



Opinion

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Creating New Varieties and Hybrids of Agricultural Plants



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Opinion

Of about 39,000 species of higher plants that grow on earth, only 400 are used for food. The first to notice this fact was N.I. Vavilov. Vavilov organized botanical-agronomic expeditions, covering all continents. He discovered ancient loci of intermutation of cultured plants on their territories and made a great contribution to the study of global plant resources and the origin, taxonomy, and geography of cultured plants.

Developing Vavilov's doctrine of genetic resources creatively, scientists of the RAS Division of Agricultural Sciences annually organize 12-20 expeditions to collect genetic materials.

The total genetic pool of agricultural crops kept at the institutes comprises over 370,000 specimens (32,540 VIR samples and 50,000 samples at other institutes). The genetic pool of agricultural crops is annually replenished with 260-350 high-quality varieties and hybrids using state-of-the-art genetic-breeding methods, including biotechnological ones with molecular genetic marking.

In Russia, 42 breeding centers function in all regions that work with economically valuable agricultural and medicinal crops. In recent years alone, the breeders of the Krasnodar Research Institute of Agriculture have used genetic bridges (especially triticale) to replenish the grain crop gene pool with 100 energy-efficient winter wheat varieties with high compensatory properties. The cost of creation of one variety is \$6.8-\$8.9 mln. For example, the winter wheat variety Grom cost \$6.8 mln.

The development of highly adaptive varieties is a priority task of stabilizing crop production in the harsh continental climate zone (the Volga Region). A classic example is selective breeding of spring wheat at the Agricultural Research Institute for the Southeast Region (ARISER), where an entire trend of breeding

varieties with an improved root suction force (25-32 atm) has been formed using the global gene pool.

Soybeans are a major source of plant protein. The Institute for Soybean Research replenished the soybean gene pool for the conditions of the Far East with productivities of more than 3-4 t/ha; VN11MK and VNIIZBK created soybean varieties for the Southern mid Central regions of Russia with a productivity of 3 t/ha.

Domestic breeders produced the promising columnar apple tree varieties (All-Russia Research Institute of Fruit Crops, All-Russia Selection-Technological Institute of Horticulture and Nursery) that combine scab immunity (gene Vf), winter hardiness (-41 °C) and highly marketable fruit properties.

Vegetable scientists have developed technologies and methods of expanding genetic diversity, accelerating vegetable crop breeding, obtaining raw materials and products for functional nutrition, and reducing the contents of radionuclides and heavy metals in crop output. A genetic collection of donors of economically valuable potato characters was formed.

Our country has a powerful potential to produce

Phyto preparations, since folk medicine uses 2000 plant species and traditional medicine-326. For Phyto chemical studies on wild-growing plants, the VILAR scientists collect them in various regions of Russia. VILAR has the country's only Botanical Garden of Medicinal Plants, which grows 1272 plant species of 93 families, including 256 tree and shrubby species, 921 grass species, and rare and endangered species. The greenhouse complex contains 373 tropical and subtropical plant species. The Botanical Garden's seed collection has 407 medicinal plant species. There is a unique herbarium with 78

600 specimens of 198 families, 1633 genera, and 20 748 species. On the basis of the genetic pool available, VILAR created varieties and developed over 100 medicinal products.

The priority tasks in studies on genetic resources are Russia's floristic diversity and resource, potential; the improvement of the strategy and modern methods of seeking plant genetic resources; the development of scientific basics of the reliable

conservation, comprehensive study, and rational use of genetic resources of cultured plants and their wild congeners; the amplification of molecular genetic monitoring of the genetic pool in crop production and the creation of a bank of transgenic plants; the expansion of methods of molecular genetics to identify new genes, regulatory elements, and physiological-biochemical mechanisms; work in molecular breeding.



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