STUDIES ON ORGANIC ACIDS CONCENTRATION OF TĂMÂIOASĂ ROMÂNEASCĂ WINE FROM COTNARI VINEYARD

STUDIUL ACIZILOR ORGANICI DIN VINURILE DE TĂMÂIOASĂ ROMÂNEASCĂ DIN PODGORIA IAŞI

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Abstract: *In this study, the must obtained in 2011 and 2012 from Tămâioasă românească variety was subjected to a number of 9 prefermentative treatments with oxalic acid, lactic acid, succinic acid, silicon dioxide, tannins, bentonite, graphen, chitosan and activated charcoal. The results showed that malic acid concentation increased due prefermetative treatments application in Tămâioasă românească wines obtained in 2011 from 1,24 g/L (M) to 1,61 g/L (V6). Acid succinic content in wine decreased after oxalic acid (V1) addition.*
Key words*: Tămâioasă românească, oxalic acid, chitosan, activated carbon*

Rezumat. *În acest studiu, mustul obţinut din soiul Tămâioasă românească în anii de recoltă 2011 şi 2012, a fost supus unui numar de 9 tratamente prefermentative cu acid oxalic, acid lactic, acid succinic, silicat de sodiu, tanin, bentonită, grafen, chitosan şi cărbune activ. Rezultatele au arătat că tratamentele prefermentative au condus la creşterea concentraţiei de acid malic din vinurile din 2011 de la1,24 g/L (M) la 1,61 g/L (V6). Tratamentul efectuat cu acid oxalic (V1) a condus la reducerea concentaţiei de acid succinic din vin.*
Cuvinte cheie*: Tămâioasă românească, acid oxalic, chitosan, cărbune activ*

INTRODUCTION

Besides the grape processing technology, the treatments applied to the must before fermentation also have an important role in deciding the wine's quality. (Ribéreau-Gayon and Dubourdieu, 2006). Several studies have been performed on the effect of enological practices on the wine's composition (Losada et al., 2010; Puig-Deu et al., 1996; Villanõ et al., 2006). The increasing of the titrable acidity and the total acidity of wine can be achieved by lactic acid addition.

Lactic acid can favour the biological evolution and maturation of wines and can also influence the obtaining of balanced wines from a gustatory point of view (***OIV, 2013). For adjustment of must acidity, oxalic or succinic acid can be used. Oxalic acid is also used to demonstrate the presence of calcium in a liquid as it causes turbidity and precipitation (Ribéreau-Gayon and Glories, 2006). As for succinic acid, its bitter- salty taste

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causes salivation and accentuates the wine's flavour and vinous character (Ribéreau-Gayon and Glories, 2006; Jackson, 2008). The exogenous tannins are frequently added to wines during the winemaking process for a number of reasons: to stabilize colour, to modify mouth-feel, to mask green characters, to increase polyphenolics and aromatic stability (Harbertson et al., 2011; Parker et al., 2007). Sodium silicate is used to clarify wines (***OIV, 2013).

The use of bentonite as a clarifying agent means to prevent the formation of protein haze in wines. Treating must with bentonite is recommended for wines which are to be clarified shortly after the completion of alcoholic fermentation (Ribéreau-Gayon and Dubourdieu, 2006). Recently characterized as "the thinnest material of the universe" (Geim and MacDonald, 2007), graphen is the two-dimensional version of graphite consisting of a two-dimensional arrangement of carbon atoms disposed in a hexagonal grid.

Graphene is the best known conductor of electricity and heat. Graphene presents a whole range of special properties, which gives it great potential for the practical production of new uses. Chitosan treatment can be an effective method to clarify the must and to prevent protein haze (Rao et al., 2010; Domingues et al., 2011, ***OIV, 2013).

It was observed that commercial preparations of β -glucosidase can be immobilized on chitosan and used in winemaking for the purpose of improving the aromatic potential of wines (Gallifuoco et al., 1998). Also, chitosan shown to effectively remove the polyphenols contained in white wines with a high polyphenol content and to have a stabilization capacity comparable to that of potassium caseinate (Spagna et al., 2000).

Another clarifying agent is activated charcoal, useful for correcting organoleptic issues of wine obtained from musts affected by fungi such as grey rot (*Botrytis cinerea*) or oidium (*Uncinula necator*), to eliminate, possible contaminants, to correct the colour from white musts derived from the white juice of red grapes, from very yellow musts derived from white grape varieties and from oxidized musts (Ribéreau-Gayon and Glories, 2006).

Knowledge of the organic acids content in wine present a great interests because these acids contributes to wine stability and affects the organoleptic qualities of wines, especially white wines (Ribereau-Gayon et al., 1982, Jackson, 1994). Their preservative properties also enhance wines' microbiological and physicochemical stability. The objective of the present study is to evaluate the influence of different enological treatments on the organic acids content of Tămâioasă românească wine.

MATERIAL AND METHOD

Grape samples and winemaking

Tămâioasă românească grapes from Cotnari vineyard were harvested in 2011 and 2012 at optimal maturity. The grapes were destemmed and crushed, and each

must obtained was transferred in glass containers. Before fermentation, nine treatments were applied to the must :

- oxalic acid - 0,6 g/L (V1),
- lactic acid – 3 g/L (V2),
- succinic acid – 2 g/L (V3),
- silicon dioxide – 2,4 g/L (V4),
- tannins – 0,05 g/L (V5),
- bentonite – 1 g/L (V6),
- graphen – 1 g/L (V7), chitosan – 1 g/L (V8)
- activated charcoal – 1 g/L (V9).

The must were stirred to ensure a homogenous fermentation. After alcoholic fermentation, wines were filtered using a filtration-filling device-Tenco Enomatic® followed by sulfur dioxide addition (40 mg / L) to preserve wine from microbiological damage. Bottling was done with a semi-automatic device. After six months of storage the wines were analysed. Also, for each grape variety, a control sample (V) was obtained without prefermentative treatment.

Regents for pre-fermentative treatments: tannin (Taniblanc® - from AEB Spa, Italy), bentonite (Bentonita Clarit PLV 45 – Sodinal, France). Oxalic acid, lactic acid, succinic acid, sodium silicate, graphen, chitosan and activated charcoal were purchased from Sigma-Aldrich, Germany.

For analysing the organic acids from wines, the used methods were those recommended by the OIV (MA-E-AS313-04-ACIORG and MA-E-AS313-17-ACSHIK). The samples were processed by using a Shimadzu HPLC composed of: autoinjector Shimadzu series Prominence SIL-20AC (used injection volume: 10 µL, samples temperature 20 °C), quaternary pump Shimadzu series Prominence LC-20AD with five channels dagasing device Shimadzu series Prominence DGU-20A5, column oven Shimadzu series Prominence CTO-20AC, Photo Diode Array Shimadzu series Prominence SPD-M20A (used scanning segment: 200-440 nm), controler of cromatographic system Shimadzu series Prominence CBM-20A and PC conectivity through LAN.

RESULTS AND DISCUSSIONS

In Romanian wines, tartaric acid is found in concentrations between 0,3–4 g/L (Cotea et.al., 2009). Figure 1 registers the fact that the limits are not exceeded: 1,44 g/L (V4 - 2011) and 2,18 g/L (V1 – 2012). The wines from 2012 have a slightly higher concentration that the 2011 wines. Regarding the malic acid concentration, this has grown after using prefermentative treatments to 2011 wines.

The lactic acid in the new wines that did not undergo malolactic fermentation, is registered in a very low quantity, up to 0,5 g/L, while in wines that did undergo malolactic fermentation, it reaches up to 2–4 g/L (Cotea et.al., 2009). Except the variant where a treatment with lactic acid was applied and where a quantity of 6,62 g/L (V2 -2012) was registered, the other treatments did not influence the lactic acid concentration in wine, the values being quite similar among them (fig. 1).

In 2012 wines, the acetic acid values are very small in samples treated with sodium silicate (V4), tannin (V5) and chitosan (V8).

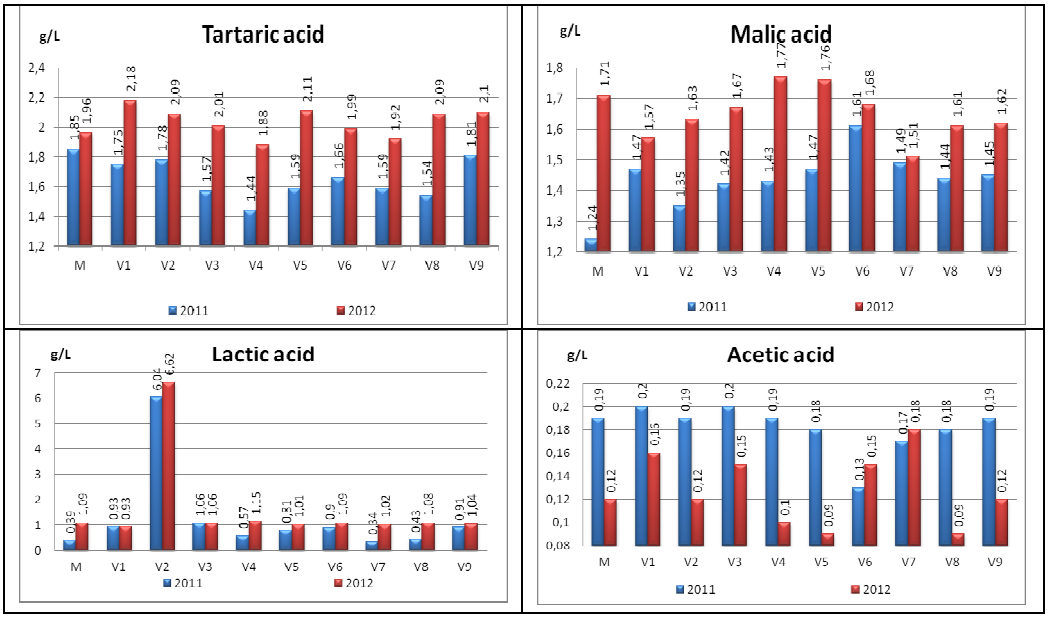

Fig.1. Tartaric acid, malic acid, lactic acid and acetic acid concentrations from Tămâioasă românească wines.

Due to the application of prefermentative treatments with oxalic acid and succinic acid (fig. 2), the concentration of these acids in wine registers values which are much higher than the other samples, such as the concentration of the succinic acid reaches a value of 1,47g/L (V3 – 2012), while oxalic acid is noted to be 80, 04 mg/L (V1 – 2011).

The succinic acid content in wine has decreased after applying the oxalic acid treatment (V1). 2012 Wines with pre-fermented treatments noted a decrease in concentrations of citric acid compared to the control.

The shikimic acid concentration (fig. 2) has much higher values in 2011 wines (V4 - 3,77 mg/L), compared to 2012 wines where the maximal values is of 1,59 mg/L (V4).

Fumaric acid content varies from 0,18 mg/L (V8 – 2011) to 0,99 mg/L (V4 – 2012) (fig. 3).

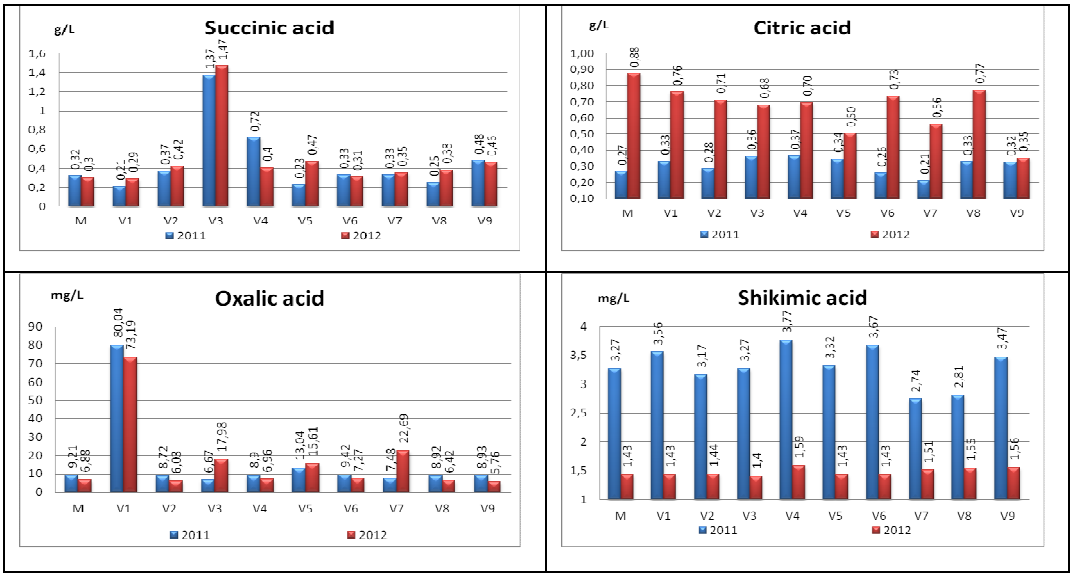

Fig.2. Succinic acid, citric acid, oxalic acid and shikimic acid concentrations from Tămâioasă românească wines.

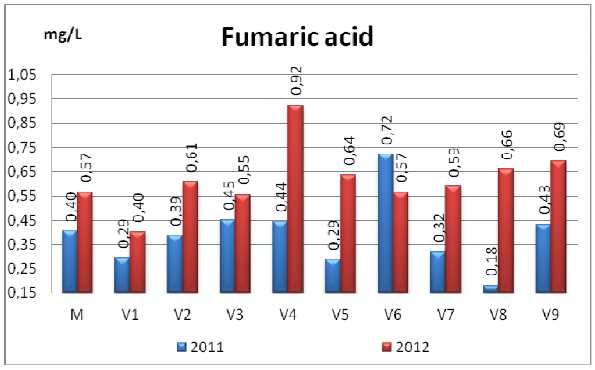

Fig.3. Fumaric acid concentration from Tămâioasă românească wines.

CONCLUSIONS

2012 wines registered higher values of tartaric acid than in 2011, while the malic acid concentration was raised after applying pre-fermentative treatments compared to the 2011 control sample.

The succinic acid content in wine has diminished after treating with oxalic acid (V1).

Treatment with sodium silicate (V4) led to a growth of the content of shikimic acid.

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