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Viticulture

Investigation of the Potential of Alien Varieties of Grapevine

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ABSTRACT. The results of phenologic, ampelographic, chemical and enocarpological studies of table and wine varieties of grapevine introduced in Georgia from leading viticulture countries and preserved in the collection of LEPL Research Center of Agriculture of village Jigaura are presented. Duration of the vegetation period of the studied varieties was determined that makes their displacement possible following the altitudinal gradient in different viticulture regions of Georgia for diversification of varieties. Differences between the tested varieties by studied indices, based on peculiarities of the particular variety and its genetic potential, were revealed. Evaluation of the potential of the particular variety has revealed differences between tested ones by the studied indices. Diversity of the parameters is responsible for the optimization of phytotechnical measures and is interesting from technological point of view. Varieties with high content of total anthocyanins (berry skin extract) and polyphenols (berry skin and grape seed extracts) were revealed for the evaluation of qualitative potential of the particular variety. Possibility of their application for the industrial purposes has been discussed. *© 2016 Bull. Georg. Natl. Acad. Sci.*

Key words: ampelography, phenology, endocarpology

More than 300 alien table and wine varieties of grapevine are preserved in the collection of LLEP Research Center of Agriculture of village Jigaura, together with the Georgian varieties of grapevine GEO038. Investigation of the alien varieties of grapevine for purposeful application of their potential, competitiveness and sustainable development of the field are responsible for stabilization of grape production, which is significant for private sector.

Against the background of climate global change, complex investigation of the introduced varieties of grapevine becomes important from the point of view of altitudinal gradient and its possible displacement. Presented work demonstrates investigation of some alien varieties of grapevine from Jigaura collection by means of multidisciplinary methods.

Materials and Methods

Experimental plot was situated in village Jigaura of Mtskheta region at 560 m above sea level. Plants

were cultivated by Georgian two-side trellis system with spacing 2.35X1.5m. Eleven table and wine varieties of alien grapevine from different countries, preserved at the collection plot, were picked out for experiments: table varieties – Alphonse Lavalee, Crimson seedless (France), Cardinal, Red Globe(USA, state California), Italy (Italy) and Muscat Hambourg (England); Wine varieties – Merlot, white Sauvignon, white Burgunder, white Muscat (France), Decapo (Germany).

During 2015 vegetation period the sum of the active temperatures was Σ_t = 3606C°. Phenological phases were recorded in relation with the temperature regimen by BBCH scale [1]from the beginning (March) till the end of vegetation (November). Observations were performed with 7 days interval. Phenological phases were monitored following the method offered by COST FA 1003 project [2].

Georgian scientist M. Ramishvili had ampelographically studied Muscat Hambourg, Italy, white Muscat and Merlot [3]. Though, according torecent demands,the harmonized descriptors of OIV were applied (48 descriptors) [4] for ampelographic researches, recommended by COST FA1003 (East-West Colaboration for Grapevine Diversity Exploration and Mobilization of Adaptive for Breeding", 2010-2014), as the basic set for investigation of grape varieties. Grape scions, young and mature leaves, flowers, clusters, berries and grape sap indices were studied by means of descriptors. The phenotyping method elaborated in frames of COST FA1003 project was used for enocarpologic evaluation of adapted varieties[5].

Results and Discussion

Following the ampelographic descriptors the mature leaf was studied by 15 features, scion – by 10, berry – by 9, cluster – by 7 and flower by one feature. While studying pubescence of the lower side of leaves (OIV084) it was established that grape varieties: Muscat Hambourg, white Burgunder, Italy, white Muscat, Merlot, white Sauvignon, and Alphonse Lavaleehave slight pubescence, while Dacapo, Cardinal, Red Globe, and Crimson seedless have glabrate leaves.

According to OIV 151 descriptor studied varieties have bisexual flowers.

The upper side of the young (fourth) leaf in varieties: Decapo, Crimson seedless, Cardinal, Alphonse Lavalee, white Muscat was of copper-red color (OIV 051), while in white Burgunder, Merlot, Italy, and white Sauvignon it has bronze color; in Red Globe and Muscat Hambourg young leaves were green.

While studying the cluster density (OIV 204) it was revealed that the varieties: Red Globe, Cardinal, and Merlot have thin cluster, Dacapo, Crimson seedless, Alphonse Lavalee, Italy and Muscat Hambourg develop clusters of middle density; White Sauvignon and white Burgunder have thick clusters, and very dense clusters has white Muscat.

By the shape of berries (OIV223): Dacapo, white Burgunder, white Muscat, white Sauvignon have globulous berries, varieties: Red Globe, Merlot, Cardinal, and Muscat Hambourg- wide ellipse form, Crimson seedless and Italy develop prolonged-ellipse shape berries, and round berries have Alphonse Lavalee.

Investigation of the duration of phenological phases showed that stable transformation of the air temperature above 10°C in Jigaura collection was observed on April 15, bud blooming – on April 28. Phases of leaf development: from the first to 14th leaf was mentioned correspondingly on April 28 - June 12. Beginning of flowering – June 5, end –June 22. Beginning of berry set – August 2.

Maturation phase–from September 10 till September 25 (Red Globe, Crimson seedless, Cardinal, Alphonse Lavalee, Muscat Hambourg). Fall – from September 6 till December 15. Duration of vegetation period from bud opening till the full maturity is about 129-145 days.

Corresponding to maturity periods laboratory analysis were made on tested varieties of vine. In particular, soluble carbohydrates, total acidity, and

Table 1. Carpologic characteristics of alien varieties of grape vine

Variety of	Berry color	Berry Weight (g)	Skin Weight (g)	Number of seeds in berry	Weight of seeds (mg)	Length of berry (mm)	Width of berry (mm)	Bunch Weight (g)
Alphonse Lavalee	Dark blue	5.3	1.4	1.6	107.5	1.7	2.8	290
Dacapo	Dark blue	1.4	0.4	2.8	62.2	1	0.9	137
Italy	White	2.8	1.3	2.2	127	2.3	2.8	532
White Muscat	White	2.1	0.4	1.8	37.2	1	1.1	234
White Bourgunder	White	1.5	0.3	2.2	81.8	1	1	164
Crimson Seedless	Dark violet	3	0.9	-	-	1.7	1.2	310
Merlot	Dark blue	1.9	0.5	2.2	88.2	1.4	1.1	185
Red Globe	Dark biolet	9.7	1.7	1.6	180.3	2.1	2	459
White Sauvignon	White	1.2	0.5	1.8	68.5	1.3	1	113
Muscat Hambourg	Dark violet	3.1	0.9	1.5	79.7	1.6	1.4	255
Cardinal	Dark violet	5.1	1.1	2.5	144.1	1.8	1.7	252

pH of the grape juice were determined. In table varieties content of sugars varied in the range of 15-16.9% (Cardinal, Italy),total acidity – 4.3-7g/l (Cardinal, Red Globe respectively), pH3.01-3.34 (Crimson seedless, Cardinal respectively).

In vine varieties content of soluble sugars was 23.3-24% (white Sauvignon, white Muscat), titrated acidity – 5.7-7.1g/l (white Muscat, Merlot), grape juice pH varied in ranges 3.35-3.68 (white Bourgonder, white Muscat). Carpological indicators were determined (Table 1).

Content of total anthocyanins was studied in seven colored varieties. It varied in ranges of 611-5278 mg per liter of grape juice. Dacapo was distinguished with the highest content of anthocyanins, and Red Globe had the lowest amount of these substances (Fig.1).

Among tested varieties of vine the highest content of total polyphenols in berry skin extract was discovered in Merlot – 3885 mg per liter of juice, the lowest – in white Bourgunder (1413mg/l). In case of table varieties the highest amount of phenols was found in Crimson seedless (5048mg/l), the lowest – in Red Globe (2758) (Table 2).

According to experimental results content of total polyphenols in grape seeds (Fig.2) was lower compared with skin extract in all studied varieties (table2). In white varieties content of polyphenols in seed extract varied from 297mg/l to 570mg/l (white Bourgunder and Alphonse Lavalee respectively). In colored varieties this index changed in ranges 325-1961mg/l (Muscat Hambourg and Alphonse Lavalee respectively) (Fig.2).

Conclusion

Duration of the vegetation period of tested varieties from bud burst till the full maturity made about 129-145 days. Accordingly, their displacement is advis-

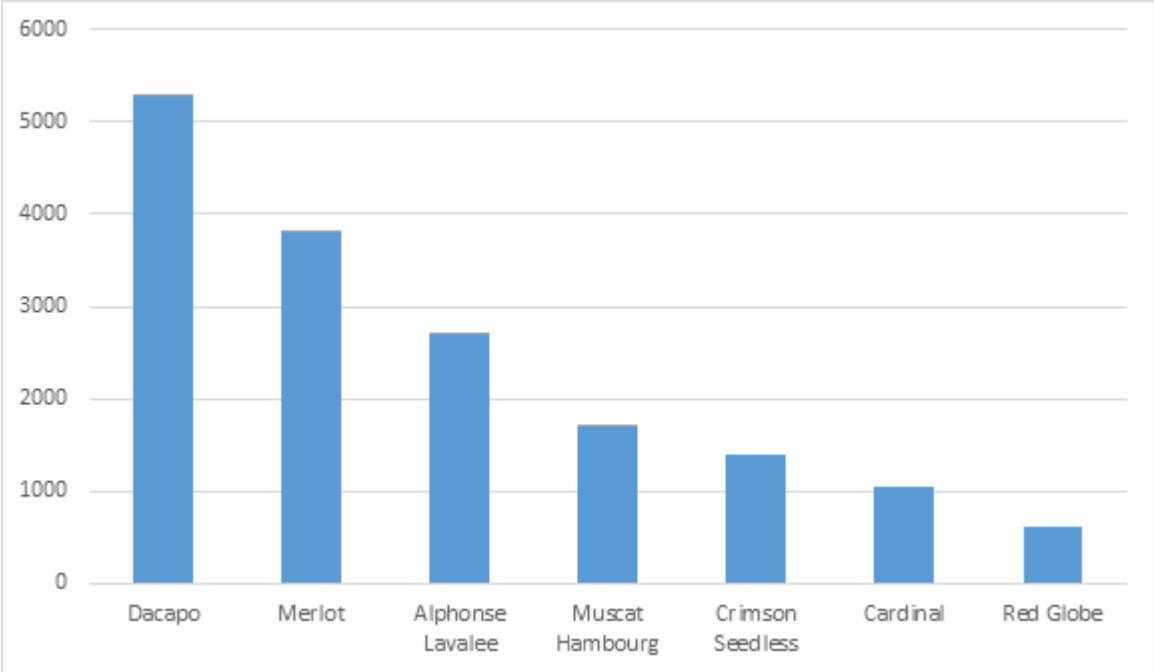

Fig. 1. Content of total anthocyanins in berry skin.

Table 2. Content of total polyphenols in white and colored varieties of grape vine

Total polyphenols mg/l grape juice	Variety	Grape color
3070	White Sauvignon	White
3001	White Muscat	White
2804	Italy	White
1413	White Bourgunder	White
5048	Crimson Seedless	Dark blue
3885	Merlot	Dark blue
3295	Alphonse Lavalee	Dark blue
2912	Muscat Hambourg	Dark violet
2758	Red Globe	Dark violet
2418	Cardinal	Dark violet
2106	Dacapo	Dark blue

able in different viticulture regions of Georgia for diversification of varieties.

Investigations demonstrated that alien varieties of grapevine reveal different endocarpologic characteristics under the same environmental conditions. Differences in content of total polyphenols and anthocyanins depends on variety, its genetic potential. Thus, this diversity is of special interest for determining the technological potential of a particular variety for industrial purposes.

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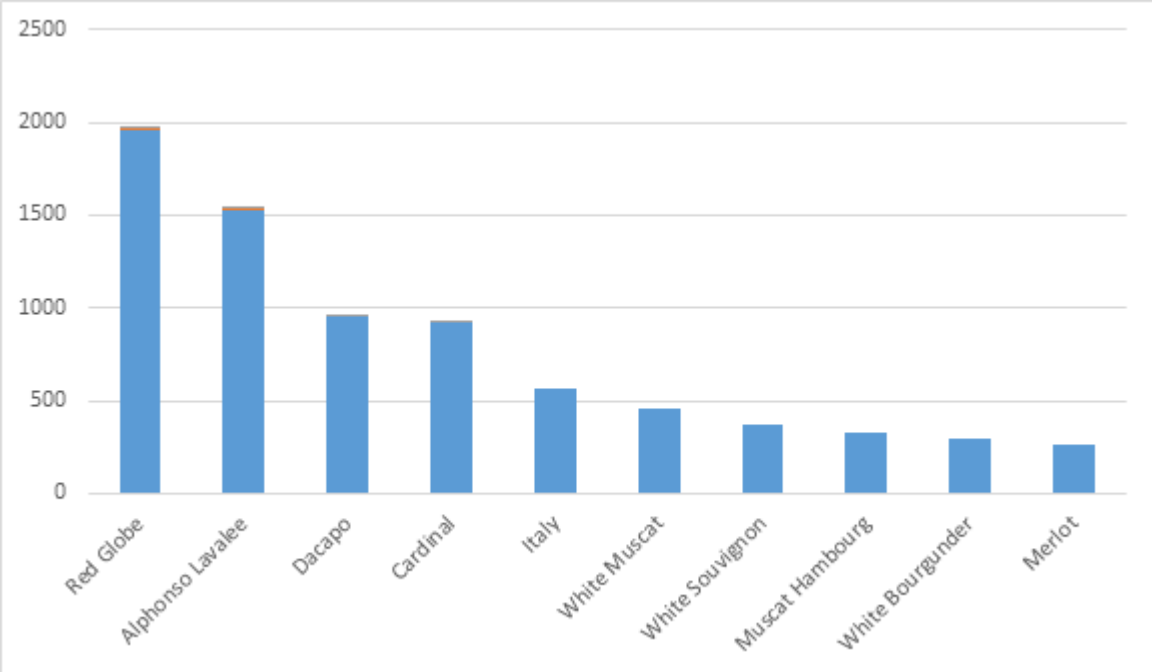

Fig. 2. Total polyphenols of seeds.

მევენახეობა

ინტროდუცირებული ვაზის ჯიშების პოტენციალის შესწავლა

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** სსიპ სოფლის მეურნეობის სამეცნიერო-კვლევითი ცენტრი, მრავალწლოვანი კულტურების კვლევისა და სარგავი მასალების წარმოების დეპარტამენტი, თბილისი, საქართველო*

(წარმოდგენილია აკადემიის წევრის თ. ბერიძის მიერ)

სტატიაში განხილულია სოფლის მეურნეობის სამეცნიერო-კვლევითი ცენტრის ჯიღაურას ვაზის ნარგაობათა კოლექციაში დაცული მსოფლიოს წამყვანი მევენახეობის ქვეყნებიდან ინტროდუცირებული საღვინე და სასუფრე მიმართულების ვაზის ჯიშების შესწავლის შედეგები ფენოლოგიური, ამპელოგრაფიული, ქიმიური და ენოკარპოლოგიური მეთოდების გამოყენებით.

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