EVALUATION OF DIVERSITY OF SEGMENT OF GRAPEVINE GENETIC RESOURCES IN CONTEXT OF CLIMATE CHALLENGES

EVALUAREA DIVERSITĂȚII UNUI SEGMENT AL RESURSELOR GENETICE ALE VIȚEI DE VIE ÎN CONTEXTUL PROVOCĂRILOR CLIMATICE

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Abstract*. In the paper is presented a segment from the diversity of the grapevine genetic resources accumulated in the Genofond of the Research and Practical Institute for Horticulture and Food Technologies: varieties for table grapes with early maturation, seedlessness. About 30 varieties were highlighted, including with increased or advanced resistance to abiotic and biotic unfavorable factors. Described genotypes represent a wide diversity by genetic origin, the color of the berry, the agrobiological properties. The highlighted sources of useful features are proposed for harness in grapevine breeding, modernization of assortment, inclusivelly in the context of climate challenges.*
Key words*:* grapevine, genofond, genetic resources, assortment, resistance

Rezumat. *În lucrare este prezentat un segment din diversitatea resurselor genetice ale viței de vie acumulate în Genofondul Institutului ştiinţifico-Practic de Horticultură şi Tehnologii Alimentare: genotipuri cu struguri pentru masă cu maturare timpurie, apirenie. Au fost evidențiate circa 30 soiuri, inclusiv cu rezistență sporită sau avansată la factorii abiotici şi biotici nefavorabili. Genotipurile descrise reprezintă o diversitate largă privind originea genetică, culoarea bobului, însuşirile agrobiolgice. Sursele de caracrtere utile evidențiate sunt propuse pentru valorificare în ameliorarea viței de vie, modernizarea sortimentului, inclusiv în contextul provocărilor climatice.*
Cuvinte cheie*:* vița de vie, genofond, resurse genetice, sortiment, rezistență

INTRODUCTION

In the context of Climate Change (CC), defined by the UN by the Rio Convention in 1992 (1992 United Nations Framework Convention on Climate Changes, 1992) and the challenges that follow for humanity, is intensifyed the influence of the main factors in the center of which the breeder operates: the environment, increasingly changing, unpredictable; the dynamic demands of the market and society; the diversity of plant genetic resources, in general, and those of grapevines in particular, which require new strategies and methods in their conservation, evaluation and use. For the Carpathian-Danubian-Pontic region, as a cradle of autochthonous vitiviniculture, the role of genetic resources is primordial

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for the further progress of the branch, their importance deriving also from the complexity of the CC phenomenon.

Synthesis works of the publications on the impact of CC on the vitiviniculture sector (Mozell *et al.,* 2014; Sacchelli *et al.,* 2016) highlights the multifaceted aspects related to this phenomenon: global warming, as a result of increasing the concentration of greenhouse gases; changing the conditions in the cultivation areas of varieties destined to produce qualitive wines; modification of the chemical composition and quality of the wines, including as a result of the modification of the phenological parameters; raising the sea level, which will affect the areas occupied by the vineyards, firstly in the recognized wine regions; increasing the number of diseases caused by pathogens and pests, their degree of virulence; the implicit socio-ecological and socio-economic effects; the procedures proposed to mitigate these effects.

In order to increase the adaptability of the varieties to the climatic challenges, the breeding of grapevine is of major importance (Savin, 2014; Audeguin *et al.,* 2015), and the breeder's task is to broaden and harness the genetic basis of resistance using the diversity of genetic resources. Lately, plant breeding has advanced by the development and use of molecular marker systems, which aim to accelerate and streamline the obtainment with high accuracy of plant resistance traits and their practical achievements in grapevine breeding (Laucou *et. al.,* 2018; INTEGRAPE, 2019).

The diversity of grapevine Genepool has been and continues to be a precondition for the long-term development of the vitiviniculture sector of the Republic of Moldova (Savin, 2014). In this context is presented a segment of the diversity of grapevine genetic resources accumulated in the Genofond of the National Institute of Vine and Wine, currently the Scientific and Practical Institute of Horticulture and Food Technologies (ISPHTA).

MATERIAL AND METHOD

The studies have been carried out during the two last decades within the grapevine Genofond of ISPHTA, located in the southern part of Chisinau city (46°58′39.65″ N şi 28°46′21.68″ E, altitude 201 m). The weather conditions of the experimental sectors correspond to the conditions of the wine region Codru of the Republic of Moldova and represent the average values for the republic.

The study included genotypes accumulated in Genofond from various vitiviniculture centers of the Earth, varied by genetic origin, the agrobiological properties. Planting scheme 3.0 x 1.25 m, the training system is bilateral cord on high trunk (60 cm). The ampelographic description was made according to the OIV Descriptor (2009).

RESULTS AND DISCUSSIONS

The completion of the current Genofond, composed by the Ampelographic Collection (founded in 1982) and the adjacent sectors, was made, partly, by the transferring the resources from the previous Ampelographic Collection. From the

literature were located the genetic sources with precocity (early and very early), resistance to frost, diseases and pests, seedlessness and, eventually, combinations of these traits. As a result of the expeditions, the exchange of biological material and introduction has been accumulated a valuable Genofond, which at the present stage includes genotypes from 67 vitiviniculture centers of the world (Savin, 2012).

The objectives of researches were the evaluation and documentation of the diversity of accumulated genotypes according the criteria: time of maturity; grape and berry size and attractiveness; quality, including seedlessness; resistance to diseases and pests; increased fertility.

In the group of genotypes with very early time of maturity of the berry, approx. 30 genotypes were highlighted, which can be proposed as genetic sources of earliness (and quality) (tab. 1). Some of them showed an advanced resistance to low temperatures, powdery and downy mildew. It is noted by the increased productivity potential and the advanced percentage of fertile shoots varieties Aromat de Iaşi, Belgradkii rannii, Elegia, Muscat timpuriu de Bucureşti. Genotypes with traits necessary to improve the assortment of grape varieties for table are also present in other ripening times, in particular - late ripening, large berry, presence of aroma, relative or increased resistance to wintering and pathogens: Antigona (YUG), Doci Nimranga (RUS), Vostorg idealinâi (RUS), Xenia (ROM) et al.

The grapevine genofond has an essential role in the creation of seedless varieties. In the context of completing the quantitative and qualitative traits of the assortment, the diversity of the seedless genotypes existing in the Genofond was supplemented with new sources of seedlessness (tab. 2). The varieties Kiş-mis AZOS, Rusbol, Kiş-miş unicalinâi are characterized by complex resistance to unfavorable conditions. The wide diversity of seedless genotypes, introduced in Genofond, seedless varieties and elites created within the institute (Savin, 2012; Savin, 2018) allow to select, evaluate them in order to identify the premises for diversifying the existing assortment: extending the consumption period of the fresh grapes with very early and early varieties, but also late; multiple biological resistance to unfavorable abiotic and biotic factors, reduction of chemical pressure on the environment; potential for obtaining natural, organic products.

The grapes are highlighted by the ability to accumulate, mainly, glucose and fructose, and the seedless varieties tend to accumulate more fructose than glucose, so they are beneficial for sufferers of gastrointestinal diseases and diabetes. In this sense the biological material has a high healing potential, unexplored. As a separate position we highlight the seedless varieties as raw material for industrialization, which are at the beginning of their wide use, offering, in this regard, wide opportunities for the diversification of grape products (including the production of jam, juice, must, marinated, raisins, homogenized, wines and distillates, etc.), as well as job creation.

Table 1

Genotypes with very early – early time of berry maturity (fragment, grapevine Genofond of ISPHTA)

Name of genotype	Contry of origin	Genetic origin	Berry color	Direction of use	Specific particularities
Alma-Atinskii ranii	KAZ	Madelein Angevine n.p.	green yellow	table grapes	very early maturity; muscat flavor; medium resistance
Aromat de Iasi	ROM	Tămâioasă Românească n.p.	green yellow	mixed	medium maturity; muscat flavor; rezistance to frosts, powdery mildew
Arkadia	UKR	Moldova x Cardinal	green yellow	table grapes	early maturity; slightly muscat flavor; high productivity; resistance to downy mildew
Avgalia	RUS	Madelein Angevine x Galan	green yellow	table grapes	very early maturity; relatively resistance to pathogens
Azur	ROM	Coarnă neagră x Cardinal	blue black	table grapes	early maturity; slightly flavor; rezistance to frosts, drought
Belgradskii ranii	YUG	Afuz Ali x Bouvier	green yellow	table grapes	very early maturity; icreased productivity; medium resistance
Elegia	UKR	Shasselas severnaia x Fioletovâi ranni	rose	mixed	very early maturity; muscat flavor; advanced resistance
Kardisah	UKR	Cardinal x Chasselas severnaia	rose	table grapes	very early maturity; muscat flavor; sensitive to the frosts and diseases
Kievskii zolotistâi	UKR	Irsai Oliver x (Malengre ranni + Lignan)	green yellow	table grapes	very early maturity; muscat flavor; medium resistance
Kirghizkii ranii	KGZ	Madelein Angevine x Muscat Vengherschii	green yellow	table grapes	very early maturity; muscat flavor; medium resistance
Muscat Kubanskii	RUS	Malengre ranii x Muscat de Hamburg	green yellow	mixed	early maturity; muscat flavor; increased resistance
Muscat jemciujnâi	UKR	Ceaus rose x Perla de Csaba	green yellow	table grapes	very early maturity; muscat flavor; medium resistance
Muscat timpuriu de Bucuresti	ROM	Coarnă albă x (Regina viilor x Perla de Csaba)	green yellow	table grapes	very early maturity; muscat flavor; medium resistance

Table 2

Seedless genotypes (fragment, grapevine Genofond of ISPHTA)

Name of genotype	Contry of origin	Genetic origin	Berry color	Direction of use	Specific particularities
Călina	ROM	Braghină x Sultanină	rose	table grapes, industr.	medium maturity; good productivity and fertility; medium resistance
Centennial seedless	SUA	Gold x (Emperor x Pirovano 75)	green yellow	table grapes	early maturity; muscat flavor
Himrood	USA	Ontario x Kiş-miş alb	green yellow	table grapes, industr.	early –medium maturity; specific flavor; increased resistance
Interlaken	USA	Ontario x Kiş-miş alb	green yellow	table grapes, industr.	early maturity; increased resistance
Iubilei VIR-a	UZB	Pobeda x Kiş-miş negru	negru	table grapes, industr.	medium-late maturity; medium resistance
Kiş-miş AZOS	RUS		dark red violet	table grapes	medium maturity; advanced resistance
Kiş-miş Hişrau	UZB	Nimrang x Kiş-miş negru	green yellow	table grapes, industr.	medium maturity; medium resistance; transportability
Kiş-miş Novocerkaskii	RUS	Villard blanc x Mecita	green yellow - rose	table grapes	medium-late maturity; high fertility; increased complex resistance
Kiş-miş unicalinâi	RUS	Severnâi x Kiş-miş negru	rose - violet	table grapes, industr.	medium maturity; very productive; resistance to frosts; sensitive to dis.
Mecita	UKR	Ceauş rose x Kiş-miş negru	rose	table grapes	medium maturity; sensitive to the frosts and diseases
Otilia	ROM	Alphonse Lavallee x Perlette	dark red violet	table grapes, industr.	early maturity; good resistance to frosts, drought and diseases
Perlon	ARG	Emperor x Perlette	rose - violet	table grapes	medium-late maturity; sensitive to the frosts and diseases
Rusbol	RUS BGR	Villard blanc x Sverhrannii besemeannâi	green yellow	table grapes, industr.	early maturity; increased resistance
Tarnau	UZB	Nimrang x Kiş-miş negru	green yellow	de vin	medium-late maturity; medium resistance

Considering that some seedless varieties contain by 10-15% more juice, compared to varieties with seeds, it results in benefits (in yield of must) as a plus value. Due to the advanced resistance, the economic effect can be increased by significantly reducing the number of chemical treatments, compative with the sensitive varieties. After all, the use and exploitation of the potential of the latest generation varieties with multiple resistance to the unfavorable abiotic and biotic factors of the environment presents a promising beginning, of perspective through the diversification and sustainability of their productive and qualitative potential, as the basis of eco production.

CONCLUSIONS

In the context of mitigating the challenges of climate change, the studied genotypes represent a segment of the potential for the diversifying the qualitative and quantitative traits favorable for grapevine breeding and amelioration of assortment: very early maturing period - medium-late; the full range of colors of the grain; different degree of seedlessness; specific or muscat aromas; medium, large or very large grapes; increased fertility, diverse use in correlation with biological resistance to abiotic and biotic factors unfavorable to the environment.

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