

Replenishment of the bioresource collection of the Subtropical Scientific Centre with varieties of own selection

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Abstract. These studies were conducted in the humid subtropics of the Krasnodar Region. The bioresource collection of the Subtropical Scientific Centre is preserved, mobilized, and maintained in living form, comprising 800 varieties of subtropical crops and over 2,000 ornamental flowering plants. The main methods of replenishment are introduction and breeding of new varieties, the value of which lies in their adaptability to local growing conditions. As a result of breeding research at the Centre, 277 varieties of tea, persimmon, mandarin, feijoa, azimina, hazelnut, fig, strawberry, peach, plum, apple, pear, pelargonium, hippeastrum, freesia, anemone, chrysanthemum, gerbera, tulip, primrose, and peony have been obtained. Over the past 6 years (2019–2024), the collection has been supplemented with new varieties resistant to major environmental stress factors, which have high yield, fruit quality, productivity, and ornamental value. In the State Register of Breeding Achievements approved for use, 73 varieties are registered, including 65 varieties of flowering plants and 8 subtropical fruit and nut crops.

1 Introduction

The creation, study, and maintenance of bio resource collections are important tasks in preserving plant biodiversity. Various research activities are conducted in scientific and educational institutions based on these collections, including genetic, physiological, biochemical, and breeding studies. Issues of preservation are addressed using both traditional and biotechnological methods, gene banks are established, and so on [1-14].

This year marks the 130th anniversary of the founding of the Federal Research Center "Subtropical Scientific Centre of the Russian Academy of Sciences" (FRC SSC RAS). On April 12, 1894, by the order of His Majesty Emperor Alexander III, the Sochi Agricultural and Horticultural Experimental Station was established, tasked with the introduction and study of plants significant to the region and distributing them among the local population. From that moment on, a genetic collection began to form for conducting various investigations. In the 1930s, a new task emerged - obtaining domestic varieties adapted to local growing conditions. At the initial stage, breeding research was carried out on

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subtropical and fruit crops, focusing on obtaining frost-resistant varieties of mandarin, high-yielding varieties of plum, fig, and hazelnut. Later, tea, persimmon, feijoa, azimina, actinidia, apple, peach, and ornamental crops (carnation, tulip, hippeastrum, freesia, gerbera, chrysanthemum, pelargonium, anemone) were also included [15].

2 Materials and methods

The research was conducted in the conditions of the humid subtropics of the Krasnodar Region. The unique climatic conditions of the Black Sea coast allow for the cultivation of many heat-loving plants in the area. The bioresource collection of the Subtropical Scientific Centre is preserved and maintained in living form and consists of 800 cultivar samples of subtropical crops and more than 2,000 ornamental flowers (Table 1). The collection was replenished with both introducents from different climatic zones of the globe and varieties developed within the Centre. New varieties were obtained using distant and interspecific hybridization, polyploidy, mutational variability, clonal selection, as well as nucellar polyembryony. The research was conducted using classical and modern introduction and breeding methods and techniques.

Table 1. Collections of the Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences, where breeding research is conducted.

Bioresource collection	Quantity, pcs	
	Total	Varieties selected by the Centre
Subtropical Technical Crops	33	6
Subtropical Fruit Crops	127	12
Citrus Crops	144	10
Nut Crops	233	18
Stone Fruit Crops	95	2
Seed Crops	108	7
Berry Crops	13	1
Bulbous and Bulbotuberiferous Crops	320	94
Pelargoniums	156	59
Perennial Herbaceous Flowering Crops	446	41
Chrysanthemums	54	22
Rare, Endangered, Endemic Species of Natural Flora	83	5
Total	1 812	277

The results of breeding research over the past 6 years are presented in this work. In particular, descriptions of varieties registered in the State Register of breeding achievements approved for use are provided.

3 Results

As a result of breeding research conducted at the Centre, 277 varieties of subtropical technical and fruit, seed, stone, berry, and flower crops have been obtained. Over the past 6 years (2019–2024), the bioresource collection has been replenished with new varieties resistant to biotic and abiotic environmental factors, possessing high yield, fruit quality, productivity, and ornamental value (Table 2).

Table 2. Replenishment of the bioresource collection of the Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences with varieties of the Centre's breeding in 2019–2024, pcs.

Culture	2019	2020	2021	2022	2023	2024
Anemone	7	5	-	2	2	5
Freesia	3	-	1	1	2	4
Chrysanthemum	-	-	-	-	2	1
Geranium	10	5	-	5	5	5
Mandarin	-	-	-	-	3	-
Persimmon	-	-	1	-	1	-
Hazelnut	3	-	-	-	-	-
Total	23	10	2	8	15	15

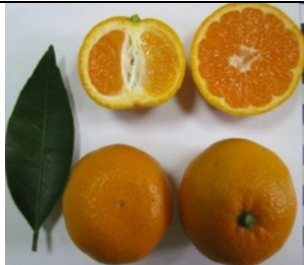

The result of targeted breeding research was the inclusion of 65 varieties of flower crops and 8 subtropical fruit and nut crops in the State Register of breeding achievements approved for use in 2019–2024. The largest number of varieties was registered in 2019 – 23, the minimum in 2021 – 2.




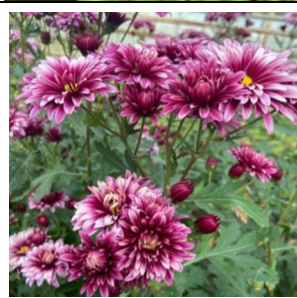
Over the past years, the highest percentage of pelargonium varieties has been registered – 41 %, followed by anemone at 29 %, freesia at 15 %, and chrysanthemum, mandarin, and hazelnut each at 4 %, and persimmon at 3 %.

In addition to developing new varieties, which are a practical result of breeding research, the Center has developed the theoretical basis for creating hybrid forms with a set of specified characteristics, constant seed lines; correlative relationships have been identified to select promising forms at early stages of ontogenesis. The chromosome numbers of the studied varieties and hybrids have been determined by various methods.

Next is a description of some new varieties (Table 3).

Table 3. Description of some new varieties.

Main information	Photo	Brief description
Mandarin (<i>Citrus unshiu</i>) 'Academic' Copyright certificate No. 86397 Patent for breeding achievement No. 12966 Authors: Kulyan R.V., Gorshkov V.M., Ryndin A.V.		Tree of medium size with a compact crown. Parthenocarpic fruiting. Average yield - 52.5 t/ha. Fruits are uniform, with an average weight of 87.5 g, round-flattened. The variety is resistant to diseases and pests
Persimmon (<i>Diospyros kaki</i>) 'Zuhra' Copyright certificate No. 86399 Patent for breeding achievement No. 12965 Authors: Omarov M.D., Omarova Z.M.		Medium-sized tree with a compact crown. Average yield - 80.0 t/ha. Large, uniform fruits with an average weight of 120-155 g. The variety belongs to the varying group, resistant to diseases and pests

<p>J.I.B.Hazelnut (<i>Corylus pontica</i>) 'Anastasia' Copyright certificate No. 58506 Patent for breeding achievement No. 9976 Authors: Makhno V.G., Ryndin A.V., Cherepenina L.V.</p>		<p>Medium-sized tree with an oval crown. Average yield - 12.1 t/ha. Large, uniform fruits with an average weight of 2.5 g. The variety is relatively resistant to pathogens, with moderate winter hardiness</p>
<p>Freesia 'Olenka' Copyright certificate No. 86048 Patent for breeding achievement No. 12748 Author: Pashchenko O.I.</p>		<p>Plant is tall. Non-double flowers, with a diameter of 6.1 cm. Flowering period - 35 days. Vase life - 8-10 days. Good transportability. The variety has high resistance to mosaic virus, aphids, and good bulb storage quality</p>
<p>Anemone 'Danaya' Copyright certificate No. 75423 Patent for breeding achievement No. 10570 Author: Kozina S.V.</p>		<p>Plant height 20.7 cm. Non-double flower, with a diameter of 10 cm. Flowering period - 52 days. Vase life - 9 days. Good resistance to adverse weather conditions, moderate winter and heat resistance</p>
<p>Chrysanthemum 'Matsyesta' Copyright certificate No. 86064 Patent for breeding achievement No. 12740 Authors: Slepchenko N.A., Yakushina L.G.</p>		<p>Plant height 140-145 cm. Strong flower stem. Semi-double flower heads, with a daisy-like disc. Flowering period - 30-32 days. Cutting productivity - 100 pcs/sq. m. Vase life - 20 days. The variety is resistant to diseases and pests, moderate drought resistance, good winter hardiness</p>

4 Conclusion

As a result of breeding research conducted at the Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences in 2019-2024, 73 varieties resistant to the conditions of the wet subtropics of Russia have been created, the bioresource collection has been enriched with new valuable adaptive genotypes. In recent years, 30 varieties of pelargonium, 21 of anemone, 11 of freesia, 3 of chrysanthemum, mandarin, and hazelnut each, and 2 of persimmon have been obtained.

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