

PROBLEMS AND PROSPECTS OF FLORICULTURE AND URBAN LANDSCAPE IN HUMID SUBTROPICS OF RUSSIA

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Abstract

The region of Russian humid subtropics is quite small. Unique climatic conditions are favorable for growing subtropical plants, including flower-and-ornamental ones. One of the Russian leading research institutions in the field of floriculture is All-Russian Scientific and Research Institute of Floriculture and Subtropical Crops of the Russian Academy of Agricultural Sciences. One of the most important research guidelines of the Institute is creation, completion and maintenance of genetic collections, which number more than 2000 cultivar samples. Available genotypes are used during selection works to produce new varieties, select and create donors and sources of economically important features. The collection of flower-and-ornamental cultures (*Dianthus* L., *Chrysanthemum* L., *Gerbera* Gronov, *Eustoma* Salisb., *Rosa* sps., *Hydrangea macrophylla* Ser., *Syringa vulgaris* L.), rare and endangered species of *Campanula sclerophylla* (Kolak.) Czerep., *Pancratium maritimum* L., *Lilium caucasicum* (Misch. ex Grossh.), as well as citrus and other crops is maintained *in vitro*. The research issues on getting flower cuttings are actual. This is distillation of small-bulbed plants of *Galanthus* L., *Leucojum* L., *Narcissus* L., *Muscari* Mill.; staffage greenery (*Cyrtomium* C. Presl., *Asparagus* L., *Formium* L., *Fatsia* Decne & Planch, etc.). Currently, our institute is working out a program of floriculture development together with the Subtropical Botanical Garden of Kuban, "Chamber of Eurasian florists" and the Department of Environment and Forestry Management of Sochi Administration.

Key words: floriculture, urban landscape, flower-and-ornamental cultures, Sochi, humid subtropics

Humid subtropical zone of Russia is not big; it is the region of Big Sochi: the coastline of the Black Sea is 145 km long totally. Unique climatic conditions are quite favorable for cultivation of many subtropical plants, including ornamentals. Famous Russian scientist N. I. Vavilov emphasized the importance of the region: "Tropics and subtropics are of exceptional interest for crop production, because the vast majority of crops cultivated in our country and Europe originate from the mountainous subtropical areas" (Vasilev, 1930).

One of the leading research institutions in Russia in the field of floriculture is the All-Russian Scientific and Research Institute of Floriculture and Subtropical Crops – Russian Academy of Agricultural Sciences. It was founded in 1894 as Sochi Agricultural Experimental Station, later, in 1967 it was reformed to the Research Institute of Mountain Horticulture and Floriculture. All that time it was functioning in the field of southern floriculture development, first in the USSR and then in Russia. Institute scientists were breeding new cultivars of flower plants, and the best cultivars of foreign selection were introduced. Technological schemes of growing flower plants were developed, including winter distillation of bulbous plants, storage of bulbs and rapid reproduction techniques. Studies were

conducted on the introduction of native flower plants to the culture, as well as on obtaining of the flower cuttings in greenhouses of a lightweight type (Vorontsov, 1968; Vakula, 1986; Bolgov, 2001).

Currently, one of the main research areas of the Institute is creating, updating and maintaining the genetic collections, which number more than 2000 cultivar samples, from which 858 are floral cultures, 242 – herbaceous perennials, 153 – ornamental herbaceous species of natural flora, 169 – ornamental woody plants.

The valuable genotypes in the collections are used in selection work with the aim to obtain new cultivars, allocate and create donors and sources of valuable features. The collection of flower and ornamental crops (*Dendranthemum* Des Moul., *Dianthus* L., *Eustoma* Salisb., *Gerbera* Gronov, *Rosa* L., *Hydrangea macrophylla* Ser., *Syringa vulgaris* L.) is retained *in vitro*, as well as the collections of rare and endangered species (*Campanula sclerophylla* (Kolak.) Czerep., *Lilium caucasicum* (Misch. ex Grossh.) Grossh., *Pancratium maritimum* L.) and various citrus and other crops.

The collection has constantly been fulfilled by the most valuable and selectively promising cultivar samples of flower and ornamental plants, as well as rare

and endangered species from natural flora. Breeders of the Institute have obtained 24 cultivars of *Hippeastrum* × *hibrida* hort., 16 – *Freesia* × *hybrida* hort., 10 – *Pelargonium zonale* (L.) L'Herit., 8 – *Dendranthemum* Des Moul., 4 – *Anemone coronaria* L., 4 – *Primula* L., 3 – *Gerbera* Gronov, 1 – *Paeonia* L. and included them to the State register of breeding achievements of Russia.

The Institute, together with Sochi branch of the Russian Geographical Society and the State Corporation "Olimpstroj" worked hard to preserve rare and endangered herbaceous plants in areas designated for construction of Olympic objects, relocated to other areas, as well as in *in vitro* conditions.

Research results in the field of floriculture and ornamental horticulture are relevant and popular. The works of the Institute scientists have been repeatedly awarded at exhibitions, competitions and conferences. The following papers were awarded with Gold medals at the Russian Agricultural Exhibition "Zolotaya osen": "Ornamental herbaceous species from natural flora of the Northwest Caucasus (Biological features and recommendations for their propagation)", "Improvement of methods of obtaining improved *Dendranthemum* planting material *in vitro* for the production of high quality floral products", and "Promising assortment of resistant and highly-ornamental cultivars of *Hydrangea macrophylla*, applying physiological methods of rapid diagnosis"; *Pelargonium zonale* 'Nezhnost' was awarded as well.

It should be noted that Russian subtropical region has been intensively developed. This is due to the preparations for the XXII Olympic Winter Games and XI Paralympic Winter Games 2014 and development of the resort infrastructure. In this regard, there is a massive importation of planting material from foreign nurseries without a proper compliance with the phytosanitary regulations.

Currently, the flower market in the region is full of products imported from European countries with a colder climate, which means these products are not in harmony with subtropical vegetation in the given region. These are mainly different cultivars of *Brassica crispera* Rafin., *Primula veris* L., *Viola* × *wittrockiana* Gams, and similar flower plants. Whereas *Browallia speciosa* Hok., *Coleus blumei* Benth., *Euphorbia millii* Boiss and many other subtropical species were previously planted in the region in large quantities. In addition, the flower beds areas have been increasing, while funding to maintain them in a proper condition has been decreasing.

Together with this, significant changes in the assortment that is sold in local flower markets served as a motive for changing research priorities of the Institute. Realizing that humid climate of the region prevents cost-effective production of high quality flowers, the Institute has stopped research in this direction. Unconventional floral cultures became recognized as

priority-oriented, as their profitable cultivation is possible in conditions of high humidity, increased pathogens and with minimum energy consumption. This is primarily winter forcing of some bulbous plants, such as *Galanthus* L., *Leucojum* L., *Muscari* Mill., *Narcissus* L.; it also industrial growing of the following staffage greenery: *Cyrtomium* C. Presl., *Asparagus* L. (evergreen species), *Phormium* L., *Fatsia* Decne. & Planch. etc. It is also cost-effective to obtain plants cultivated without shelter such as *Acacia dealbata* Link, *Hydrangea macrophylla* Ser., *Camellia* L., *Forsythia* Vahl and others (Karpun, 2014; Evsukova, 2009; Randin, Karpun and Kelina, 2013b).

At the same time, it is planned to focus on research of subtropical flower plants used in landscaping. Many perennial flower plants are admittedly related to the least expensive and most cost-effective plants group. Favorable conditions of Russian subtropics promote safe wintering of perennials and allow many of them to vegetate in the cold season, staying evergreen plants (Karpun, 2014). Favorable regional conditions allow to increase perennials assortment compared with other regions of Russia. These promising perennials include: *Acanthus* Tourn. ex L., *Agapanthus* L. Herit., *Ajania* P. Poljakov, *Anemone* L., *Bletia* Ruiz. & Pav., *Dorotheanthus* Deutsch., *Helleborus* L., *Hemerocallis* L., *Hypericum* Tourn. ex L., *Liriope* Lour. and others.

It should be noted that the soil-climatic, genetic and scientific potentials of Russian subtropical zone are rather high but used not fully and irrationally. There are not enough nurseries in the region; progressive technologies of planting material cultivation and propagation are not common, including micropropagation technique. Domestic demand is insufficient to form a full internal market; access to foreign markets is difficult because of logistical isolation of the region. All these facts prevent realization of on-site large volumes of floricultural products and significantly increase its cost beyond the region.

This situation contributes to the fact that the research results obtained by the Institute are not fully implemented, some of them are still unclaimed. Productive communication between the institute and producers is insufficient and random, which can be explained by financial capabilities of the parties as well.

There are many objective reasons limiting industrial production of flower production in the region, i.e.:

- expressed cold period with temperatures close to zero, and, as a consequence, high air humidity of the ground layer with the increased pathogens level, which does not prevent the cultivation of subtropical plants but makes it difficult to obtain marketable products, especially in winter;
- limited opportunities for the internal market and isolation from the rest parts of Russia, which complicates realization on the spot and makes it more expensive outside the region;

- expressed recreational orientation of the region and, as a consequence, an acute shortage of land for nurseries and flower farms.

This complicates the commercial production of ornamental plants, but does not make it impossible. While developing such production in the region, the identified limiting factors should be taken into consideration and their negative impact has to be eliminated on the basis of current situation on market, applying flexible marketing and modern technologies.

Thus, the adverse effects of climatic factors and increased activity of pathogenic microorganisms can be effectively neutralized by acting in several directions:

- Use translucent shelters of a lightweight frame type, which can be equipped with heaters. In some cases, such shelters may have only a roof, the presence of which can significantly reduce the humidity in surface air layer and limit the number of pathogenic microorganisms. Using such shelters, it is possible to obtain flower cutting (*Helleborus* L., *Galanthus* L., *Cyclamen* L.) and staffage greenery: fern fronds (*Cyrtomium* C. Presl. and similar), leaves (*Phormium*, *Fatsia*), branches (*Chamaecyparis* L. et al.); it is possible to grow container plants such as cultivars of *Pteris* L., variegated *Aucuba* Thunb. and the like.

- Grow native plants that are adapted to specific conditions of the winter period in the region, as well as grow those introduced plants species that acquire a salable condition during the summer vegetation season and can retain it in winter (*Aucuba*, *Hedera* L., various citrus fruits, etc.) without suffering from water logging.

- Use systemic preparations of a sustained effect that could protect cultivated plants from pests and diseases for a long time.

Consequences of a small amount at the local market and transport isolation of the region can also be sufficiently neutralized applying the following measures:

- Grow container plants with “double” purpose: those which can be realized in the region, mainly for landscaping, and in more northern regions as potted or tub plants. The range of such plants is large enough; these are ornamental plants: *Agapanthus africanus* Hoffm. gg., *Alpinia zerumbet* (Pers.) BL Burt & R. M. Smith cv. *Variiegata*, dwarf varieties of *Alstroemeria* L., varieties with beautiful fruits: *Solanum pseudocapsicum* L. and *Capsicum annum* L., variegated – *Carex* L., dwarf garden – *Dendranthemum*, *Crinum* L., dwarf varieties of *Gerbera* Gronov, *Hedychium coronarium* Koen., hybrids of *Hippeastrum* L., *Nerine* L., *Liriope muscari* (Decne.) LH Bailey cv. *Variiegata*, black-leaved *Ophiopogon planiscapus* Nakai cv. *Nigrescens*, miniature *Musa* L., dwarf varieties of *Phormium*, variegated form of *Rohdea japonica* Roth cv. *Marginata Minor*, variegated *Vinca* L. and others, as well as shrubs, mostly evergreen and dwarf *Ardisia*

japonica Blume, various *Aucuba*, varietal *Camellia* L., *Cocculus laurifolius* (Roxb.) DC, *Cuphea hyssopifolia* Humb. Bonpl. & Kunth, *Fatsia japonica* (Thunb.) Decne. & Planch., *Ficus pumila* L., double varieties of *Gardenia* L., *Hebe* × *andersonii* (Lindl. & Paxt.) Cockayne, varietal *Hedera*, dwarf varieties of *Hydrangea macrophylla*, small-leaved varieties of *Laurus nobilis* L., *Myrtus communis* L., double-leaved varieties of *Nerium* L., varietal *Rhododendron* L., *Sarcococca* Lindl., *Serissa foetida* (L. Fil.) Larn., *Trachelospermum jasminoides* (Lindl.) Lern. and others (Karpun, 2012a; Karpun, 2012b).

- While selecting the assortment of cut and container plants, it is necessary to give preference to those that are characterized by a prolonged merchantability period and have a stable overground part, which allows to transport them without losing merchantability.

Regarding the deficit of land suitable for the production, the solution is primarily to organize flower farms and nurseries in the region. As world experience shows, specialization of farms has been formed for a sufficiently long time, taking into account many factors. In our view, zonation by microclimatic conditions of the sites must serve as a basis for future specialization of nurseries and flower farms in the region, regardless of their form of ownership and taking into account the nature of mountain areas. Plants that can be quite profitable to grow in the seaside slope of the southern exposure cannot be cultivated at a long distance from the sea, and vice versa.

At the moment, the following problems must be solved for further successful development of floriculture in the region:

- optimize the range of subtropical flower and ornamental plants for landscaping purposes and develop recommendations for their use, cultivation and breeding;

- set up a list of flower and ornamental plants promising for production in nurseries and flower farms of the region on the basis of studying the existing features and objective marketing, and develop recommendations for their cultivation;

- develop interaction in the system “producer → seller → consumer”, providing the producers of floral products with information and scientific support (Randin and Kelina, 2013a).

The Institute methodically and consistently makes the necessary steps in this direction. These are roundtables where topical issues on the use of flower crops in parks construction of the region are discussed; business meetings of the Institute scientists with manufacturers of flower production, on which they discuss landscaping problems, market needs of flower production, development of local nurseries, modern methods of control over pests and diseases of flowering plants and other topics of interest. Currently, a program of floriculture development in South Russia is under de-

velopment in our Institute; it has also been developed by the staff of Subtropical Botanical Garden of Kuban, professionals of forestry management in Sochi Administration and Eurasian Community House.

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