



DOI: 10.22620/agrisci.2016.20.005

VARIETIES AND FORMATIONS OF ROOTSTOCKS OF GRAPES OF THE ANAPA'S ZONAL EXPERIMENTAL STATION OF VITICULTURE AND WINE-MAKING**Zhukov Alexandr Ivanovich, Doctor of Agricultural Sciences
Mikhailovsky Stanislav Sergeevich**Federal State Budgetary Scientific Institution Anapa's Zone Experimental Station
of Viticulture and Wine-making of the North Caucasus Zonal Scientific Research Institute
of Horticulture and Viticulture, Anapa, Russia.

E-mail: azosviv@mail.ru

Abstract

In modern viticulture an inoculation of European-Asian grape varieties on rootstocks is used for fighting against a root form of phylloxera as these varieties are resistant to this pest. This article presents the information about what kinds of rootstocks of domestic and foreign selection are used in the up-to-date branch of viticulture. There is the description of the sphere of their usage and the article highlights useful features of the rootstocks and their disadvantages. The aim of this work is creating of new grape rootstocks which would not have the disadvantages of the existing ones. The short description of the grape rootstocks of selection of the Anapa's Zone Experimental Station of Viticulture and Wine-making as AZOS-1, AZOS-2, AZOS-3, AZOS-4, AZOS-5 and AZOS-6 is given in the article. It is indicated that these rootstocks have a high resistance to a leaf form of phylloxera, to chlorosis and to some other diseases of the grape vine. They have a short period of vegetation, a high quantity of standard cutting per hectare and other useful properties. The description of a new formation of rootstock grape vines with free trail shoots "AOS-1" is given in the article. This formation of grape vines is developed by the Anapa's Zone Experimental Station of Viticulture and Wine-making. All advantages of this forming in comparison with other designs of grape vines are also pointed out. It is especially noted that the usage of this forming of vines increases the productivity in the process of vine scrap and preparation of cuttings; the expenditures on the disease and pest control in the vineyards are reduced; the quantity of standard grape cuttings increases by 27-33%.

Key words: rootstock, variety, hybrid, resistance to phylloxera, formation, trellis.**INTRODUCTION**

In the modern viticulture a vaccine of European-Asian grape varieties of rootstocks is used to fight against root phylloxera – these varieties are resistant to this pest.

Currently, all rootstocks varieties are divided into 4 groups according to their origin:

1 – pure species or natural hybrids (Riparia Gloire de Montpellier, Rupestris du lautaret, Riparia Grand glaber, Rupestris Brunie, Rupestris Martin, Berlandieri Ressegue No. 1, etc.);

2 – the hybrids of inter-American species (Riparia x Rupestris 101-14, 3306, 3309, Berlandieri x Riparia Kober 5BB, SO4, Craciunul-2, etc.);

3 – American hybrid species with European (Chasselas x Berlandieri 41-B, Fercal, Mourvedre x Rupestris 1202, Aramon x Rupestris Ganzen No. 1, etc.);

4 – hybrids of American and European species with labrusca or Amur grape (alpha, Bujtor, Arctic, Moscow sustainable, etc.), characterized by high frost resistance [1, 2].

There are also rootstocks with a narrow focus of use: relatively resistant to salinity of the soil (Colones x Riparia 1616), hematotoxicity (Dogreg, Salt Creek, Berner, Solonis x Othello 1613, etc.), tolerant to root phylloxera, but giving the commercial harvest of grapes and carrying hereditary traits of the species *V. vinifera* (phylloxera-resistant Dzhemete, Cabernet AZOS, Decent, Krasnostop AZOS, the Firstborn of Magarach, Grushevsky white, Dekabrsky, etc). These rootstocks are distributed locally [3, 4].

Grape nursery of Russia uses mostly rootstocks of the second and the third groups, as the rootstocks of the first group can stand a small content of the movable lime (6%), in the soil and the rootstocks of the fourth group mainly do for the Northern regions, which is not infected with phylloxera [4].

However, rootstocks of the second and the third groups have a number of disadvantages. Thus, varieties of the inter-American hybrids, Riparia x Rupestris can not grow on soils containing more than 11% of the movable calcium, furthermore they are also strongly affected by the leaf form of phylloxera and other diseases.

The rootstock hybrids Berlandieri x Riparia, being tolerant up to 20% of lime in the soil, have a long growing period, There are some years when their vine ripens poorly, which adversely affects the yield of cuttings per 1 ha and seedlings from tabs. In addition, they are also affected by the leaf form of phylloxera. Both forms of these hybrid rootstocks have a great ability of creating laterals, which requires large expenditures for conducting side-shoot removal. Rootstocks of the third group of American species with European stand up to 40% of lime in the soil, but they are not frost-resistant and they sometimes are affected by mildew and other diseases [5].

Therefore, we have made it our aim to create new varieties of rootstocks, which would have less disadvantages or would not have them at all.

RESULTS AND DISCUSSION

To solve this task crossing of varieties resistant to phylloxera has been carried out: Dzhemete with rootstocks - Berlandieri x Riparia SO4, Craciunul 2, Chasselas x Berlandieri 41-B, Richter 44. The main characteristics of these donor varieties are given in the table.

Phylloxera-resistant Dzhemete even though carries the hereditary signs of Vitisvinifera, but has relative resistance to root phylloxera and high resistance to leaf phylloxera, with a short period of vegetation and very low lateral ability;

Berlandieri x Riparia SO4 has a high cold resistance and a high yield of rootstock cuttings, not affected by fungal diseases;

Berlandieri x Riparia Craciunul-2 is weakly affected by the leaf phylloxera and fungal diseases, its chlorosis resistance is mean, lateral ability is low, it gives a high yield of cuttings;

Chasselas x Berlandieri 41B –is not enough frost and resistant and mildewproof, but chlorosis and drought resistance is high, vine ripens well;

Richter 44 is chlorosis and drought-resistant, has a low lateral ability [3, 6].

As a result of hybridization new varieties of rootstocks have been selected (Azos-1; Azo-2, Azos-3; Azos-4; Azos-5 Azos-6) with high resistance to phylloxera, chlorosis, short vegetation period and high yield cuttings of half a meter high. Brief description of the distinguishing features of new rootstocks are listed below.

Azos-1. A leaf is of medium size, five-bladed. The leaf plate is wavy, the upper surface is reticulate-rugose. Cutting's notch is closed, egg-shaped. Petiole is of light- cherry colour, the same as the central vein of a leaf (15 cm). The growing strength of bushes is above the average. Ripened vine is brown of even colouration. Shoots grow upright. The length of internodes is 14-15 sm. The growing of shoots starts in the second half of August. The growing of side-shoots is insignificant. Rootstock is well joined with many European grape varieties. It ensures the high output of first-class seedlings [4].

Azos-2. A leaf is of medium size, bud-shaped, three-bladed, almost whole, as one piece. The upper surface of the leaf changes from smooth to reticulate rugose. Main veins at the base are light-cherry. Petiole notch is open, wide, with flat-angled bottom. Petiole is smaller than the main vein of the leaf. The strong growth of bushes. Ripened vine is brown. The length of internodes is 14-16 cm. Side-shoots are rare and weakly developed. Aging of shoots is early. It is not affected by the leaf form of phylloxera. When rainy years, there can be patches of mildew. The manifestation of lime chlorosis is not observed. The rootstock is well joined with many European grape varieties and provides a high yield of the first-class seedlings [4].

Azos-3. A leaf is of medium size, five-bladed, small-cut. The leaf plate is funnel-shaped, the upper surface of the leaf is reticulate rugose, dark

Feature of new grape rootstocks (average within four years)

| Cultivar rootstock | Outlet of 0,5 m cuttings | | Vine aging % | Chlorosine bushes, number | Lesion by the leaf form of phylloxera, number |
|--------------------|--------------------------|-------------------------|--------------|---------------------------|---|
| | per a bush, pcs | per 1ha thousand pieces | | | |
| CO4 (control) | 70 | 115,6 | 83 | 2,3 | 2,4 |
| AZOS-1 | 98 | 162,7 | 84 | 0 | 0 |
| AZOS-2 | 94 | 156,0 | 84 | 0 | 0 |
| AZOS-3 | 101 | 168,5 | 85 | 0 | 0,2 |
| AZOS-4 | 91 | 151,0 | 83 | 0 | 0,2 |
| AZOS-5 | 93 | 154,4 | 86 | 0,2 | 0,1 |
| AZOS-6 | 94 | 156,0 | 82 | 0,2 | 0,1 |



green. The main veins on the upper surface of the leaf are light green, on the bottom side surface they are slightly pinkish. Petiolate cavity is open, vaulted with a rounded bottom. Petiole is green with a pink tint and equal to the central vein of the leaf. The strength of the growth of bushes is average. The growing of shoots is vertical. Ripened vine is light brown, in cross section it is rounded. The length of internodes is 13-15 cm. The main feature of the variety is an even growing of vines with their good ripening and a small number of laterals. Insignificant affection by the leaf form of phylloxera is observed in the second half of the growing period. During rainy years, mildew manifests itself in the form of necrotic spots [4].

Azos-4. A leaf is of medium size, five-bladed. The edges of the leaf are wavy, slightly funnel-shaped. The upper surface is slightly reticulate, dark green with a metallic sheen. Main veins on the upper side of the leaf are green, on the lower side with a pink-cherry shade. A petiolate notch is open, rounded with a pointed bottom. The petiole is smaller than the main vein. The strength of the growth of bushes is weak, their shape is compact that facilitates the maintenance of technological operations. Ripened vine is brown, in cross section it is rounded, laterals are weak. The length of internodes is 12-13 cm, the aging of the vines is early and complete. The bunch is small, cylindrical, friable. A berry is very small, rounded, dark purple, while ripening it becomes bluish-black. The seed is small, round, brown [4].

Azos-5. A leaf is rounded, five-bladed of medium cutting. The leaf plate is wavy, funnel-shaped, the upper surface is slightly rugose. Main veins on both surfaces are green. Petiolate notch is open. The petiole is of the same size as the central vein of the leaf. A bunch is small, cylindrical-conical, friable. Grapes are very small, rounded, dark purple, when they are completely ripened they get a blue-black tint. The seed is small, rounded-oblong, dark brown. Bushes are very high. Ripened vine is brown. The length of internodes is 14-15 cm. The aging of shoots starts in the second half of August. The rootstock is well combined with many European grape varieties and ensures getting high yield of seedlings of high quality [4].

Azos-6. A leaf is of medium size, five-bladed, rounded, almost whole. The leaf plate is wavy, the upper surface is reticulate-rugose. The upper and the lower leaf veins are green. Petiolate notch is closed, with an oval bottom. The petiole is smaller than the main vein of the leaf. The strength of growth of bushes is above average. The rootstock is well fused with many European grape varieties [4].

All these grape rootstocks have been patented. They were tested in Kuban and regionalized (released). But taking into consideration the fact that all the rootstocks give only vines for grafting the grape, not for the commercial harvest of berries, we decided to breed such varieties that would be resistant to the root phylloxera and give the commercial harvest of grapes.

This was accomplished through the mating of grape varieties – Cabernet Azos Krasnostop Azos, the Firstborn of Magarach, Pleven sustainable, Arabella, Golden Autumn with hybrid forms of stocks of the first generation (f.3, f.4, f.7, f.10), which were notable for their advantages (resistance to diseases and pests, high economic yield of grapes, etc.), but for a number of some negative qualities were not recognized as varieties. Ongoing research in this direction pre-shows encouraging results.

While forming vine rootstock bushes the following formations are usually used: a capitata formation – the conducting of bushes on the ground (without trellis) and on the 4-6 vertical wire trellis or on stakes - «green fountain» by Tereshchenko A. P.; a short-sleeved formation – on the same trellis; low and medium-trunked formation on vertical and T- or U-shaped trellis [7], on a high (1.5 m) trunk with dangling down green shoots [8].

The disadvantages of the above-mentioned formations and the way of doing vine bushes are: high consumption of trellis wire and suspender material (with the exception of doing the bushes on the ground and on stakes), the complex of agrotechnical methods (cutting of green shoots, dry and green garter of shoots, 4-6-times of removing side-shoots depending on rootstock varieties, harvesting of cuttings), the inconvenience of manual work in the vineyards (inclined position), and while conducting the bushes in the distance (on the ground) and on the horizontal trellis (T and –P-shaped) and uneven circular aging of vines because of shading the lower side (from the ground).

On the stakes and according to L. Moser, lower parts ripen badly because of the formation of a «tent» of hanging shoots. This adversely affects the yield of cuttings per area unit, and it is also difficult to fight against diseases and pests of the grape bushes [9].

For the purpose of eliminating or reducing the above-described drawbacks of forming and methods of doing of rootstock vine bushes, we have developed a new formation «AZOS-1»

The main advantages of this form are:

- quick and easy forming of shrubs; the convenient work with rootstock bushes; it effects 3-6 times saving trellis wire;
- “dry” and “green” garter shoots are excluded (winding between the wires) and sleeves, conducting of the side-shoot removal; productivity is increased by cutting bushes and harvesting of cuttings;
- costs for fighting against diseases and pests are reduced;
- the increase of the yield of rootstock cuttings is to 27-33%.

AZOS-1. The basic material (matochnik) is laid on sites measuring 3.0...4.0 m x 1.5...3.0 m (depending on the growing power of rootstock variety, soil fertility and the availability of moisture). The trunks of 1.7 m high (Fig. 1) are grown.

The sleeves are formed (better as χ – shaped) in the form of a spiral, by winding them on the helix of the trellis wire, and 1-2 eye knots are created (the best from laterals) on them as fruit formations, from which developed shoots are coined next spring, causing the growth of laterals. Loose-hanging ripened side-shoots are used for getting rootstock cuttings.

Trellis is set with one layer of wire on the height of the trunk. In the case of using a thin wire, wire tier is made from coupled wires so that it does not cut into the sleeves.

While forming the sleeves from the green shoots the latters are not tied to the wire, the tying is only made once at the top among ripened shoots.

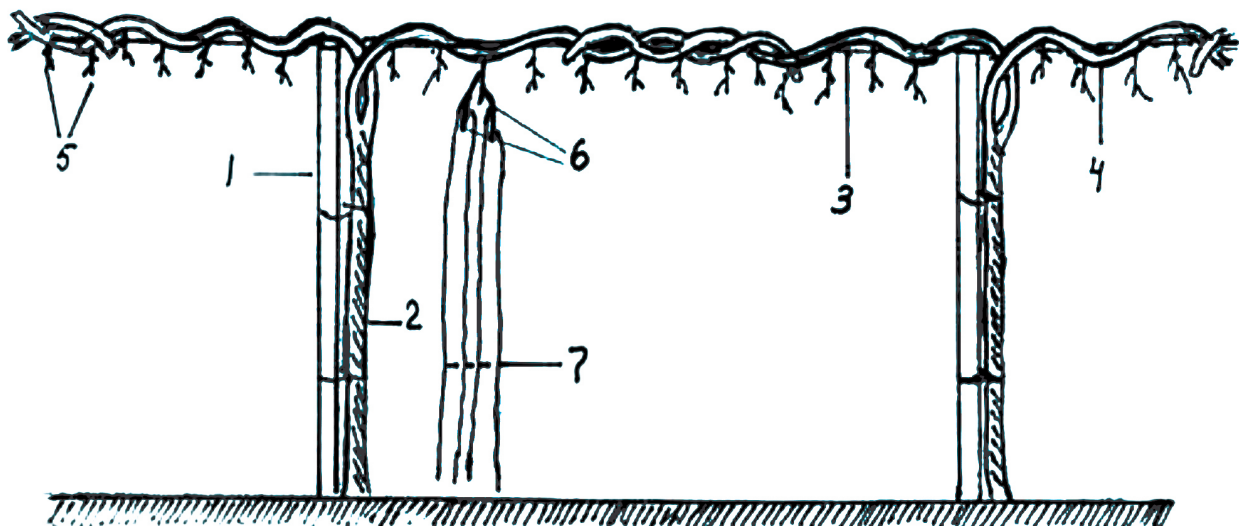
The spiral formation of the sleeve corresponds to the biology of the grape as the curled plants that do not require annual anchorage to the portage, increases the number of long-term timber and fruit formations (knots) from laterals.

The direction of the sleeves in opposite directions relatively to each other (χ metaphorically) protects them from damage in the event of a breach of the integrity of the single cordon, plays the role of tension last and eliminates the formation of «Windows» (gaps) without shoots above the head of Bush.

The formation on the sleeves from laterals of 1-2 eyed knots reduces formation of clusters, and after minting the shoots, due to reverse polarity of side-shoot growth, the latters are not formed for the second time, that eliminates the process of side-shoot removal of bushes.

This forming can be one-sided. In this case, it is advisable to form bushes by method of «zahodkami» from 8 to 10 rows with the sleeves in different directions, which contributes to more convenient conducting of all mechanized operations. While stam stakes must be installed in the bushes on the opposite side to the direction of formation of the sleeve, so that when Merkulova tillage in the row PRVN-72000 not to injure the trunks of the bushes. It is noteworthy the fact that, when deriving the trunks and sleeves with fruit entities, usually formed for one year.

The application was made for the forming AOS-1, as the invention.



1 – pole, 2 – bush trunk, 3 – wire, 4 – sleeve of the bush, 5 – fruit swirls, 6 – minted green shoots, 7 – laterals

Fig. 1. Forming rootstock Bush “AZOS-1”



REFERENCES

- Gromakovski, I. K.* Grape nursery of Moldova / I. K. Gromakovsky, I. N. Tikhvinsky, I. Terekhov, S. I. Unguryanu.–Kishinyov, 1979. –183 с.
- Zhukov, A. I.* The Use of phylloxera-resistant grape varieties as rootstocks / A. I. Zhukov, O. M. Ilyashenko, Y. N. Nikulushkin // Materials of scientific-practical conference “Forms and methods of scientific, organizational and economic support industries in the conditions of market relations” (horticulture and viticulture) (6-7 February 2001)–Krasnodar, 2001. – P. 170–172.
- Maltabar, A. L.* Grape Rootstocks / A. L. Maltabar, A. I. Zhukov. Krasnodar, 1985.– 16 S.
- Zhukov, A. I.* Grape Rootstocks for the Black Sea area of Kuban viticulture / A. I. Zhukov, G. E. Nikulushkina, S.S. Mikhailovsky // Wine-making and viticulture.– 2012.– No. 4. – Pp. 46–47.
- Zhukov, A. I.* Promising grape rootstocks varieties of AzosV\$W`s breeding / A. I. Zhukov, G. E. Nikulushkina, S.S.Mikhailovsky // Grape. – 2011. – №8(20). – P. 60–61.
- Stanko, Vršiča.* Factors influencing grafting success and compatibility of grape rootstocks / Stanko Vršič, Borut Pulko, Laszlo Kocsis // Scientia Horticulturae. Vol. 181, 2015, Pages 168–173.
- Smirnov, K. V.* Viticulture / K. V. Smirnov, L. M. Maltabar, A. K. Radzhabov, N. In. Matuzok. – M.: publishing house of the ICCA. – 1998. 510 p.
- Moser, L.* Viticulture in new ways / L. Moser. – Moscow, 1961. 106 С.
- Zhukov, A. I.* New ways of doing vines / A. I. Zhukov. – Anapa, 2012. – 24. S.

