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THE ANATOMICAL FEATURES OF THE STABILITY OF THE GRAPES TO THE PHYLLOXERA

Eugeniu ALEXANDROV

Institute of Genetics, Physiology and Plant Protection of the Academy of Sciences of Moldova, 20 Padurii Street, MD-2002, Chisinau, Republic of Moldova, Phone\Fax: +(373)22550740, Mobile: +(373)79450998, Email: e_alexandrov@mail.ru

Corresponding author: e_alexandrov@mail.ru

Abstract

The resistance against phylloxera of the vine is ensured by the morphological and anatomical characteristics of root. The study establish the fact that the first periderm is formed of cells arranged at rizodermoy and that the thickness of the first root periderm in interspecific hybrids of grapes Vitis vinifera L. x Muscadinia rotundifolia Michx., ranges from 80 µm to 124 µm and is formed of 8-12 rows of closely packed cells. The length of these cells varies from 30 µm to 45 µm, and the width varies from 8 µm to 12,5 µm. Fellemy thickness is ranging from 75 µm to 93 µm. The next layer fellemy, if created in the same year, is formed from the deeper layers of the root cortex cells. In the interspecific hybrid DRX-M5- (4-6) a second layer is located beneath the fellemy brown crust with a thickness in the range 93-110 µm. As a result, this area of dead tissue, formed of two layers fellemy, inside and outside, and a layer of crust disposed between two layers fellemy has a thickness in the range 170-180 µm and protects the roots of phylloxera exposure and pathogenic organisms.

Keywords: *fellem, interspecific hybrides, periderm, phylloxera, root, vines.*

INTRODUCTION

The problem of stability of the grapes to the phylloxera (*Phylloxera vastatrix* Planch.) has been studied for over a hundred years and still has not been solved completely. Creating a healthy planting material grafted on rootstocks with resistance to this pest is quite challenging. Creation of own-rooted vine plantations would be much more economical and easier, but it needs to be resistant to phylloxera grapes. To create such varieties is necessary to determine the anatomical and biochemical characteristics that provide immunity against phylloxera [1; 7; 17; 24].

At the end of the 19th century, after the from phylloxera killed almost all the vineyards of Europe, "*grafted culture*" accepted everywhere "*as a necessary evil*."

Thus, there is an actual problem of the creation new varieties of grapes with agro biological signs which would satisfy maximally requirements for table grapes, used in fresh form, as well as those which are intended for industrial processing (juices, concentrates, wine, etc.) [12; 13; 32].

MATERIALS AND METHODS

As object of the study have served interspecific hybrids of vines *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. and some of varieties of grafted vines. [2; 3; 6; 7; 11; 24; 25; 27].

RESULTS AND DISCUSSIONS

The viticulture it is practiced in over 75 countries, limited parallels 35° and 53 ° north latitude and within parallels 40° and 25° south latitude [Fig. 1].

Fig. 1. The evolution of world vine plantations.

- vine plantations are growing
- vine plantations are stable
- vine plantations are decreasing.

Vine plantations are growing in Chile, China, New Zealand etc. Vine plantations in Brazil, Romania, South Africa, Germany, Turkey, USA, etc. are stable and vine plantations in France, Hungary, Italy, Spain, Greece etc. are decreasing [Fig.1.].

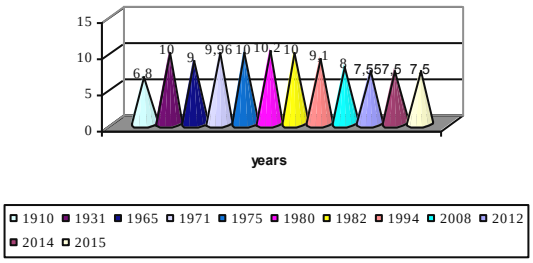

Fig. 2. The total land area occupied by the vines on the globe. (millions ha)

The total area of agricultural lands of the entire world constitutes about 4.6 billions. hectares, and of vines plantations occupy an area of 7.5 millions hectares [Fig. 2].

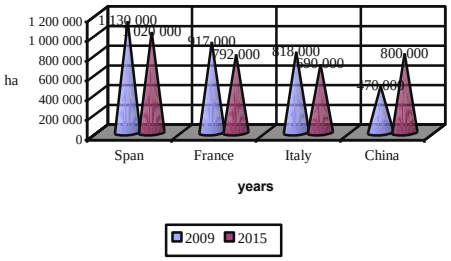

Fig. 3. The evolution of surfaces with vineyards in some countries vines.

57.9% of the total area planted with vines of the entire world is in the European countries [Fig. 4.].

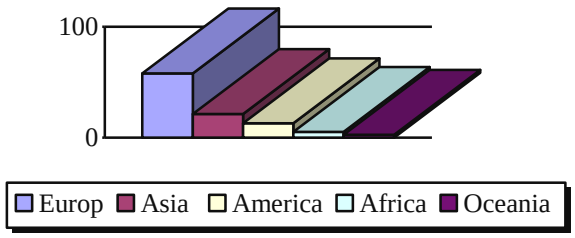

Fig. 4. Land distribution vineyards on Earth.

In China and the some countries of South America lands with vineyards are growing. In the last 6 years China has redoubled surfaces covered with vineyards (from 470,000 ha to 800,000 ha). In most European countries vine plantations are decreasing. The decline in land with vineyards in Europe is to regulation by the EU Council quantity of wine products and prevent lower prices [Fig.3].

The land fund of Republic of Moldova constitutes about 3,384,600 ha, including agricultural lands - 2,528,300 ha (75.6% of the total) of vines plantations occupies the area of 140,000 ha (3.7%) [Fig. 5].

Derived products the wine in Republic of Moldova is about 25% of total manufacturing and about 5% of GDP. Currently about 25% of revenues from the export of Republic of Moldova wine production are generated [29].

The development of viticulture in Bessarabia until the XIX century was based on the indigenous varieties like: *Feteasca Neagră (Băbeasca Neagra, Serecsia), Feteasca Albă, Feteasca Regală, Cabasma (Cabasma Albă, Cabasma Neagră), Ciorcuţa Roză, Calabura, Gordin Verde, Gordin Gurguiat, Zghihara de Huşi, Plăvaie, Copceac* etc. [1; 7; 13; 29; 31].

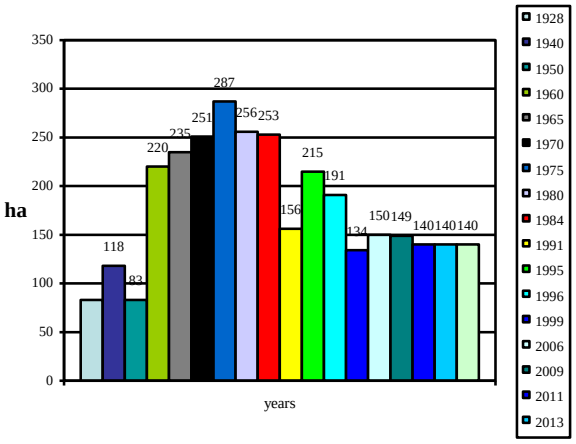

Fig. 5. The evolution of vines of surfaces the Republic of Moldova

The vine was planted on their own roots.

In Bessarabia phylloxera it was detected in 1886 on lands of vines in localities: Lupa-Cold Drăsliceni, Miclesti etc. the central region of the country. To save the vineyards, by 1915 all plantations vines on their own roots were replaced by grafted vines [23 - 25].

The direct methods of combating phylloxera as: disinfection of ground with carbon disulfide or naphthalene, periodic flooding of land, etc., did not contribute to solving the

problem.

The revitalization of viticulture, in that period was possible thanks to the work all coaches will pick: M.Baco, A.Seibel, Terras, Couderc etc. by creating and introducing direct producer hybrids (Seibel 1, Seibel 1000, Terras-20, Flot d'or, Baco Noir, Couderc, Rayon d'Or, etc.) and grafted varieties [1; 2].

For the cultivation of the vine it had to be applied highly productive method of grafting, which has some drawbacks, namely:

- to produce grafted planting material are needed:
  - the considerable human and financial resources;
  - parent stock and scion mother plantations;
  - professional technological equipments etc.;
- for the production of the wine derivatives is required:
  - chemical treatments (12 treatments/season);
  - perfecting technological processes (double filtration etc.) [1; 17; 31;32].

The renowned French viticulturist Daniel, mention: *"... the introduction of the method of cultivation of vines grafted saved vineyard in France at the moment, but has destroyed her future ..."*

Currently are known about 12,000 genotypes of the vine. Nevertheless, so far does not was succeeded in to obtain the variety "ideal".

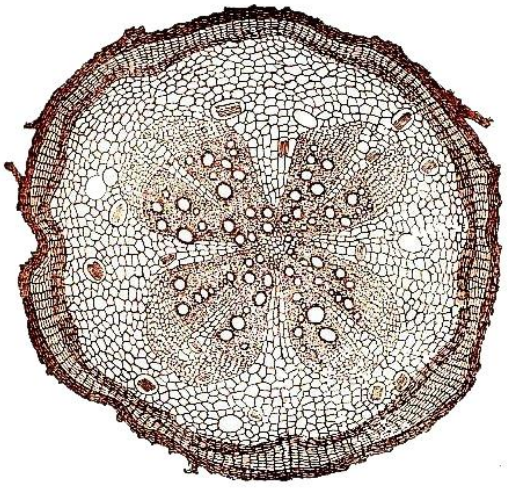

Fig. 6. The perriderm insulates entire primary root cortex.

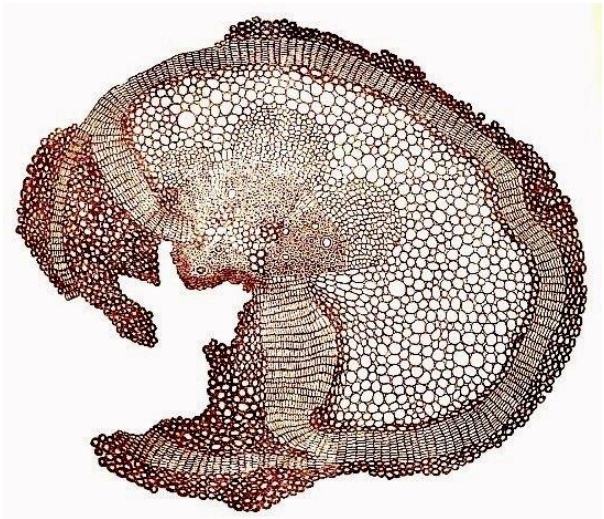

Fig. 7. Not insulates root perriderm tissue attacked by phylloxera.

It is should be noted that European varieties cultivation makes it compulsory grafting parent stock North American (resistant to phylloxera), which greatly increases the cost of production of planting material and plantation of vines creation.

The question thus remains the actual issue of creating indigenous of the vine varieties with increased resistance to biotic and abiotic factors of the environment, productive and quality.

As a result of cross-breeding of the American of wild grapes *M.rotundifolia* Michx. with cultural grapes *V.vinifera* L. ssp. *sativa* D.C. different generations of interspecies hybrids own rooted grapes were obtained [2; 3; 4].

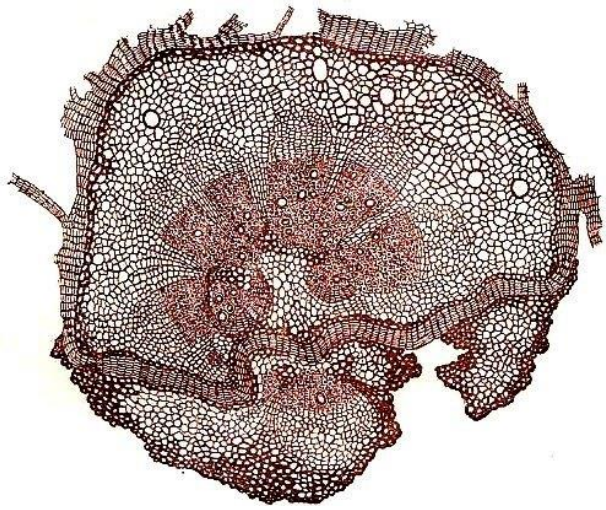

Fig. 8. Of the plague be the periderm tissues insulates attacked by phylloxera.

The study of the anatomical structure of interspecific hybrids of grape roots has the purpose to establish their primary and secondary structure to determine the anatomical features typical of a wild grapes *Muscadinia rotundifolia* Michx., which has an absolute resistance to phylloxera [11].

Vine varieties of *Vitisi vinifera* L., non-resistant to phylloxera, the first root periderm is formed and isolated pericycle all primary root bark, which then dies and falls off at the root [Fig. 6.; Fig. 7.].

Of the plague be the periderm tissues insulates attacked by phylloxera and push them outwards. Thereby, it enables the development of pathogen agents [Fig. 8.].

The vine resistant to phylloxera develop to the wound periderm, which has bactericidal properties and stop the spread of pathogens [Fig. 9.].

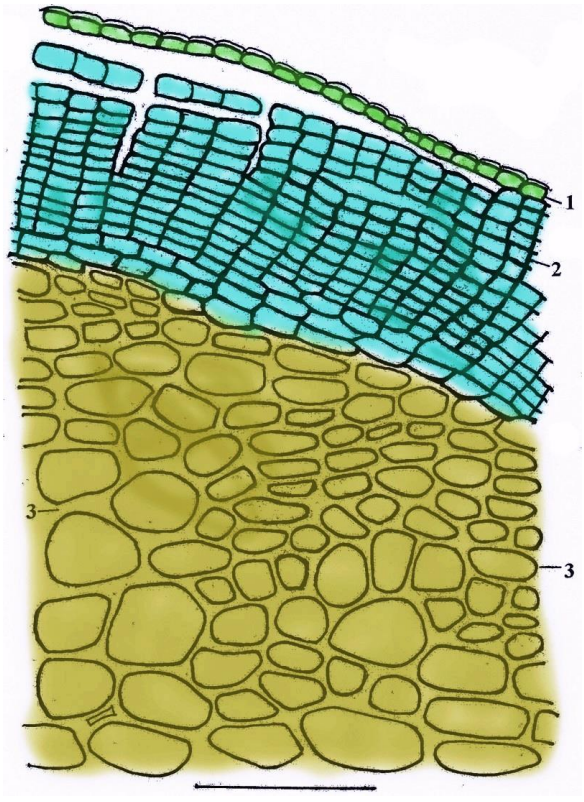

Fig. 9. The interspecific hybrids of grapes (*V.vinifera* L. x *M.rotundifolia* Michx.), 11-508: 1. epidermis; 2. peridermis; 3. cortex.

In interspecific hybrids of grapes (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.), the first root periderm, with secondary anatomical structure, created from layers of radial 8-12 tangentially elongated cells compactly arranged between them, created from the layer of cells beneath the rizodermoy. Another layer of periderm, if created in the same year, is formed from the deeper layers of the root cortex cells [11; 25]. This morphological and anatomical and hybrids-specific feature determines the resistance to phylloxera root interspecific hybrids of grapes (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) [Fig. 9.].

Interspecific hybrids *Vitisi vinifera* L. x *Muscadinia rotundifolia* Michx can be effectively grown on their own roots in the region of Central and Northern agroclimatic the Republic of Moldova, there where most varieties vine *Vitis vinifera* L. not withstand low temperatures of winter [2; 3; 5; 6; 17; 18].

Fig. 10. The sector of interspecific hybrids of vine *V.vinifera* L. x *M.rotundifolia* Michx.

Initiated the procedure for creating sectors of interspecific hybrids of vines on their own roots in the Central region (Chişinău, IGPPP ASM) and North (Soroca) of Moldova [Fig. 10; Fig. 11.], where most varieties of vines group *Vitis vinifera* L. overwintering does not withstand low temperatures [2; 3; 5; 6; 17; 19].

Fig. 11. New varieties of vines on their own roots for implementation (12-35; 11-37; 11-75).

CONCLUSIONS

The resistance against the phylloxera of the vine is provided by morphological and anatomical structure of root and concentration of chemicals, such as: resveratrol etc.

Periderm, the first layer is formed from cells located under rizodermoy and that the thickness of the first root periderm in interspecific hybrids grape V.vinifera L. x M.rotundifolia Michx.), ranges from 80 μm to 124 μm and formed from 8-12 rows of cells arranged compactly. The length of these cells varies from 30 μm to 45 μm, and the width varies from 8 μm to 12.5 μm. Fellemy thickness ranging from 75 uM to 93 μm. The next layer fellemy if created in the same year, formed from the deeper layers of the root cortex cells. In the interspecific hybrid DRX-M5- (4-6) a second layer located beneath the fellemy brown crust with a thickness in the range 93-110 μm. As a result, this area of dead tissue, formed of two layers fellemy, inside and outside, and a layer of crust disposed between two layers fellemy has a thickness in the range 170-180 μm and protects the roots of phylloxera exposure and pathogenic organisms.

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