Annals of the Academy of Romanian Scientists
Online Edition Series on Agriculture, Silviculture and Veterinary Medicine Sciences
ISSN 2344 – 2085 Volume 1, Number 2/2012

PARTICULARITIES OF THE BIOCHEMISTRY OF THE GRAPE BERRIES OF VINE INTER-SPECIFIC HYBRIDS (*V.VINIFERA* L. X *M.ROTUNDIFOLIA* MICHX).

E. ALEXANDROV, B. GAINA[1]

Abstract. *The morphological and biochemical analysis effected on the grape berries of the vine inter-specific hybrids of 4th backcross (V. vinifera L. x M. rotundifolia Michx.) have shown the concentrations of phenolic substances, resveratrols, pectins etc. are relatively higher than in varieties of the cultivated vine (V. vinifera L.). However, the wild vine (Vitis vinifera subsp. silvestris Gmel.) has much more higher concentrations of phenolic substances, resveratrols, pectins etc. comparatively to those of vine inter-specific hybrids of 4th backcross (V. vinifera L. x M. rotundifolia Michx.).*

Keywords: berry, flavor, taste, resveratrol, pectin, sugars, pH, morphology.

1. Introduction

The morphological and biochemical analysis effected on the grape berries of the vine inter-specific hybrids of 4th backcross (*V. vinifera* L. x *M. rotundifolia* Michx.) have shown the concentrations of phenolic substances, resveratrols, pectins etc. are relatively higher than in varieties of the cultivated vine (*V. vinifera* L.).

However, the wild vine (*Vitis sylvestris* Gmel.) has much more higher concentrations of phenolic substances, resveratrols, pectins etc. comparatively to those of vine inter-specific hybrids of 4th backcross (*V. vinifera* L. x *M. rotundifolia* Michx.).

2. Materials and Methods

The plant material was composed of clusters of grapes and interspecific hybrids of the fourth backcross (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) (hybrids were obtained in the Laboratory of Dendrology Botanical Garden (Institute) of Academy of Sciences of Moldova), of *Muscadinia rotundifolia* Michx., *Vitis vinifera* L. (or vines planted), *Vitis sylvestris* Gmel. (or wild grape or vine wood).

[1] Prof., Acad., Practical Scientific Institute of Horticulture and Food Technology, Republic of Moldova (e_mail: bgaina@asm.md)

Morphological and biochemical analyzes were performed in Montpellier, France, using methods approved by the International Office of Vine and Wine [1999]. Morphological analyzes were carried out in the Laboratory of Dendrology Botanical Garden (Institute) of the Academy, such biochemical were carried out in the Laboratory of Quality control wines the National Institute of Vine and Wine of the Republic of Moldova and the National School of Agronomy of Montpellier, France, according to the method [2, 3, 9] approved by the International Office of Vine and Wine [1999].

3..Results and Discussions

Morphological and biochemical elements and clusters of grapes that have reached maturity, are shown in Table 1. Biochemical composition is very different from one genotype to another, both in quantitative and qualitative terms.

The following materials were assayed in berries vine total phenolics, resveratrols, pectin, organic acids and pH.

Biochemical analyzes performed according to methods approved by the International Office of Vine and Wine (1999) demonstrated a concentration of total phenolic compounds that varies among genotypes: 1970 mg/kg for hybrid berry blue-violet (DRX-M4-660), 597 mg/kg for hybrid pink berries DRX-M4-515), and the hybrid yellowish-green berries in intervals of 219 mg/kg (DRX-M4-520) until to 309 mg/kg (DRX-M4-545). This important biological indicator is a characteristic of the resistance against the attack of fungal parasites, bacteria, acetic, etc. phylloxera. Concerning the hybrid DRX-M4-660, with purple-blue berries, which contains 1970 mg/kg of phenolic compounds, it should be noted that over the contents of those noted in the varieties of Chismis Bujac (481 mg/kg), Kismis Moldova (399 mg/kg) and Pamiati Juraveli (511 mg/kg) determined in the years 2003-2007 at the National Institute of Vine and Wine of the Republic of Moldova [5, 6, 8].

In comparison with the inter-specific hybrids and species listed above, the wild vine (*Vitis sylvestris* Gmel.) With purple-blue berries contains 2019 mg/kg of phenolic compounds, which is absolutely remarkable.

Figure 1 shows all these results and highlights the hybrid DRX-M4-660 and *Vitis sylvestris* Gmel.

It is noted that in interspecific hybrids 4th generation backcrosses, there is also a relatively high concentration of resveratrol, from 4.9 mg/kg (DRX-M4-510) to 14.0 mg/kg (DRX-M4-660).

Resveratrol is also involved in resistance to pests and pests, as well as trap free radicals in the human body. In the hybrid grapes to dark violet-blue color, along with high concentrations of phenolic compounds 1970mg/kg (DRX-M4-660), relatively high concentrations of resveratrol 14.0 mg/kg were detected (DRX-M4-660).

As for phenolic compounds, resveratrol content, also very important, more than twice that of grapes *Vitis vinifera* L. If we consider the following varieties in the southern region of viticulture in Moldova for the years 2005-2007 in concentrations between 5 and 7 mg/kg were found for Cabernet Sauvignon, Merlot and Pinot -Black [6].

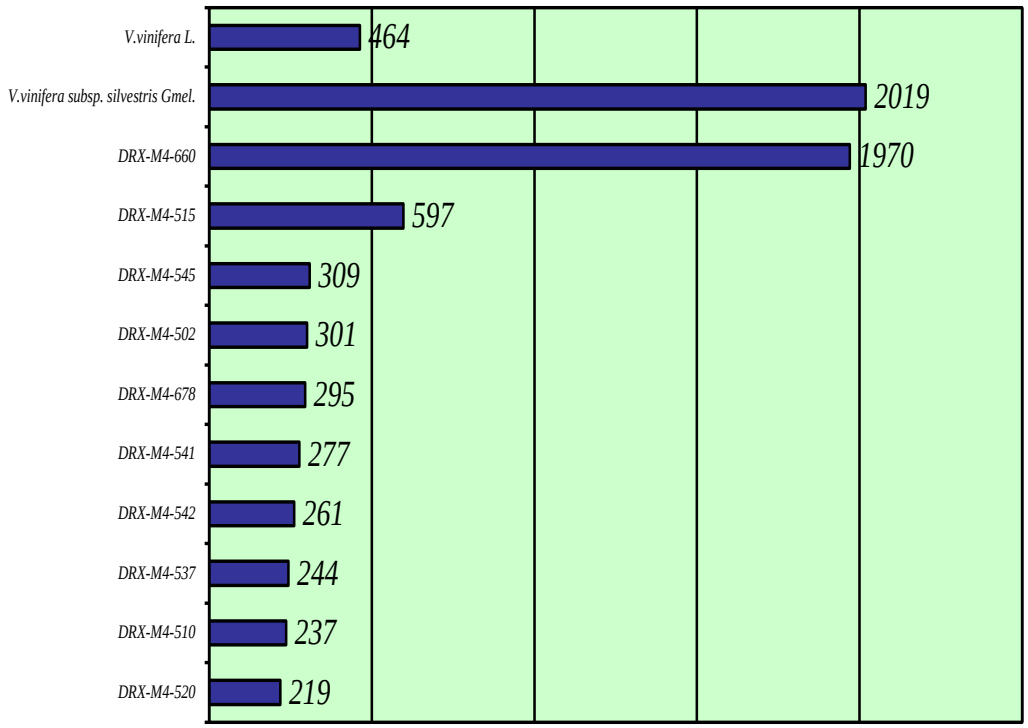

Fig. 1. Content of grape berry total polyphenols compounds (mg/kg) of inter-specific hybrids *V.vinifera L. x M.rotundifolia* and of *V. sylvestris* Gmel.

Wild vine *Vitis sylvestris* Gmel. has bays 16.0 mg/kg of resveratrol, which is here also quite noticeable, while the highest values are those of *Muscadinia rotundifolia* Michx. Figure 2 shows the overall results.

An equally important element for use in products œnothérapie interspecific hybrids for consumption pectins, which are dietary fiber, and are responsible for some balance in the blood of the human body, including the reduction of absorption through the intestinal wall of saturated fats and LDL cholesterol first (ie oxidized lipids that induce various adverse effects, according to Mr. Montignac, 2010). In interspecific hybrids were found in bays concentration of

pectin varies in the range of 413 mg / kg (DRX-M4-520) up to 711 mg/kg (DRX-M4-515). Values of *Vitis sylvestris* Gmel. here are also remarkable. Figure 3 shows these results.

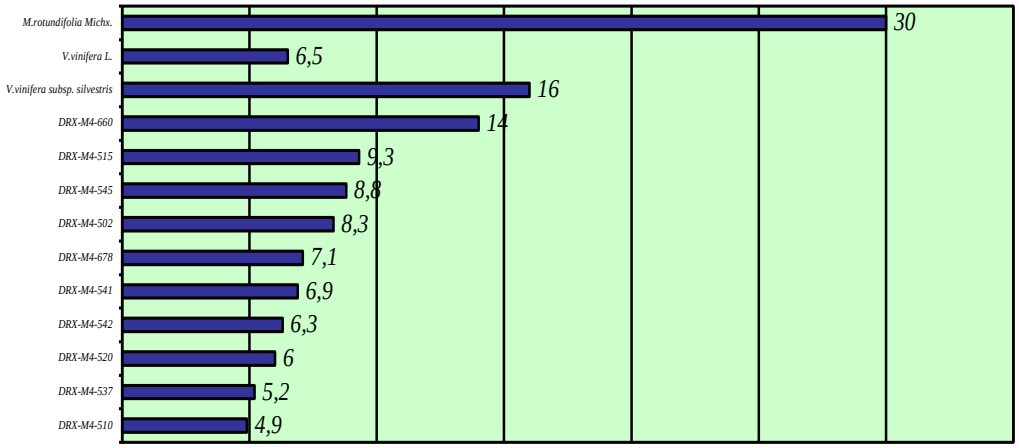

Fig. 2. Content of grape berry total resveratrols (mg/kg) of inter-specific hybrids *V.vinifera L. x M. rotundifolia* Michx., of *M. rotundifolia* Michx. and of *V.sylvestris* Gmel.

The human body receives substantially more than 50% of fiber needed by consuming an amount of 250-360 g of grapes (the rest of the input comes from the bread, vegetables etc.).

The analysis of the potential of the main organic acids in grapes - tartaric acid and malic acid - as well as those of titratable acidity and pH, attest to a normal presence of these in the total range of biological substances that influence taste, freshness and balance sensory components of interspecific hybrids of grapes 4th generation backcrosses *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. *Vitis sylvestris* Gmel. here is the usual standards. Figure 4 shows these values.

According to the results of biochemical analyzes conducted on berries of interspecific hybrids of grapevine (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) 4th generation backcrosses, it was found that their content in phenolic compounds, pectins or resveratrols is relatively higher than in the cultivated vine varieties (*Vitis vinifera* L.).

The American vine (*Muscadinia rotundifolia* Michx.) has an absolute resistance against phylloxera snout and the leaves (gall), and a series of resistance to fungal parasites major. It is logical to observe that the concentration of resveratrols totaiux reaches the limit of 30 mg/kg, and also that the total phenolic content and

total pectins are higher than in the European vine (*Vitis vinifera* L.) is not resistant to phylloxera pest or fungal.

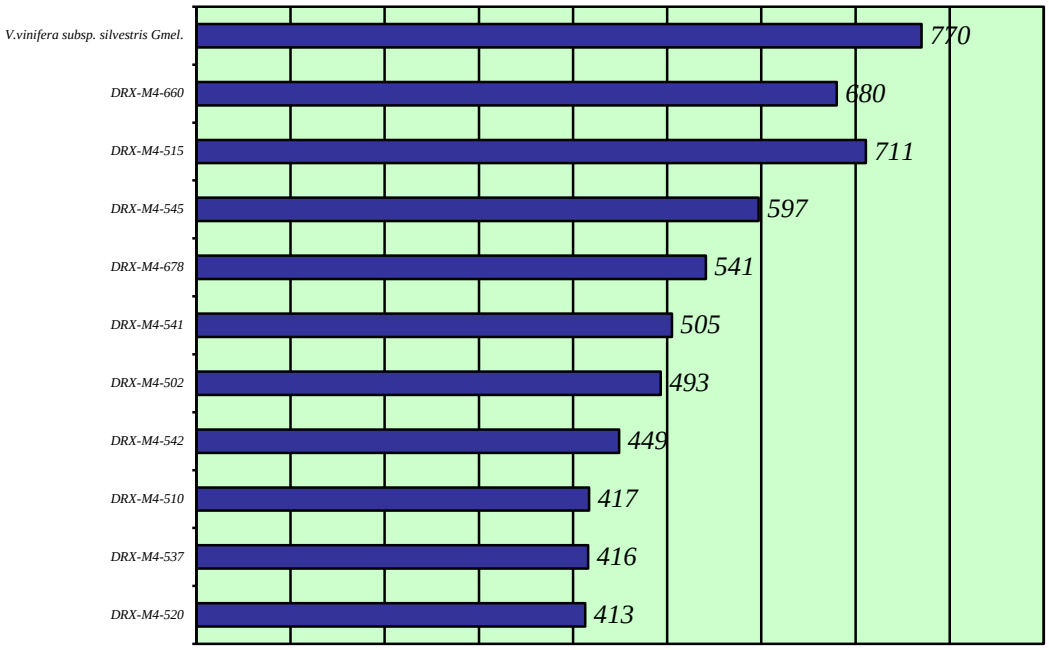

Fig. 3. Content of total pectins of inter-specific hybrids *V.vinifera L. x M. rotundifolia* Michx. and of *V. syilvestris* Gmel.

Interspecific hybrids (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) are not attacked by the phylloxera gall or snout, or by major fungal parasites. Their previous levels of the compounds is higher than the cultivated vine, may sless however, that for the parent resistance *Muscadinia rotundifolia* Michx.

But the result probably relates more original wild vine (*Vitis sylvestris* Gmel.) Which is not known to possess remarkable resistance to pests, parasites and pests above. Any time it is suitable for environments often difficult, and therefore probably has genes for tolerance to abiotic environmental stress. In any case it contains concentrations of phenolics, pectins and resveratrols much higher than interspecific hybrids, and therefore *Vitis vinifera* L.

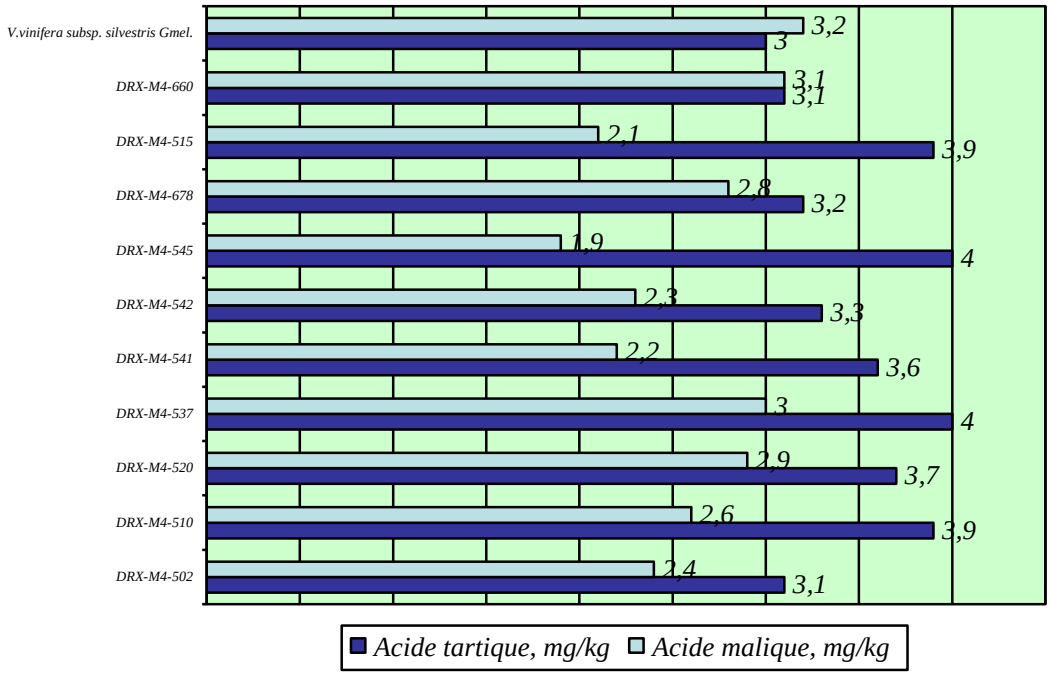

Fig. 4. Content (mg/kg) of malic acid and tartaric acid of inter-specific hybrids *V.vinifera L. x M.rotundifolia* Michx. and of *V. sylvestris* Gmel.

Conclusions

(1)Interspecific hybrids of grapevine (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) With berries yellowish green have total phenolic contents within: 219, mg/kg (DRX-M4-520) until to 309 mg/kg (DRX-M4-545) in resveratrols total 4.9 mg/kg (DRX-M4-510) to 8.3 mg/kg, and total pectin 413 mg/kg (DRX -M4-520) up to 597 mg/kg (DRX-M4-545); interspecific hybrids with pink berries (DRX-M4-515) hold: the total phenolic concentrations of 9.3 mg/kg, total resveratrols mg/kg, and total pectin 680 mg/kg and interspecific hybrids with berries blue-violet (DRX-M4-660) possess the total phenolic contents of 1970 mg/kg, resveratrols total 14.0 mg/kg and total pectin 680 mg/kg.
(2)Wild vine (*Vitis szlvestris* Gmel.) With berries of a blue-violet shade holds: the total phenolic content of 2019 mg/kg in total resveratrols 16.0 mg/kg and total pectins 770 mg/kg.
(3).American wild grapes (*Muscadinia rotundifolia* Michx.), Also having the berries of a blue-violet shade, holds bays resveratrols total concentrations of 30 mg/kg.

(4).Wild plants have a much higher resistance to biotic and abiotic environment that cultivated plants, but breeding can transmit these characters largely from parent *Muscadinia rotundifolia* Michx. As for the wild grape, *Vitis sylvestris* Gmel., a search would be interesting to develop in order to know their characteristics and possible interests.

References

[1] Alexandrov E. *Hibridarea distanţă la viţa de vie (V.vinifera L. x V.rotundifolia Michx.).* (Printr-Caro, Chişinău, Republica Moldova, 2010, 182 pag.).

[2] Heroiu Elena, Savulescu Georgeta, Racota Rodica. *Studii asupra resveratrolului, compus biologic activ*. Iu Link: http://www.univagro-iasi.ro/Horti/Lucr. St. 2005/63.

[3] Kolouchova-Hanzlikova, melzoch Karel, Filip Vladimir, Smidrkal. *Rapid method for resveratrol determination by HPLC with electrochemical and UV detections in Wines*. J. of Food Chemisty 87, 151-158 (2004).

[4] Alexandrov E. *L'hybridation distante de la vigne (Vitis vinifera L. x V.rotundifolia Michx.).* Revista Botanică. **II. 2.,** 148-154 (2010).

[5] Gaina B. *Struguri, vinul şi proprietăţile lor nutritive şi curative*. (Chişinău, Republica Moldova, 1999. 56 pag.)

[6] Gaina B., Roman O., Bourzeix R., Gougeon R. *Viticultura şi vinificiaţia în Moldova*. Chişinău, Republica, **3**, 24-25 (2007).

[7] Montignac Michel. *Vinul un aliment esenţial pentru sănătatea ta.* (Editura „Litera", Bucureşti, România, 2010, 238 pag.)

[8] Odăgeriu G., Niculana M., Cotea V., Gaina B., Zamfir C. *Study on the profile of antocyans from red wines obtained by different technological variants of maceration-fermentation.* Cercetări Agronomice în Moldova. Iaşi, România, **2 (130),** 41-53 (2007).

[9] Alexandrov E. *Otdalennie ghibridi vinograda Vitis vinifera L. x Muscadinia rotundifolia Michx*. Visnik Kiivsikovo Nationalinovo Universitetu Imeni Tarasa Sevcenco «Introductia ta zberegania roslinnovo riznomanittea», **19-21**, 29-30 (2009).

[10] Gaina B. *Anologhia i biotehnologhia productiov pererabotcki vinograda*. (Chisinau. Stiinta. 1990, 266 st.)

[11] Juan F. Mareno-Labanda, Ricardo Mallavia, Laura Pere-Fons, Victoria Lizama, Domingo Saura, and Vicente Micol. *Determination of Piceid and Resveratrol in Spanish Wines Deriving from Monastrell (Vitis vinifera L.) Grape Variety*. J. Of. Agric. Food. Chem.. **52**, 5396-5403 (2004).

Topala S. *Cariologhia, poliploidia i otdalennaia ghibridizatia vinograda*. (combinatul Poligrafic, Chisinau, 2008, 550 pag.).