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SHORT COMUNICATION

Conservation and using of grapevine genetic resources in the Republic of Moldova for pre-breeding stage

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Abstract

Accumulation, conservation and sustainable using of grapevine genetic resources in the Republic of Moldova allowed creation of actual grapevine assortment, satisfactory adapted to local meteorological conditions. Biological material derived from previously breeding programs and newly mobilized genotypes created premises for future improvement of assortment aimed, particularly, to diversification of table grape assortment: early maturation, seedless and big berry, various directions of utilization of grapes, advanced resistance to unfavorable abiotic factors of environment. Some of preliminary tested seedless genotypes confirmed high potential of regeneration of immature embryos and receptivity to in vitro cultivation of obtained plantlets.

Keywords: genetic resources, grapevine, pre-breeding program, assortment

Introduction

Grapevine assortment in the Republic of Moldova was diversified during the last 40 years as a result of accumulation and using in breeding programs of grapevine genetic resources from various viticulture centers of the world (GH. SAVIN [1]). Actually in the Register of Plant Varieties are registered 29 varieties for table grape, 35 for wine, 6 seedless varieties and 10 varieties recommended for alimentary products (REGISTRUL [2]). Among them are 16 new creations of our institute and 3 old autochthonous varieties. Derived both from intraspecific (*V.vinifera*) and interspecific crossings, a part of newly created varieties have medium and increased resistance to winter conditions, pest and diseases.

An important achievement of actual assortment is the presence of seedless varieties, completely absent between the traditional autochthonous cultivars. Recently created seedless varieties and elites (Apiren alb, Apiren roz et. al) destined for the consumption of fresh grapes, revealed comparatively advanced resistance to winter conditions and diseases (GH. SAVIN & al. [3]). In addition, some of them also can be used in production of must, juice, compotes, marinade, jam and raisins. All new created varieties need a reduced number of chemical treatments, so reducing the chemical pressure on environment, allows application of energy-saving technologies and can be included as component of sustainable viticulture.

Creation of new varieties with large bunch and berry, early stage of full maturity of berries, seedless berries, resistant to winter conditions, were formulated as purposes for future improvement of assortment. Biological material derived from previously breeding programs and newly mobilized grapevine genetic resources created premises for this progress (GH. SAVIN [4]). In this paper some characteristics of biological material accumulated at pre-breeding stage and general principles for future breeding scheme are presented.

Materials and Methods

Grapevine Genofond of the institute is situated on Southern part of Chisinau, in the Central zone of Republic. The length of active vegetation in this zone is about 175-185 days with the sum of active atmospheric temperature equal to 3000-3200 ºC and annual sum of precipitations equal to 265-315 mm. The mean air temperature in the warmest month (July) is 20,1…22,0 ºC and in the coldest month (January) is -3,5…-4,5 ºC, but minimal temperature can fall up to -29…-35 ºC.

Grapevine genotypes mobilized during the last 20 years from many viticulture centers of the world were evaluated and introduced in the Institute Collection (Genofond) (GH. SAVIN & al. [5]). Accumulated biological material was preserved both in greenhouse-solarium and in the field conditions using different modifications of the bud-grafting method. The applied technological procedures on experimental plots correspond to traditional ones for our country. Description and evaluation of genotypes was effectuated according the general accepted methodology (AGROUKAZANIYA [6]; OIV DESCRIPTOR [7]).

Result and Discussions

Main formulated principles during the mobilization of genotypes were: early time of maturity of berries, high accumulation of sugar, large bunch and berry, seedless berries, improved resistance to abiotic and biotic unfavorable factors of environment. Lately some valuable genotypes were accumulated in other production units of our country (e.g. "SAURON" S.R.L.). Evaluation of these resources denoted presence of a wide variety of characteristics: long and very long bunches and berries, muscat and other specific flavors, various shapes and time of maturity of the berries (e.g. Victoria, Codreanca (Black magic), Lora, Arkadia, Talisman, Down seedless, Loose Perlette, Summer muscat, Summer royal, Beauty seedless etc.) (Table 1).

Table 1. Diversity of grapevine genetic resources involved at pre-breeding stage (fragment)

Name of genotype	Country of origin	Length of bunch ($^{+}$OIV 202)	Berry			Maturity of berry (OIV 241)	Degrees of resistance to winter conditions^{++}
			length (OIV 220)	color of skin (OIV 225)	particular flavor (OIV 236)		
Arcadia	Ukraine	7	9	1	1	3	7
Codreanca	Moldova	7	9	7	1	3	7
Kirghizchii rannii	Kirghiz-stan	5	5	1		1-3	5
Muscat timpuriu de Bucureşti	Romania	5	5	1	2	3	5
Suvenir cernăi	Ukraine	5	7	5	4	5-7	7
Victoria	Romania	9	9	1	1	5	5
Prezentabil	Bulgaria	7-9	7	1	1	3	7
Seedless varieties							
Apiren alb	Moldova	7	3	1	1	5	5-7
Apiren negru de Grozeşti	Moldova	5	1	6	1	7	7-9
Apiren roz	Moldova	7	5-7	2	4	5	5-7
Apiren roz Basarabean	Moldova	3-5	1	2	1	5	7-9
Apiren roz extratimpuriu	Moldova	3	1-3	2	4	1	7-9
Bessemeannii	Bulgaria	7	5-7	1	1	7	5

ghibrid V-6							
Calina	Romania	5	1-3	2	1	5	5
Centennial seedless	USA	5-7	7	1	2	3	3
Flame seedless	USA	9	5	3	1	3	3
Kişmiş lucistîi	Moldova	7	5	2	4	3	3
VIII-1-24	Moldova	7-9	5	5	1	5-7	3
XI-37-38	Moldova	7-9		5	1	7	5

[+] Codes according OIV DESCRIPTOR [7]
[++] adopted scale from 1 (low resistance) to 9 (very high)

Concerning the percent of lost buds after unfavorable winters, this value was less than 40% for all new created varieties (according average data for 2006-2009). Smallest values were for Apiren negru de Grozesti (12, 7%) and Apiren roz extratimpuriu (17, 4%).

There are some varieties with high accumulation of sugar, important for technological processing of berries: Centennial seedless (219, 0 g/dm^3), Interlaken (240, 5 g/dm^3), Apiren negru de Grozesti (230, 0 g/dm^3) and Apiren roz extratimpuriu (265, 0 g/dm^3).

Some of preliminary tested seedless genotypes confirmed high potential of regeneration of immature embryos and receptivity to *in vitro* cultivation of obtained plantlets: the ratio of ovules with viable embryos was higher for Apiren roz Basarabean (30, 5-34, 5%) and the elite I-15-15 (27, 1-32, 2%) and the rate of embryos conversion into plant reached maxim value for Apiren roz extratimpuriu (42, 1%) and I-15-15 (35, 6%) (GH. CHIRIAC & al. [8]).

Accumulated at pre-breeding stage valuable biological material, obtained by *in vitro* techniques, created premises for future initiation of effective breeding programs, including also seedless x seedless crossing (Figure 1).

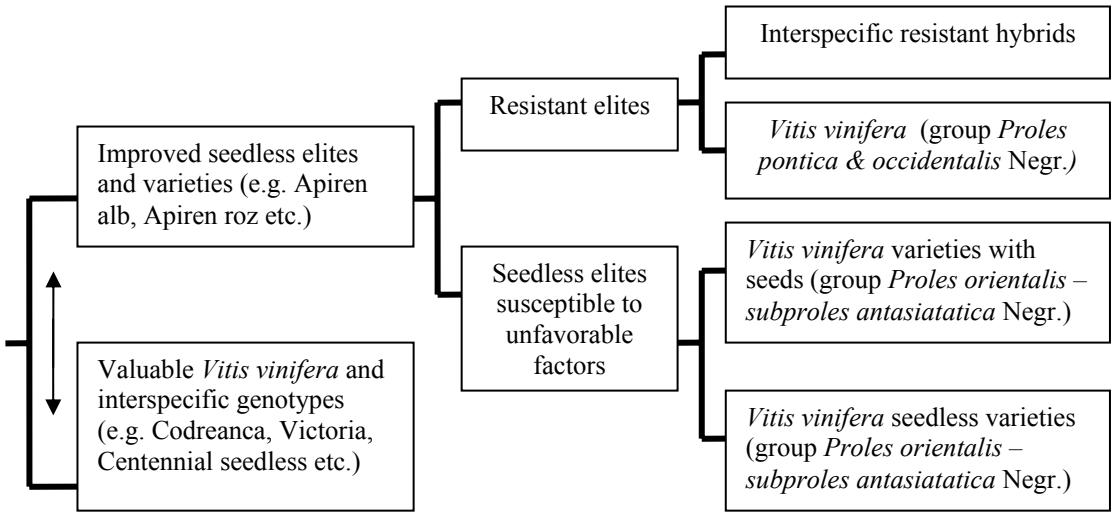

Fig. 1. Evolution of obtained biological material for pre-breeding stage

According to ŞT.TOPALĂ [9], distance hybrids DRX-M$_5$ (with the participation of *V.rotundifolia*) have a very low susceptibility to *Phylloxera vastatrix* on roots. The morphological and anatomical studies (V. CODREANU [10]), on a part of our Genofond collection marked out some genotypes from Caucasus, Middle Asia as well as old autochthonous varieties with potential resistance to drought. According to different sources (e.g. http://vine.com.ua/sorta/), and results reported in our breeding programs (The Research Institutes from the former USSR - Chisinau, Yalta, Odessa, Novocherkask), during the last 25 years a flow of new grapevine varieties were obtained, including some obtained by private

breeders. Future evaluation of these resources and of wild grapevine genotypes still present in the natural habitats, will supplement the existing biodiversity of the initial biological material necessary for breeding programs.

Conclusions

Continuous process of preservation, conservation and evaluation of grapevine genetic resources allowed:

- Enlargement of grapevine assortment with new valuable varieties: seedless, resistant to unfavorable conditions of environment, especially to winter conditions;

- Accumulation and creation at pre-breeding stage of a wide biodiversity of biological material important for future improvement of assortment: long and very long bunches and berries, muscat and other specific flavors, various shapes and period of maturity and ripening, relative resistance to unfavorable abiotic factors of environment;

The seedless genotypes belonging to our collection, expressing high *in vitro* regenerative potential from immature embryos, are considered as the most valuable genetic resources for further breeding programs.

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