

## CONTEMPORARY SPECIALITY OF INTRODUCTION AND WAYS FOR IMPROVEMENT OF VINE GRAPES ASSORTMENT IN BELARUS

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**Abstract:** The contemporary state of viticulture in Belarus has been analyzed. The social need and economic expediency of grape gardening development is shown. The feasibility of viticulture introduction in the republic agroclimatic zones on the basis of a large-scale *Vitis* nursery foundation (by using new resistant high-quality cultivars) is scientifically proved. The article presents the assessments of regionalized and new cultivars of *Vitis* for covered and uncovered crops; the perspective grape cultivars with high biological plasticity and winter-hardiness, which are the most promising ones as candidates for introduction, have been selected. The conclusion based on the long-term laboratory and field tests has confirmed that Belarus industrial vine growing is capable to provide high profitability and competitiveness of the corresponding production. Therefore, it is one of the most perspective branches in the general structure of gardening.

### INTRODUCTION

The first official mentions about viticulture on Belarus territory concern XVI century. Then grapevines arrived concurrently with Queen Bona Sforza d' Aragona [1]. But scientific foundations for grape wine introduction with regard to different climatic zones were developed by A.M. Negrul since 1938 [2] and the scholar proved successful attempts of cultivation were fulfilled in the Republic of Belarus (RB) by auspice of National Academy of Sciences (NASB) only at 1946-1958 on Central botanical garden vineyard (CBG of NASB, Minsk). Here rather big collection of *Vitis* cultivars (*cvs*) planted (predominately of early & super early grades). In separate years they yielded more than 100 metric centners of berries per ha. The sorted grapevines were assembled substantially from introduced European *V. vinifera cvs* (*Early Malengre, Madeleine Angevine, Chasselas White & Pink* etc.) – unfortunately those ones lacked ecological plasticity (stability), also froze slightly in severe winters and were long restored [3]. Further, a 'base station of viticulture' had established in more convenient climatic region of southern Belarus (near Pinsk city), that becomes a main source of ampelographic collection and local 'origin centre' for *Vitis* cultivar propagation. Now

Viticulture products are overwhelmingly important because of negative Chernobyl consequences and building in RB the Ostrovetskaya nuclear power plant: dark-red grapes are not only delicious berries but also contain the natural substances possessing high antioxidant & radioprotecting activities. That is why principal ampelographic collection (more than 400 cvs) are concentrated at village Samokhvalovichy (10 km southward from Minsk) by specialized Institute for fruit growing and Institute of experimental botany at Minsk (IFG & IEB, NASB). Now IFG, CBG and IEB carry out significant work on studying of adaptation and development processes concerning perspective grapes cvs & hybrids [4–7].

### MATERIALS AND METHODS

Analytical methods applied to analyze the situation that has developed in the Republic of Belarus on grapevine cultivars introduction and viticulture promotion. In addition, authors accomplished ampelographic long-term laboratory and field-tests.

### RESULTS AND DISCUSSIONS

As for climatic conditions all RB territory is of risky agriculture (located between 56° & 51° of northern latitude) and according to the international classification relates to the 5-th winter hardiness zone (WHZ 5, winter *T* diapason: from -23,3°C to -28,9°C) [5]. The total duration of plants vegetation period constitutes in Belarus 120...145 days depending on geographic latitude of region. The insolation levels vary from 3500 MJ/m<sup>2</sup> to 4100 MJ/m<sup>2</sup> [5, 6].

The essential changes of weather were not observed since 1881 (when tool supervision in Belarus has begun) until 1989. Steady warming of RB climate has begun in the late eighties of the XX century. A distinct trait of warming is appreciable increase of temperatures during the winter period and spring months. Summer also changed to some extent – August became warmer and more arid. The mid-annual temperature of air in Belarus has risen approximately on 1.1°C in comparison with previous ones. With all this going on for winter months, the temperature has raised on 3°C and for spring months on 2°C. Seasons were displaced almost on two weeks. Winter snow cover comes to naught. Depth of soil's freezing has decreased for 6...10 centimeters. Vegetation period begins for 15 days earlier [6].

Unfortunately, climate warming has not only positive, but also the negative effects. In particular, the droughts become customary for RB south (at Byelorussian' woodlands 'Polesye'). Occurrences of new phytoinfectious diseases were registered. Local warm winters often weaken the vital strength of plants in many respects.

Gradual expansion of northern borders of grapes and other thermophilic cultures is observed due to global warming of a climate. Perfection of grape assortment is quite natural process in Belarus. Because the republic industrial vine growing only arises, own selection of viticulture yet has not received development.

It is characteristic of the RB economic sector that practically all *Vitis* assortment is introduced. As is well-known, clonal selection (CS) serves as the considerable lever for increase of grapevine productivity in France, Germany, Hungary, but in RB, due to some obstacles, CS is absent.

Thus, viticulture of Belarus holds a formation stage. The works mainly aimed to search and select grapes *cvs* perspective for RB climatic regimes.

A future success in the vine repertory enrichment depends on cultivars ecological plasticity (including their positive reactions to technologies of cultivation) [7].

Note should be taken – northern viticulture gives some advantages. Thus, more durable winter period with low temperature in RB prevents development of *Viteus vitifolii* – quarantine grape pest phylloxera. In addition several hazardous grape diseases (grapevine fanleaf virus, grapevine yellow mosaic *virus*) are absent in Belarus. The grape fungal infections (powdery mildew, oidium, gray mold) are less aggressive due to moderate temperatures of *Vitis* vegetation period. Thus, a number of pesticide treatments is excluded or reduced to prophylaxis.

The *Vitis cvs* of Russian (*Krasa Severa*, *Cosmonaut*, *Cosmos*, *Agat Donskoj*), and Baltic (*Zilga*, *Supaga*) selection are already zoned (regionalized) in RB.

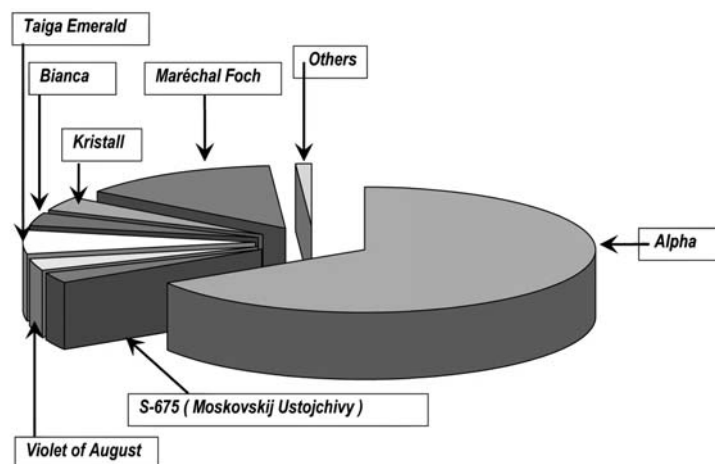
Biologically plastic & steady against diseases grape *cvs* (new for RB & of value for wine growing) are: *Bianca*, *Kristall*, *Platovskij*, *Augusta* & *Regent*, also of neukryvnyh grape varieties: *Maréchal Foch* & *S-675*. Now they are under the state variety trials. Among the perspective it is necessary to name as well other grapes of the Russian, Ukrainian, Moldavian selection. The big potential possibilities for assortment perfection represent the passing field tests complex-steady grapes: *Muscat Platovskij*, *Krasen*, *Citron Magaracha*, *Gift Magaracha*, *Riton*, and also dessert *cvs*: *Augustine*, *Euro Pleven*, *Nero*, *Delight Oval*, *Flame Seedless*, *Codreanca* etc. As for RB viticulture industry, because grape nurseries are absent, the choice of grapes *cvs* is limited and appreciably defined by available material. The diagram (Fig. 1) shows contemporary Byelorussian ratio of areas under grapevine *cvs* (the data of 2013). Thus, we denote the fact, that existing assortment requires serious improvement and perfection – taking into account considerable successes and achievements of *Vitis* selection (including regions of risky agriculture) [5, 7].

The choice of perspective grape's varieties conducted taking into account conformity of their biological requirements to climatic conditions of RB regions.

For instance, only about 60 grape *cvs* grow now on our partner's plantation of JSC «Pinskij wine producing factory». They acquired from the leading selection centres and vine nurseries of Russia, Ukraine, Hungary, Germany and USA. We want to choose the most proof and reliable from them (the most suitable to a climate of Belarus 'neukryvnyh'). Perspective grapes should correspond to following criteria: to be of high winter hardiness, to have a biological plasticity and a short period of vegetation. Besides, there is a plan to make a re-grafting of vines that already fructify

(*cvs Alpha, Moskovskij Ustojchivy, Taiga Emerald*) having replaced them on more valuable – corresponding to the international standards and EU requirements [5, 7].

*Vitis cvs* should be unpretentious, resistant to pests & diseases (1–2 credits) and at the minimal management to give stable rich berries' harvest of high quality.



**Figure 1.** Ratio of the areas under cultivated in Belarus grape's cultivars [7]

Some 'complex-resistant' sorts and hybrids were created during last decades by crossing the best Franco-American hybrids (FAH) and European *V. vinifera* (Table 1). For instance, rather new among 'neukryvnyh' vine *cv Frontenac* of American selection (University of Minnesota, 1996) is received by consecutive hybridization of six different grape's types and has the genetic formula: 25.96% *V. vinifera* + 2.05% *V. labrusca* + 11.00% *V. rupestris* + 7.81% *V. berlandieri* + 51.27% *V. riparia* + 1.91% *V. lincecumii* [7].

Table 1

**The areas occupied with new grape's cvs of the American selection (acres) [7]**

Cultivars	Vineyards younger than 4 years	Vineyards older than 4 years
<i>Marquette</i>	109,500	3,779
<i>Frontenac</i>	63,338	53,044
<i>Sabrevois</i>	7,592	6,003
<i>Frontenac Gris</i>	61,577	13,887
<i>La Crescent</i>	55,951	29,790
<i>Prairie Star</i>	12,954	9,703
<i>Brianna</i>	10,500	0,562
<i>Marechal Foch</i>	9,574	16,174
<i>St. Pepin</i>	4,274	4,462
<i>Bluebell</i>	2,056	7,185

As one can see from the data of Table 1, the industrial vineyards of USA (Wyoming, Wisconsin, Minnesota, Northern Dakota) exploits the best selection achievements: *Marquette*, *Frontenac*, *Frontenac Gris*, *La Crescent*, *Prairie Star*. Their qualities are at levels of the traditional European *cvs*.

The Belarus *Vitis*' growing experience [7] demonstrates additionally the greatest value of American selection reliable 'neukryvnyh' *cvs* (*Adalmiina*, *Prairie Star*) and some novelties (*Briana*, *Marquette*, *Frontenac Gris*, *Somerset Seedless*). They need not winter sheltering and can grow with a minimum of chemical protection – good possibility for the RB organic viticulture development. Certainly, northern organic vine growing is risky, but no more than any other new business. Not entering polemic, we will remind a known proverb: «Who does not risk – that does not drink some champagne»!

Now world practice already has assured example of successful organic vine agriculture. For example, Peru produced 'ecologically pure' grape berries for USA and European consumers due to special usage of new safe biopreparations for plant protection. The Peruvian winegrowers have taken advantage of unique regional climatic features (good insolation, heat abundance, minimal quantity of atmospheric precipitates) and of best world selection variety achievements (*Red Globe*, *Sugraone*, *Flame Seedless*, *Autumn Royal*) [7].

## CONCLUSIONS

Soon we plan to set additional nurseries (maternal plantations) of grapes on the territories of specialized organizations (CBG, IFG ... of NASB) and at some enterprises (JSC "Pinskij wine producing factory").

The creation of joint projects and the conclusion of contracts are expected with the interested partners & owners (rightholders, originators) of grape selection novelties (within the framework programs of the international cooperation). The purposes are: 1) receiving the right to study new *cvs* and their pertinences to the local RB conditions; 2) the best *cvs* reproduction and promotion through state variety trials (in limited scales – one subject of managing).

Development of the international cooperation is perspective on participation of Belarus in the programs of the specialized selection centers of vine growing (NIViW "Magarach" of UAAS at Yalta, VNIIViV at Novochoerkassk & etc.). We mean joint creation of new grape *cvs* (adopted for northern viticulture) and their probing in geographically remote regions.

## RESUME

1) Successes of modern selection and climate warming create favorable conditions for a sustainable viticulture development in Belarus.

2) Ecologically oriented viticulture presents a most perspective branch in the general structure of gardening.

3) The introduction of modern complex-resistant *Vitis* cultivars (of the newest selection) is a basic in actual Belarus practice for organic viticulture ecotechnology realization.

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