

Bioresource collection of flower crops in FRC SSC of RAS and its use in breeding research

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Abstract. The paper deals with topical issues of introduction and breeding research in the framework of import substitution in the floriculture industry. An extensive gene pool of flower crops has been mobilized at the Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences (Sochi). On the basis of the Centre's collections, apart from scientific purposes of conserving biodiversity, researching plants resistance and adaptability, as well as developing methods for studying cultivar samples, etc., there are practical tasks of obtaining planting material and cut flowers, including off-season periods, and using them in various forms of floral decoration, which are being solved. Bioresource collections include 1,499 cultivar samples, of which 34.29 % are perennial herbaceous plants, 20.61 % are bulbous and bulbotuberiferous, 16.94 % are irises, 14.34 % are pelargoniums, 9.47 % are species of natural flora, 4.34 % are chrysanthemums. The collections are also the basis for conducting breeding research in order to create highly ornamental, original, environmentally resistant and productive cultivars in the Centre with different flowering periods. Over the past 10 years, 85 cultivars of flower crops have been created (including 36 pelargoniums, 15 freesias and anemones, 12 chrysanthemums, 4 gerberas, 2 primroses, 1 tulip). The obtained cultivars are highly ornamental and resistant to biotic and abiotic factors. Freesia, anemone and pelargonium cultivars registered in the State Register of Breeding Achievements of the Russian Federation belong only to the FRC SSC of RAS.

1 Introduction

In the modern world, the issues of horticultural development, including ornamental gardening, are being raised more and more often. Their planting areas are increasing, the range of flower and ornamental crops is expanding, and the demand for cut products is growing.

Today, as part of the development of domestic floriculture, special attention should be paid to preservation and maintenance of existing genetic collections, as well as to the cultivars bred in Russia. Selection and breeding of a resistant assortment developed as a

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result of introduction studies and the use of domestic cultivars increase the profitability of flower production.

Currently, import substitution issues are most relevant. The world production of ornamental plants, including cut flower products, was based on foreign material and amounted to about 40-45 bln dollars [1]. However, in recent years, floriculture industry has been paid considerable attention in our country; the construction of greenhouse plants and flower farms has been started. In turn, scientific centres and botanical gardens preserve and maintain collections of flower crops, conducting diverse research [2-7]. In addition, breeding work is being actively carried out on many crops, varietal sources of valuable traits are being identified, and new original domestic cultivars are being bred [8-15]. All this is the basis for import substitution and production commercialization.

2 Materials and methods

Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences (FRC SSC of RAS) has been engaged in the formation and study of genetic resources of flower crops since the 1960s. The purpose of the research was and remains – the search and mobilization of genetic resources from the studied crops with specified properties, their preservation and comprehensive study.

The uniqueness of the research, its novelty and practical significance lie in the fact that a large varietal gene pool of flower and ornamental crops from different floristic regions of the globe, grown in open or protected ground in the humid subtropical zone, as well as rare and endemic species from the natural flora of the Caucasus and southern Russia have been collected, preserved and studied. On the basis of the Centre's bioresource collection of flower crops, breeding studies are conducted to create new forms and cultivars.

Collections of the following crops are supported: bulbous (tulips, daffodils, muscari, xiphiums, etc.), bulbotuberiferous (freesias, crocuses, gladioli, etc.), perennial herbaceous (irises, hemerocallis, anemones, gerberas, pelargoniums, chrysanthemums, etc.), species of natural flora. Assortments and technologies of reproducing and cultivating planting material, as well as obtaining cut flowers in the process of distillation are being developed and improved on the basis of bioresource collections.

3 Results and discussion

Currently, the gene pool of flower crops in FRC SSC of RAS includes 1,499 cultivar samples (Fig. 1).

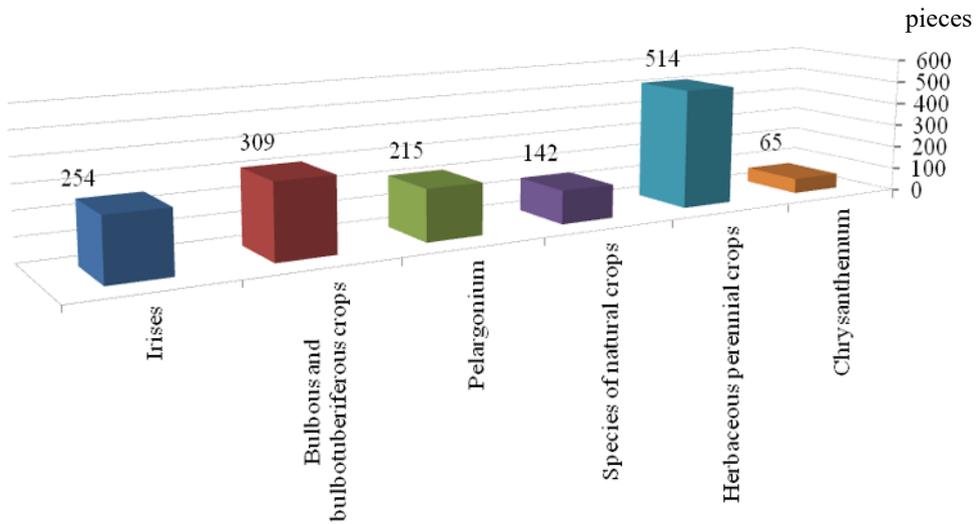


Fig. 1. Genetic collection of flower crops in FRC SSC of RAS.

The most extensive collection of perennial herbaceous plants consists of 8 families: Xanthorrhoeaceae Juss., Ranunculaceae Juss., Amaryllidaceae Jaume Saint-Hilaire, Paeoniaceae Raf., Cannaceae Juss., Asparagaceae Juss., Caryophyllaceae Juss., Compositae Giseke. It includes 514 cultivar samples, among them 428 – hemerocallis, 32 – anemones, 15 – gerberas, 14 – plants from the Liriopa, 10 – peonies, 4 – ranunculus, 3 – cannas and 2 hypsophila and agapanthus.

Bulbous and bulbotuberiferous are represented by flower crops cultivated in open and protected ground from the families: Amaryllidaceae Jaume Saint-Hilaire, Asparagaceae, Liliaceae Juss., Iridaceae Juss., Liliaceae Juss. They include 309 cultivar samples from 25 genera. The most numerous are: *Tulipa* L. – 90 cultivars, *Freesia* Eckl. ex Klatt – 48, *Narcissus* L. – 39, *Crocus* L. – 24, *Muscari* Mill. – 19.

The collection of the genus *Iris* from *Iridaceae* family includes 254 cultivars, most of which are *Iris hybrida* hort. cultivars (81,5 %). *Iris sibirica* L. cultivars – 10.2 %, *Iris ensata* Thunb. – 3.2 %, *I. spuria* L. – 1.6 %. Irises from the natural flora are also maintained, they make up 3.5%.

The collection of *Pelargonium* (L.Her it. ex Ait) genus from Geraniaceae Juss. family contains 215 cultivars, including 35 species, 30 cultivars of Russian and 150 of foreign breeding. The collection also includes representatives of four branches, four subgenera and 6 sections, of which 79.0 % is Branch A (subgenus *Pelargonium*); 3.5 % – Branch B (subgenus *Parvulipetala*); 1.0 % is Branch C1 (subgenus *Magnipetala*); 16.5 % – Branch C2 (subgenus *Paucisignata*).

The bioresource collection of natural flora species includes 142 cultivars belonging to 104 genera and 56 families. In addition to the fact that many species in the collection are ornamental, a number of them have different statuses and categories of rarity, so 24 are listed in the Red Book of the Russian Federation, 89 are in the Red Books of the subjects of the Russian Federation, 37 are in the list of IUCN (International Union for Conservation of Nature and Natural Resources).

The garden chrysanthemum (*Chrysanthemum × hortorum* Bailey) from Compositae family includes 65 cultivars. The collection consists of four groups, including large–

flowered – 30 cultivars, small-flowered – 23, multiflora (*Chrysanthemum coreanum* (H.Lév. & Vaniot) Nakai Multiflora) – 9 and chrysanthemums for gardening – 3 cultivars.

Breeding studies are being conducted to create Centre's highly ornamental, original, environmentally sustainable, productive cultivars with different flowering periods. Extensive genetic collections of flower crops make it possible to solve not only biodiversity conservation problems, but they also can be used in the breeding process to create new competitive cultivars in the conditions of import substitution. The essential importance of Russian cultivars lies in their high adaptive potential. Local cultivars can significantly improve the assortment for a specific zone.

Over the past 10 years, 85 cultivars of the studied crops have been created at the Centre (Fig. 2).

Breeding studies are being carried out on the following crops: freesia, anemone, chrysanthemum, pelargonium, etc. The obtained cultivars are highly ornamental and resistant to bio- and abiotic factors. It should be noted that only our Centre is engaged in the breeding of freesia, anemone and pelargonium.

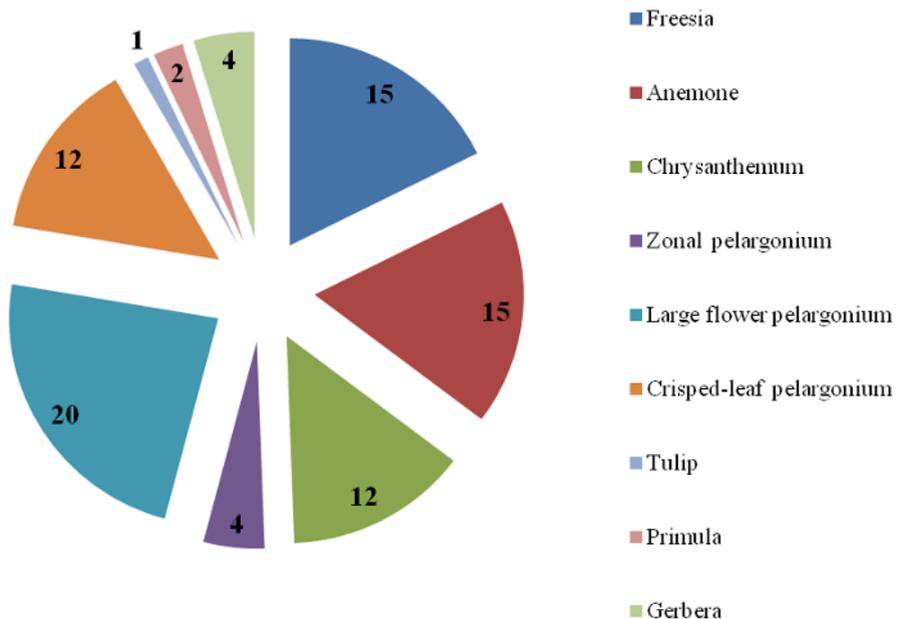


Fig. 2. Cultivars of FRC SSC of RAS included in the State Register of Breeding Achievements of the Russian Federation from 2011 to 2021.

Breeding work with pelargonium is being carried out in various directions with different sections of this genus. Pelargonium (zonal, large flower, curly) cultivars, bred in the Centre, differ in various colours, terms and duration of flowering, growth strength and plant size. Curly pelargonium cultivars differ in their original aroma.

Freesia is cultivated in glass greenhouses with an unregulated microclimate. These conditions are not characteristic, which makes it possible to breed resistant, adapted cultivars. New cultivars are distinguished by a variety of colours and flower shapes.

Crown anemone cultivars differ significantly from foreign ones in colour and shape of the flower and plant height and can be used both as cut flowers and in landscaping.

4 Conclusion

Thus, the bioresource collection of flower crops at FRC SSC of RAS can be used as a base for the development of the Russian market of flower products. New Russian cultivars are competitive and will solve import substitution problems.

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