### THE INFLUENCE OF CULTIVATION TECHNOLOGY ON THE PHENOLIC COMPOSITION OF FETEASCA NEAGRA VARIETY GROWN IN MURFATLAR

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### INTRODUCTION

An increasing number of scientific studies show that a moderate consumption of wine not only makes life better, but it also extends it.

The scientific arguments regarding the benefic effects of moderate wine consumption, especially red wine, have been well received by the consumers, and as a result the modern life style is hard to imagine without wine.

Recent medical research has discovered that the phenolic compounds from red grapes and wines have remarkable features from the viewpoint of human health, due to their direct and indirect antioxidant action: cardiovascular protectors, antiviral / antihistamin / anticarcinogenic / antiinflammatory action etc.

The viticultural practices that can influence the concentration phenolic compounds from grapes are very numerous. Some of them, mentioned in various scientific papers, are:

- the vine training,
- space between rows,
- pruning,
- reducing the number of bunches on the plant,
- thinning of berries and leaves rărirea boabelor și a frunzelor,
- management of irrigation and fertilization,
- conventional, organic and/or biodynamic systems etc.





### **RESEARCH MATERIALS**



The experiments carried out in this study focused on the variety Feteasca neagra, grown on two different plots: • one cultivated organically (organic certification since 2010 by S.C. ECOINSPECT, evaluator approved by the Ministry of Agriculture (MADR)

• another one cultivated in the conventional system (ampelographic collection)

The reduction of the number of bunches on the vine was done in the veraison stage (Filippetti I. and colab., 2007, Demir K., 2011).

Maturity was reached differently due to different conditions in the two years of study:

- year 2013: harvesting was done on September 12
- year 2014: harvesting was done on September 16.

The essential condition for obtaining organic wines is the use of grapes obtained 100% in an organic system, while at least 95% of the other products used in the process must be of certified organic origin.

The difference between the classic technology and the organic technology consists of adherence to a set of complex rules comprised in the EU Regulation no. 834/2007 for the vineyard and 203/2012 for the wine, which establish a series of norms that maintain the natural character of the products while also allowing for diversity and keeping the high standards of quality.



# **METHODS**



Determination of the individual phenolic compounds by HPLC -DAD was done in the Laboratory for Food Quality from the National Institute of Research and Development for Criogeny Technologies Râmnicu Vâlcea.

a) **Determination of individual phenolic compunds** was done by RP-HPLC by direct injection of the sample into the chromatographic system. The HPLC equipment used was a Thermo Finnigan<sup>TM</sup> Surveyor Plus HPLC System equipped with a Surveyor Photodiode Array Detector (PDA), autosampler (Surveyor autosampler), a Surveyor LC Pump (Quaternary gradient) and the software for data processing (Chrome Quest Chromatography Workstation).

b) *Determination of individual anthocyans* was done by RP-HPLC according to the method MA-E-AS315-11-ANCYAN described in the OIV Compendium.

*c)* Determination of totali polyphenols (mg GAE L<sup>-1</sup>) was done using the Folin-Ciocâlteu method.

d) **Determination of total anthocyans** (mg L<sup>-1</sup>) was done using the Ribereau-Stonestreet method.

e) **Determination of the antioxidant activity** (µmol/l) was done using the anti-radical (DPPH) method on the basis of spectrophotometric measurements.

f) The statistic analysis was done using analysis of variance (ANOVA), the Duncan tests for multiple comparison, for the discrimination of the two factors: cultivation system (organic and conventional) and the reduction of the number of bunches on the vine (by 30% compared to the control), at  $p \le 0.05$ , for each year of study.



#### THE TEHNOLOGIA FOR OBTAINING THE RED WINES STABILIREA MOMENTULUI OPTIM DE RECOLTARE RECEPTIA CANTITATIVĂ ȘI CALITATIVĂ ZDBOBIRE ȘI DESCIORCHINARE EVACUAREA CIORCHINILOR MACERAREA FERMENTAREA PE BOȘTINĂ The winemaking process was PRESARE carried out in batches of 50 ASAMBLAREA MUSTURILOR kg/variant in the microvinification compartment, FERMENTAȚIA ALCOOLICĂ SUPLIMENTARĂ by applying the classic technology for quality red wines FERMENTATIA MALOLACTICĂ (maceration-fermentation on skins lasted 5 days for all TRATAMENTE DE CONDIȚIONARE ȘI STABILIZARE experimental variants). MATURARE *ÏMBUTELIERE* **INVECHIRE**

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## **RESULTS AND DISCUSSION**



The specificity of red wine is given by it's polypehnols composition, which is very rich and complex, consisting of phenolic acids, flavanols, flavonols, stilbes (trans-resveratrol), anthocyans and many other polyphenols.

In this study a total of 20 phenolic compounds were identified in the analyzed wines. They can be grouped in:

- phenolic acids (galic, siringic and p-cumaric acids)
- flavonols (catechine and epicatechine),
- stilbens (trans-resveratrol),
- flavones (rutin and quercitin)
- monoglycosid anthocyans (delfinidine, cyanidine, peonidine, petunidine, malvidine) acilates and cumarilates





In case of gallic acid, the grape thinning did not cause significant increases in the two cultivation systems. Higher values were seen in 2014/conventional system. Significant differences are seen when the two years are compared.

PHENOLIC ACIDS

For syringic acid, grape thinning caused small nonsignificant decreases in both cultivation systems. In the conventional system the values are close, between 1.05 and 1.19 mg/l. Significant differences are seen when the two years are compared.



For p-cumaric acid grape thinning caused small nonsignificant increases in both cultivation systems. Higher values were seen in the conventional system.

#### Acid siringic (mg/l)





The values of CTH oscillated over a narrow range 7.43-10.17 mg/l.

Grape thinning cause a small non-significant increase in both cultivation system. The values were higher in the conventional system.



For ECTH, grape thinning led to an average increase of 45.6% in the organic system and 78.7% in the conventional system. The values in the organic system were on average higher by 118% compared to the conventional system.





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In case of R, grape thinning led to a significant increase in both systems, on average by 21%. There are significant differences between the organic and conventional systems. The values were higher in 2013.

In case of T grape thinning led to an average increase of 20% in both systems. The values in the organic system were on average higher by 25% than those in the conventional system.

ecologic

conventional

2014

conventional

2013

ecologic

### INDIVIDUAL ANTHOCYANS

The anthocyans analyzed in the studied wines were monoglycosid derivatives of 5 anthocyanidins: delfinidine, cyanidina, petunidine, peonidine and malvidine, as well as two acetil derivatives and two cumaril derivatives.

	Vintage 2013				
Compound (mg L <sup>-1</sup> )	Organic- control	Organic-reduced 30%	Convention al-Control	Conventional- reduced 30%	
Delfinidina-3-monoglucozid	0.67±0.22 <sup>b</sup>	1.71±0.63ª	0.50±0.32 <sup>b</sup>	0.69±0.37 <sup>b</sup>	
Cianidina-3-monoglucozid	0.25±0.11 <sup>b</sup>	0.59±0.26ª	$0.38 \pm 0.10^{ab}$	0.40±0.13 <sup>ab</sup>	
Petunidina-3-monoglucozid	0.92±0.55ª	1.71±0.38ª	$1.00 \pm 0.30^{a}$	1.16±0.52ª	
Peonidina-3-monoglucozid	0.26±0.11 <sup>a</sup>	0.39±0.22ª	0.39±0.22ª	0.43±0.15 <sup>a</sup>	
Malvidina-3-monoglucozid	18.91±4.30 <sup>a</sup>	20.73±2.60 <sup>a</sup>	16.08±2.90 <sup>a</sup>	18.94±3.20 <sup>a</sup>	
Peonidina-3-acetil-glicozid	0.35±0.10 <sup>b</sup>	0.35±0.18 <sup>b</sup>	0.82±0.26 <sup>a</sup>	0.74±0.29 <sup>ab</sup>	
Malvidina-3-acetil-glicozid	5.65±1.62 <sup>a</sup>	6.96±1.35ª	0.77±0.28 <sup>b</sup>	0.84±0.33 <sup>b</sup>	
Petunidina-3-cumaril-					
glicozid	0.34±0.20ª	0.37±0.199ª	$0.30 \pm 0.18^{a}$	$0.33 \pm 0.10^{a}$	
Malvidina-3-cumaril-					
glicozid	2.40±0.30ª	1.47±0.10 <sup>b</sup>	1.15±0.10 <sup>b</sup>	1.31±0.16 <sup>b</sup>	



For all individual anthocyans, grape thinning led to an increase compared to the control for both cultivation systems. The values were higher in the organic system.



### ANTOCIANI INDIVIDUALI



	Vintage 2014				
Compound (mg L <sup>-1</sup> )	Ecologic-Martor	Ecologic-redus 30%	Conv-Martor	Conv-redus 30%	
Delfinidina-3-monoglucozid	1.75±0.27 <sup>b</sup>	2.48±0.33ª	1.00±0.18 <sup>c</sup>	1.80±0.36 <sup>b</sup>	
Cianidina-3-monoglucozid	0.27±0.10ª	0.29±0.04ª	0.31±0.09ª	0.37±0.11ª	
Petunidina-3-monoglucozid	4.26±1.172 <sup>ab</sup>	5.93±1.20ª	2.16±1.06 <sup>b</sup>	3.90±1.18 <sup>ab</sup>	
Peonidina-3-monoglucozid	3.38±0.52 <sup>b</sup>	<b>4.64±0.66</b> ª	2.36±0.30 <sup>b</sup>	5.19±0.76ª	
Malvidina-3-monoglucozid	32.75±6.30 <sup>ab</sup>	<b>43.29</b> ± <b>7.50</b> <sup>a</sup>	20.57±6.20ª	31.56±5.80 <sup>ab</sup>	
Peonidina-3-acetil-glicozid	0.51±0.21ª	0.60±0.16ª	$0.51{\pm}0.20^{a}$	0.48±0.18 <sup>a</sup>	
Malvidina-3-acetil-glicozid	1.34±0.30 <sup>ab</sup>	1.78±0.35ª	1.04±0.27 <sup>b</sup>	1.25±0.38 <sup>ab</sup>	
Petunidina-3-cumaril-glicozid	0.86±0.21 <sup>ab</sup>	1.16±0.32ª	0.54±0.16 <sup>b</sup>	0.83±0.20 <sup>ab</sup>	
Malvidina-3-cumaril-glicozid	1.88±0.33 <sup>b</sup>	2.53±0.38ª	1.14±0.27 <sup>c</sup>	1.66±0.29 <sup>bc</sup>	

Constatăm că în cazul tuturor antocianilor individuali, LRS a dus la o creștere comparativ cu martorul în cazul ambelor SC. Diferențe se observă și între cele două SC, **SE prezententând valori mai mari comparativ cu SC.** 





Regarding anthocyans content, the highest values were in thinned variants, the average increase being 26.6% for both systems. The organic system showed a rise comparable with the conventional one, about 16% on average.

The variant with highest content of total polyphenols is the one with grape thinning. The average increase was 14.7% and the organic system had a higher rise compared to the conventional system.

#### Antociani totali (mg/l)



By their activity the phenolic compounds have the ability of acting antioxidant agents, preventing some medical conditions (cancer, cardiovascular diseases etc.) and slowing down degenerative processes and aging.



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![](_page_13_Picture_3.jpeg)

Analizing the data it can be concluded that grape thinning led to an increase of the antioxidant activity on average by 17.7% in both systems. The organic system showed higher values by 10.3% compared to the conventional one.

# CONCLUSIONS

Important amounts of gallic acid, p-cumaric acid and catechine were identified in the studied wines, in a higher concentration in the conventional wines. However, the organic wines presented a higher content of total polyphenols, especially as a result of a higher content of several phenols such as *epicatechine*, *rutin*, *quercitin and transresveratrol*.

As for the **total anthocyans** they are observed in a **higher concentration in the organic wines**, compared with the conventional ones, for the majority of the analyzed compounds, with the exception of peonidine-3 monoglycoside.

The thinning of the grapes on the vine by 30% led to an enrichment of the wines in phenolic compounds thus contributing to the increase of the antioxidant activity for both cultivation systems.

*It is therefore recommended,* for improving the phenolic content of wines of Feteasca neagra, to use the organic cultivation system coupled with a reduction of the number of bunches on the grapevine.

![](_page_14_Picture_5.jpeg)

![](_page_14_Picture_6.jpeg)

![](_page_15_Picture_0.jpeg)

# Thank you for your attention!

![](_page_15_Picture_2.jpeg)

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