemesia strumosa* was carried out, and the life form of plants was determined [15; 16].

The dominant task was to update the assortment with modern species. Accordingly, in this study, when conducting an assessment, the author used the method of searching and selecting options for using plants, taking into account their decorative qualities according to the requirements of this time.

RESULTS AND DISCUSSION

A complex cultivar assessment of nemesia strumosa

An assessment of cultivar material makes it possible to identify the best, most adapted cultivars and recommend them for further cultivar testing, which is carried out according to a separately approved methodology at the state level by a specially authorised service. According to its results, tested and evaluated objects enter the State Register of plant cultivars of Ukraine if they meet

a specified level of criteria. Of the plants studied by the authors, *nemesia strumosa* cultivars were not included in the list of plants in this register. Therefore, for this purpose it is necessary to develop an appropriate method of cultivar assessment. The set of criteria proposed by the method is universal and allows a comprehensive assessment of cultivars, while taking into account both characteristics that determine decorativeness and commercial-biological qualities. Therefore, despite the fact that the task of this work did not apply to the development of recommendations for introducing cultivars of *nemesia strumosa* in the State Register mentioned above, these criteria were used for a comprehensive assessment of cultivars of this plant introduced in the conditions of Podillia. The description of *nemesia strumosa* cultivars and the results of their assessment by decorative qualities are given in Table 1.

Table 1. The general characteristics of *Nemesia strumosa* cultivars, that were tested in the conditions of Vinnytsia

Cultivar	Number of days from planting to flowering	Plant height, cm	Number of inflorescences, pcs	Number of flowers in the inflorescence, pcs	Flower		Flowering time
					Diameter, cm	Colour	
The Orange Prince	72	30-40	6-8	6-8	3	Orange	June-October
The White Knight	74	30-40	6-7	6-7	3	White	June-September
Red and white	80	30-40	5-6	5-6	2.5	Variegated (upper lip is red, lower lip is white)	June-September
The Fire King	73	30-40	6-7	5-6	3	Red	June-September
The Blue Treasure	75	18-30	5-6	5-6	2.5	Blue	June-September

Source: formed based on the results of the author's own research

Although *nemesia strumosa* is not a widespread culture in Ukraine, it is widely used in world horticulture. The high decorative value of brightly coloured inflorescences, a relatively long period of continuous flowering (from June to September, and sometimes until mid-October) contributes to the fact that flowers of this genus are often found in world floriculture. These qualities were fully manifested in the cultivars chosen

by the author of the article for testing in Vinnytsia, which is confirmed by the results of phenological observations and accounting for their commercial-biological qualities in accordance with the methodology of conducting a cultivar examination of the decorative group for suitability for distribution in Ukraine [16]. Their results are presented in Table 2.

Table 2. The data of phenological observations during the testing of *N. strumosa* cultivars

Cultivar name	Beginning of the growing season			Flowering				
	Planting	Emergence of sprouts	Mass rooting of seedlings	Beginning	Mass	End	Complete loss of decorativeness	End of the growing season
The Orange Prince	28.03	13.04	30.04	10.06	12.08	1.10	16.10	24.10
The White Knight	28.03	14.04	1.05	12.06	9.08	28.09	13.10	19.10
Red and white	28.03	12.04	1.05	15.06	17.08	21.09	7.10	13.10
The Fire King	28.03	13.04	29.4	13.06	8.08	24.09	8.10	16.10
The Blue Treasure	28.03	15.04	2.05	14.06	10.08	22.09	10.10	18.10

Source: formed based on the results of the author's own research

Due to the improvement of people's well-being, the demand for flower products is increasing. All this elevates floriculture to an important branch of the national economy, so the study assessed cultivars for resistance to unfavourable weather conditions, diseases, and pests, which are shown in Table 3.

When processing the results of research on commercial-biological qualities, *nemesia strumosa* cultivars turned out to be quite resistant to unfavourable conditions. Almost all plants adapted well to the growing conditions, were not affected by diseases, and generally deserve high valuation. They also differ in average seed productivity (0.19-0.26 g/plant), but it should be noted that the seeds are very small (the number of seeds per 1g is 3.28 thousand pcs.). Based on this the conclusion

can be made that the plants of these cultivars have a great potential for wider distribution in gardening in Ukraine. However, with any, even a sufficiently large set of criteria, such an assessment cannot be objective, since the author assessed the level of suitability of the studied species only by a set of commercial-biological indicators. The basis for determining the set of indicators of such assessment was the corresponding method [15; 16]. In order to obtain data that would comprehensively and simultaneously from different sides reflect the patterns of ontogenetic morphogenesis of different *nemesia strumosa* cultivars, plant observations were made on the phases of development. The phenological phases of the aerial part development of 5 cultivars were determined (Tables 4, 5).

Table 3. A record for commercial-biological qualities of *N. strumosa* cultivars

Cultivar name	Resistance to unfavourable weather conditions	Resistance to diseases and pests	Sparse planting	Typicality of the cultivar	Flowering productivity, flowers/plant	Seed harvest, g/plant	Period of preservation of decorativeness of cut inflorescences in water, days
The Orange Prince	High	High	Low	High	64	0.26	3-4
The White Knight	High	Average	Low	High	49	0.24	2-3
Red and white	High	High	Average	High	36	0.23	1-2
The Fire King	Low	Average	Low	High	42	0.21	2-3
The Blue Treasure	Low	Average	Average	High	36	0.19	1-2

Source: formed based on the results of the author's own research

Table 4. Calendar dates of individual phenological growth phases in cultivars of the species *N. strumosa* in the conditions of Podillia

Cultivar name	Date of planting	Sprouts, date			Leaf growth and formation of the shoot system, date	Budding, date	Flowering, date	Fructification, date
		Emergence	Mass	End				
The Orange Prince	28.03	13.04	16.04	23.04	24.04-28.05	29.05-9.06	10.06-1.10	2.10-31.10
The White Knight	28.03	14.04	17.04	25.04	26.04-27.05	28.05-11.06	12.06-28.09	29.09-30.10
Red and white	28.03	12.04	15.04	24.04	25.04-29.05	30.05-14.06	15.06-21.09	21.09-29.10
The Fire King	28.03	13.04	16.04	24.04	25.04-28.05	29.05-12.06	13.06-24.09	25.09-28.10
The Blue Treasure	28.03	15.04	17.04	25.04	26.04-27.05	28.05-13.06	14.06-22.09	23.09-27.10

Source: formed based on the results of the author's own research

Table 5. The duration of individual phenological growth phases in cultivars of the *N. Strumosa* species in the conditions of Podillia

Cultivar name	Seed germination period, days	Duration of the seedling phase, days	Leaf growth and formation of the shoot system, days	Budding, days	Duration of the period from planting to flowering, days	Flowering, days	Fructification, days
The Orange Prince	16	10	34	12	72	113	29
The White Knight	17	11	31	15	74	108	31
Red and white	15	16	34	15	80	98	38
The Fire King	16	9	33	15	73	103	33
The Blue Treasure	18	10	31	16	75	100	34

Source: formed based on the results of the author's own research

Use cases in decorative gardening

Continuous improvement of flower design is an urgent problem for the entire world of gardening. In Ukraine, it is becoming particularly acute due to the significant lag of our state behind the world leading countries in terms of both the range of flower crops and their use cases. Therefore, the task of this study was to investigate the range of species and cultivars of the genus *Nemesia* Vent for various areas of their implementation in decorative gardening. Based on the analysis of the potential capabilities of these plants, variants of their use as promising species are proposed to enrich the taxonomic composition of the assortment and avoid monotony and uniformity of garden compositions. The richness of colour, high decorative effect, and long flowering period allow considering decorative species and cultivars of

nemesia promising for their widespread introduction into floriculture in Ukraine.

To enrich the assortment, the author recommends one species of ornamental plants of *nemesia strumosa*, which differ in the colour of leaves and flowers, different in flowering time, which is especially important for ensuring a constantly high decorative value of flowerbeds. Due to the peculiarity of flowers and the abundance of flowering of this species, it can be used in our conditions to create ridges, compositions, decorative spots, alpine gardens, rock gardens, borders, arabesques, parterres, mini-flowerbeds, as a border for flowerbeds, as well as container plants in gardens, parks and hanging baskets (Table 6). Options for use of the studied species in decorative gardening are demonstrated in Figure 2.

Table 6. Biomorphological features and recommendations for the use of *nemesia strumosa* cultivars

Cultivar name	Life form	Vegetation type	Plant height, cm	Duration of flowering, days	Recommendations for use
The Orange Prince	Annual	Summergreen	35-40	113	Compositions, ridges, borders, flower spots, rock gardens, container and ampelous culture
The White Knight	Annual	Summergreen	30-40	108	Flower spots, compositions, ridges, borders, pots, alpine gardens, rock gardens
Red and white	Annual	Summergreen	30-40	98	Borders, pots and baskets, as borders for flowerbeds, compositions, ridges
The Fire King	Annual	Summergreen	30-40	103	Flowerbeds, alpine gardens, rock gardens, compositions, ridges, borders, pot plant
The Blue Treasure	Annual	Summergreen	18-30	100	Decorative spots, group plantings, ridges, borders, for bowls and hanging baskets



Figure 2. The use for landscaping health complexes, recreation areas, offices, and adjacent territories

Agrotechnics of growing *nemesia strumosa*

A necessary condition for successful practical use of plants is the development of the basics of agricultural technology in new growing conditions. Plants of the genus *Nemesia Vent* are grown only by seedling culture. The technology of growing seedlings is as follows:

1. Containers. Trays, boxes, and regular flower pots are used. Drainage holes or crevices are required. Containers are washed, clay pots are soaked overnight.

2. Compost. Peat-based compost is perfect – it is sterile, light, and homogeneous. The container is filled with compost and slightly compacted with a plank. The day before planting, the compost is sprayed with water – during planting it should be moist (but not wet). Seeds are planted not thickly, then sprinkled with a thin layer of compost (very small seeds do not need to be sprinkled) and pressed with a plank.

There are two methods of growing seedlings: *First* – the standard “under the glass” method. The tray or pot is covered with glass, and a sheet of thick paper is placed on top. It is kept at a temperature of 16–21°C. Every day, the glass is wiped and turned over. As soon as the sprouts appear, the paper is removed and the glass is lifted from one edge. After a few more days, the glass is removed completely and the container is moved closer to the light. The compost is kept moist.

Second – a simple “on the windowsill” method. A plastic bag is put on the pot or container and fixed with an elastic band. It is kept in a shaded place at a temperature of 16–21°C. As soon as the shoots appear, the bag is removed and the seedlings are moved to the windowsill, where direct sunlight does not fall. The pots are rotated regularly so that the flowers do not stretch out to one side. The compost is kept moist, but not wet.

3. Transplanting. As soon as the first pair of true leaves opens, the seedlings should be transplanted 4–4.5 cm into trays or pots filled with compost. For transplanting, seedlings are held at cotyledonous leaves, and not at stems. After transplanting, the container is placed in a dark place for a day or two.

4. Hardening. When the seedlings have taken roots after transplanting, they need to be seasoned to prepare for life in the open ground. To do this, one needs to increase the ventilation and move the container to a cool place or a greenhouse. Then they are put out on the street for a day. Before planting, the seedlings are left outside for a week.

Bedding. After hardening, the plants are planted in the open ground in spring in the period from April to June. In order for the plants to take roots, they are planted with soil that was in pots [17; 18].

To extend the duration of flowering, in the second half of summer (after the first wave of flowering), plants are rejuvenated by cutting. The dried stems that lost decorativeness are cut off, after which they grow back and bloom again, although less abundantly.

CONCLUSIONS

It was established that in the field of horticulture, the genus *Nemesia Vent* is represented by both a significant number of species (50) and a rich cultivar assortment, which is approximately 100 cultivars. When comparing with the cultivar assortment of the world leading countries, the cultivars of *Nemesia Vent* species are completely absent in Ukraine. According to preliminary data, plants of the *Nemesia strumosa* species can be considered a significant source for increasing the range of promising flower plants in the area of Podillia. To improve the range of flower plants, cultivars of *nemesia strumosa* species are of primary importance: Orange Prince, White Knight, Red and White, Fire King, and Blue Treasure.

As a result of investigating the flowering characteristics of the studied cultivars, it was established that the largest flowering period (113 days) and its significant intensity (35 pcs. flowers per plant) was observed in the Orange Prince cultivar, which is a priority for enriching cultivars in the Podillia area. It was determined that in all the studied cultivars, ontogenesis ends with a complete fructification with a seed productivity of 0.19 to 0.27 g per plant, with an amount of 3.16 to 3.39 thousand seeds per 1 g, which is a high indicator for the Podillia area.

The studied cultivars of the *Nemesia strumosa* species received high values on a set of indicators that determine their decorative effect and commercial-biological qualities. Therefore, they can be widely used in our conditions for creating ridges, compositions, decorative spots, alpine gardens, rock gardens, borders, arabesques, parterres, mini-flowerbeds, as a border for flowerbeds, as well as container plants in gardens, parks and for hanging baskets.

REFERENCES

- [1] Ishchuk, L.P., Oleshko, O.H., Chernyak, V.M., & Kozak, L.A. (2014). *Floriculture*. Bila Tserkva: Polihraf.
- [2] Didur, I.M., Matusyak, M.V., Prokopchuk, V.M., & Monarch, V.V. (2020). *Forestry*. Vinnytsia: RVV VNAU.
- [3] Prokopchuk, V.M. (2012). *Introduction to the Forest-Steppe of Ukraine of flowering and ornamental plants of the family Scrophulariaceae Juss.* Vinnytsia.
- [4] Didur, I.M., Prokopchuk, V.M., Pantsireva, V.G., & Tsyganska, O.I. (2020). *Recreational garden and park economy*. Vinnytsia: VNAU.
- [5] Prokopchuk, V.M., & Mazur, V.A. (2011). *Ornamental gardening and floriculture*. Vinnytsia: Vinnytsia National Agrarian University.

- [6] Steiner, K.E. (2009). Two new species of *Nemesia* (Scrophulariaceae) from arid areas of the Northern Cape, South Africa. *Hothalia*, 39(1), 67-72.
- [7] Shibuya, K. (2018). Molecular aspects of flower senescence and strategies to improve flower longevity. *Breeding Science*, 68, 99-108.
- [8] *Nemesia strumosa* (Herb. Banks ex Benth.) Benth. (n.d.) Retrieved from <http://pza.sanbi.org/nemesia-strumosa>.
- [9] Kosachev, P.A. (2017). Check-list of Scrophulariaceae Juss. s. l. of North Asia. *Acta Biologica Sibirica*, 3(4), 31-76.
- [10] Sharipova, V. (2020). Features of the structure of vegetative organs *Dodartia orientalis* L. (Scrophulariaceae Juss.) from different ecological conditions. *International Conferences "Plant Diversity: Status, Trends, Conservation Concept" 2020*, 24, article number 00078. doi: 10.1051/bioconf/20202400078.
- [11] Mosyakin, S.L., & Tsybalyuk, Z.M. (2017). Pollen morphology of the tribe Hemimerideae: Possible evidence of ancestral pollen types and parallel evolution in the basalmost clade of Scrophulariaceae s.str. *Willdenowia*, 47(1), 15-27.
- [12] Haynes, K.G., & Guedes, M.L. (2018). Self-compatibility in a diploid hybrid population of *Solanum phureja* – *S. stenotomum*. *American Journal of Potato Research*, 95, 729-734.
- [13] Zimowska, B., Zalewska, E.D., & Król, E.D. (2016). Occurrence and characterization of *Colletotrichum fuscum*. *Acta Scientiarum Polonorum Hortorum Cultus*, 15(4), 121-134
- [14] Wien, H.C. (2017). Response of branching and nonbranching cut flower cultivars of sunflower to pinching and planting density. *Hort Technology*, 27(2), 257-262.
- [15] Prokopchuk, V.M., & Monarch, V.V. (2019). Taxonomic and biological-environmental assessment of alpine plant species on the alpine slide of VNAU. *Scientific Scientific Bulletin of UNFU*, 29(2), 73-76.
- [16] Tkachyk, S.O. (Ed.). (2017). *Methods of examination of plant varieties of ornamental, medicinal and essential oil, forest for suitability for distribution in Ukraine*. Vinnytsia: FOP Korzun D. Yu.
- [17] Prokopchuk, V.M., Tsyganska, O.I., & Tsyganskyi, V.I. (2017). *Ornamental nursery with the basics of seed production*. Vinnytsia: VNAU.
- [18] Prokopchuk, V.M., & Tsyganska, O.I. (2018). *Garden and park compositions*. Vinnytsia: RVV VNAU.

ОЦІНКА СОРТІВ КВІТНИКОВО-ДЕКОРАТИВНИХ РОСЛИН ВИДУ *NEMESIA VENT* В УМОВАХ ПОДІЛЛЯ

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Анотація. Через брак відомостей про біоморфологічні особливості та технологію вирощування видів роду *Nemesia Vent* вони поки що рідко зустрічаються на території України і тим самим становлять величезний інтерес для їх вирощування і використання для оформлення квітників. Метою наукової роботи було проаналізувати сучасний світовий асортимент роду *Nemesia Vent*, а також дослідити особливості цвітіння, репродуктивну здатність, агротехніку вирощування сортів немезії зобовидної та оцінити перспективність варіантів їх використання в декоративному садівництві України. Під час досліджень сортів немезії зобовидної були використані методи лабораторних і польових досліджень. Обґрунтовано, що всі досліджувані сорти отримали високі оцінки їх декоративності, оскільки рослини в умовах експерименту мали добре розвинені суцвіття, рясне та тривале квітування. Рослини зберегли яскравість свого забарвлення протягом усього періоду життя квітки, добре адаптувались до умов вирощування, практично не уражались хворобами, загалом виявились достатньо стійкими до несприятливих умов. Сорт Помаранчевий принц проявив себе найкраще з усіх досліджуваних сортів по тривалості та інтенсивності цвітіння, яке досягало максимальних своїх значень на 60-й день від початку фази з кількістю квіток 35 штук на рослину. Досліджувані сорти можуть бути використані при озелененні оздоровчих комплексів, зон відпочинку, територій офісів, прибудинкових територій, а також при оформленні різних видів квітників. Результати отриманих досліджень є першочергово необхідними під час вибору варіантів використання, розробки агротехніки і селекційних програм та для здійснення науково-дослідних робіт, спрямованих на задоволення потреб садівництва. Враховуючи те, що вони вирощуються як для потреб закритого ґрунту, так і для зовнішнього квітникового оформлення, опрацювання даних питань становить вагомий внесок для ботанічної науки загалом, в першу чергу для декоративного садівництва України, а також для практичного квітникарства та ландшафтного дизайну

Ключові слова: *Scrophulariaceae Juss*, *Nemesia strumosa*, світовий асортимент, інтродукція, культивари, квітникарство, садово-паркове будівництво