

EVALUATION OF FERTILITY OF NEW SEEDLESS VARIETIES INCLUDED IN GRAPEVINE ASSORTMENT OF THE REPUBLIC OF MOLDOVA

EVALUAREA FERTILITĂȚII SOIURILOR NOI APIRENE INCLUSE ÎN SORTIMENTUL VITICOL AL REPUBLICII MOLDOVA

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Abstract. *In the paper are presented the results of study of fertility of the new seedless varieties included in the grapevine assortment of the Republic of Moldova - Apiren roz timpuriu, Apiren alb, Apiren roz, Apiren Basarabean and Apiren negru de Grozești. The correlation between the main fertility elements (number of buds left after pruning, number of growing buds, total number of shoots, including fertile, number of formed grapes) was appreciated. In all cases a direct, very close correlation has been attested, especially for the varieties Apiren roz timpuriu and Apiren negru de Grozești. It is noted the advanced potential of all varieties for issuing shoots from multiannual wood, inclusive of fertile shoots.*

Key words: grapevine, assortment, seedless varieties, fertility

Rezumat. *În lucrare sunt prezentate rezultatele studiului fertilității soiurilor noi apirene incluse în sortimentul viticol al Republicii Moldova – Apiren roz timpuriu, Apiren alb, Apiren roz, Apiren Basarabean și Apiren negru de Grozești. A fost apreciată corelația dintre principalele elemente de fertilitate (numărul de ochi lăsați la tăiere, numărul de ochi porniți, numărul total de lăstari, inclusiv fertili, numărul de struguri formați). În toate cazurile s-a atestat o corelație directă, foarte strânsă, în special pentru soiurile Apiren negru de Grozești și Apiren roz timpuriu. Pentru aceste soiuri se remarcă și potențialul de emisie a lăstarilor din lemnul multiannual, inclusiv și a lăstarilor fertili.*

Cuvinte cheie: vița de vie, sortiment, soiuri apirene, fertilitate

INTRODUCTION

According to the F.A.O.-O.I.V. study (2016), world table grape production holds a major share of global grape production (around 46%). For table grapes, in particular, the following consumer preferences are mentioned: mid-sized seedless grapes with uniformly colored, crispy berries and thin skin and harmonious taste. In the same context genetic-ameliorative research activities on the creation of new varieties of table grapes are also being developed: seedlessness, adaptability to

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environmental conditions, transportability (Careno, 2014, Ritel *et al.*, 2015, Xu *et al.*, 2015; FAO-OIV, 2016; Ahmed *et al.*, 2017).

The indigenous producers' orientation to this category of varieties requires the presence of a seedless assortment, adapted to the climatic conditions of our geographical area, located at the northern border of industrial viticulture. Cultivation in the Carpathian-Danubian-Pontic area of traditional seedless varieties of Oriental origin does not always provide sustained productions (Constantinescu and Indreaș, 1976): setting of elements of fructification for the next year begins late, often under restrictive weather conditions, is not completely realized; for some varieties predominate the luxuriant growth and poor fruiting (varieties from Kishmish group); agri-food and production characteristics do not meet market requirements.

The development of seedless assortment, adapted to the pedo-climatic conditions of the Republic of Moldova, is the result of grapevine breeding program, initiated at the beginning of the 80s of the last century (Juraveli and Savin, 1972), which confirmed the hypothesis of the possibility of combining in a single genotype the characteristics of resistance to winter conditions and downy mildew and grape quality (Savin, 1970). The first results were the creation of varieties Moldova, Pamiati Negrulea, etc., which were subsequently included in the standard assortment in republic and abroad. The hypothesis formulated was further reconfirmed and developed by creating, for the first time in the Euro-Asian area, of seedless varieties possessing biological resistance to low temperatures and pathogens, ensuring annual production, and grapes possessing a wide range of uses (Savin, 2012). The new varieties Apiren roz timpuriu, Apiren alb, Apiren roz, Apiren Basarabean and Apiren negru de Grozești have been patented, homologated and included in the list of varieties admitted to use in the Republic of Moldova (Catalogul de soiuri, 2017). The culture of these seedless varieties, relatively new for the viticulture of the republic, inclusive in the context of increasing climatic variability in recent decades, requires a wider assessment in space and time to establish the degree of correlation between the main elements of fertility.

MATERIAL AND METHOD

The observations were made during the years 2006-2016 within the experimental plots of the Institute's Genofond. The general climatic characteristic of sectors (located in the south of Chisinau, 46°58'39.65 "N and 28°46'21.68" E, 201 m altitude) corresponds to the conditions of the Codru wine region of the Republic of Moldova and the weather parameters represent the average values for the republic. Years of observation include varied weather conditions, especially with regard to rainfall, extreme temperatures during the year: the years 2006, 2010, 2012, 2014 were characterized by severe winter temperatures with an absolute minimum of -26...-30°C; during the summer period the maximum was above + 35 ° C, and in 2007-2010, 2012, 2014-2016 - over +38 ... + 42 ° C, being exceeded by 3-15 times the norm of

consecutive days with high temperatures; severe droughts or rainfall deficit, especially during the summer, were registered in 2007, 2011, 2012, 2015 (www.meteo.md).

In study were included new seedless varieties, created in the Republic of Moldova, approved for industrial cultivation: Apiren roz timpuriu, Apiren alb, Apiren roz, Apiren Basarabean (in the process of homologation) and Apiren negru de Grozești. The planting scheme is 3.0x1.25 m, training system is the double cordon on the high trunk (60 cm). They were determined: the total number of buds left on cutting, the number of buds that started the vegetation, the number of shoots grown, including the number of fertile shoots, the number of grapes

Processing of experimental data, the graphical presentation was performed with the STATISTICA 7.0 software package.

RESULTS AND DISCUSSIONS

In order to establish the correlation between the total number of buds left on cutting and the number of buds started to grow, between the total number of shoots and the number of fertile shoots and between the total number of buds and the number of grapes, the respective linear correlation coefficients were calculated and obtained the regression equations (tab. 1). In all cases was attested a direct, significant correlation (at significance level $\alpha=0,05$). A stronger correlation is found between the total number of buds and the number of buds started to grow, the total number of shoots and the number of fertile shoots (linear correlation coefficient $r=0,65\div 0,90$).

Table 1

Correlation between fruiting elements for new seedless varieties homologated in the Republic of Moldova

Variety	Total number of buds x Number of buds started to grow	Total number of shoots x Number of fertile shoots	Total number of buds x Number of grapes
Apiren roz timpuriu	$y = 4.59 + 0.73 x$ $r = 0.90$	$y = 0.76 + 0.67 x$ $r = 0.84$	$y = 3.52 + 0.71 x$ $r = 0.68$
Apiren alb	$y = 7.03 + 0.53 x$ $r = 0.82$	$y = 1.04 + 0.38 x$ $r = 0.67$	$y = 5.22 + 0.20 x$ $r = 0.42$
Apiren roz	$y = 12.98 + 0.28 x$ $r = 0.36$	$y = 0.81 + 0.47 x$ $r = 0.65$	$y = 9.42 + 0.10 x$ $r = 0.15^*$
Apiren Basarabean	$y = 2.23 + 0.78 x$ $r = 0.88$	$y = -6.69 + 0.83 x$ $r = 0.82$	$y = 2.65 + 0.68 x$ $r = 0.50$
Apiren negru de Grozești	$y = 14.72 + 0.51 x$ $r = 0.78$	$y = -3.59 + 0.79 x$ $r = 0.86$	$y = 17.27 + 0.43 x$ $r = 0.47$

* - insignificant correlation coefficient

The strong correlation between the total number of buds left on cutting and the number of buds starting to grow (fig.1) denotes the genetic resistance of studied varieties at severe temperatures, generally to wintering conditions. A weaker correlation between these parameters was found for the variety Apiren roz ($r=0,36$), the coefficient, however, was statistically significant.

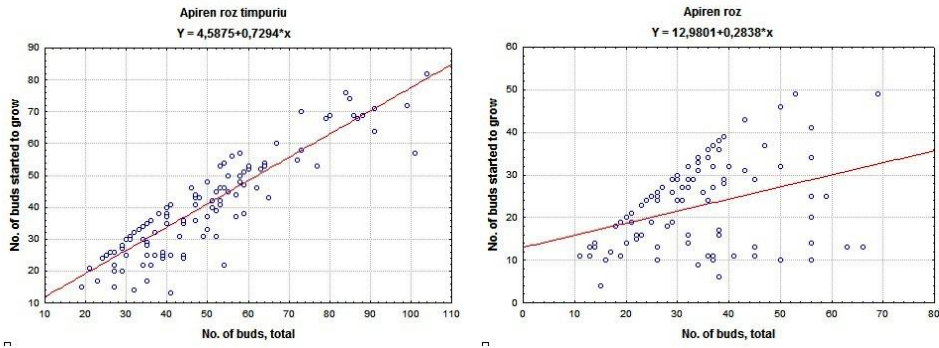


Fig. 1 Regression between total number of buds and buds started to grow

The high correlation coefficients ($r=0.65\div 0.84$) between the total number of shoots and the number of fertile shoots (fig. 2) denotes a significant fertility potential of the newly created varieties, constituting a distinctive characteristic of them, in compared to some old *V. vinifera* seedless varieties.

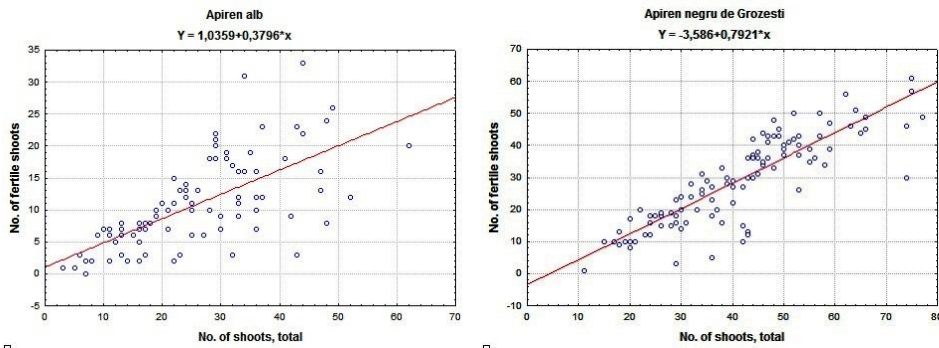


Fig. 2 Regression between total number of shoots and number of fertile shoots

The average percentage of fertile shoots ranges from 58.2 for Apiren roz to 71.8 for the Apiren Basarabean variety (tab. 2). Grape varieties with large and very large grapes (Apiren alb and Apiren roz) form on average one grape on each fertile shoot (absolute fertility coefficient, $AFC=1.08\div 1.10$), and varieties with small-medium grape - on average 1.3 grapes per shoot ($AFC=1.28\div 1.30$). Varieties Apiren Basarabean and Apiren negru de Grozești frequently have shoots with 2 grapes (20-35% of shoots). For the relative fertility coefficients (RFC) the same trend is observed - for Apiren alb and Apiren pink $RFC=0.47\div 0.65$ - lower values compared to small-medium grape varieties with $RFC=0.90\div 0.94$. In general, all varieties provide a favorable balance between the vegetative growth and fructification.

**Indexes of fertility and productivity for new seedless varieties
(average for 2006-2016)**

Variety name	Fertile shoots, %	AFC	RFC	Average weight of bunch, g	API*	RPI**
Apiren roz timpuriu	69.2±1.3	1.28±0.02	0.90±0.03	151.3	193.7	136.2
Apiren alb	43.4±1.8	1.08±0.01	0.47±0.02	310.3	335.1	145.8
Apiren roz	58.2±1.8	1.10±0.01	0.65±0.02	314.1	345.5	204.2
Apiren Basarabean	71.8±1.4	1.30±0.02	0.95±0.03	251.1	326.4	238.5
Apiren negru de Grozești	71.5±1.4	1.29±0.01	0.94±0.02	238.5	307.7	224.2

* API - absolute productivity index (API=AFC* weight of bunch)

* RPI – relative productivity index (RPI=RFC* weight of bunch)

The correlation coefficients between the total number of buds and the number of grapes (fig. 3), relatively smaller - $r=0.42\div 0.68$ (in the case of Apiren roz $r=0.16$, statistically insignificant), indicates the need for some additional studies on the distribution of fertile buds along the shoot, in order to detect the optimal cutting length and total number of buds left on cutting.

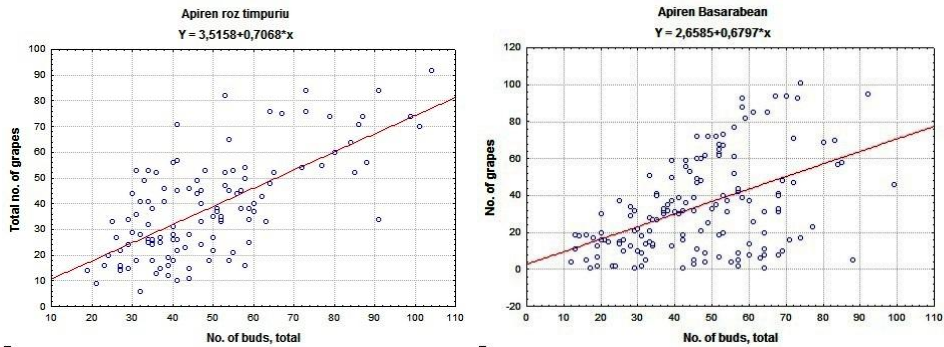


Fig. 3 Regression between total number of buds and total number of grapes

The studied varieties have an increased potential of development of shoots from dormant buds (on average 4-8 shoots/plant) and therefore the possibility of restoring of plant's architectonics after eventual climatic accidents. The variety Apiren Basarabean is characterized by the highest number of shoots developed from dormant buds (on average up to 12 shoots per vine) and Apiren negru de Grozești - by the high percentage of fertile shoots in this category (up to 20% of the issued shoots are fertile).

CONCLUSIONS

1. The presence, for the new seedless varieties included in standard grapevine assortment in Republic of Moldova, of a direct, very strong correlation between the total number of buds left to be cut and the number of buds started in grow ($r=0.78\div 0.90$), the total number of shoots and the number of fertile shoots $r=0.65\div 0.86$), and a reasonable correlation between the total number of buds and the number of grapes ($r=0.42\div 0.68$) indicates a significant fertility potential of these varieties in our climatic conditions, ensuring also a balance between the vegetative growth and fructification.

2. The studied varieties have an increased potential of development of shoots from the dormant buds (on average 4-8 shoots/plant), including fertile shoots, thus having the possibility of restoring the plant architectonics after eventual climatic accidents.

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