PROPOSAL FOR AN ALTERNATIVE PRODUCT TO ACIDIFY GRAPE MUSTS AND WINES

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Introduction

Grape must and wine acidification is an important winemaking practice. It is subject to regulations and laws, and beside these may be different from a producer country to another.
According to the European Community rules, and the International Code of Enological Practices (7), only organic acids can be added to the wine, with the objective to increase the total acidity and to decrease the pH. It is not just a matter of balance the wine flavor, but also to favorite the good biological evolution and a good wine preservation.
Among the allowed practices, we can mention the biological acidification that uses selected strain of *Saccharomyces*, according to the OIV resolution "oeno5/2003" (8).
Other than tartaric acid, the use of citric acid is allowed in wine, provided that its amount is kept below certain values. The use of citric acid is allowed only in certain non-Europeans winemaking countries. In alternative to acidification, several hypotheses have been the object of numerous studies (1, 2, 3, 4, 5, 9, 11).
The main aim of this study is to evaluate and to propose a natural product of viticulture origin, as alternative to tartaric acid to acidification. The possibility to produce an acid juice, essentially characterized by malic acid acidity, starting with grapes harvested during cluster thinning practiced in the vineyard, has been evaluated.

Material and methods

Grape originated from cluster thinning carried out in July have been used, and grinded with the stems. Pressing of the all batch has been carried out with a pneumatic press and the obtained juice (70-80% yield) has been clarified in order to eliminate possible pesticide residuals and polyphenol surplus.
The juice obtained was utilized for the acidification of 4 wines, and compared to tartaric acid addition: two white wines and two red wines with a very low acidity caused by a non desired malolactic fermentation, or by an excessive malic acid degradation due to summer high temperature. Malic acid was practically absent in the grape musts.
Acidification was carried out using tartaric acid (H_2T), the only one admitted by the current laws, or adding a juice rich in malic acid (H_2M) obtained from the grape removed during cluster thinning carried out on the second decade of July.
Both tartaric acid use (T1 and T2) and addition of juices from removed grape (J1 and J2), increased the total acidity of 1 and 2 g/L.
When the acid juice was used, the increase of 1 g/L of acidity was achieved by adding 29 mL/L of juice.
Tartaric stability of the acidified wines was evaluated by a mini-contact test (6, 11). After treatment, the major parameters related to wine acidity and the sensory tests were carries out.

Natural acid juice production

The juice was obtained starting from the grape removed during an early cluster thinning following the scheme described below.

General scheme of acid juice production from grape collected during cluster thinning

Harvest of the grape clusters

Whole cluster grinding with a mill used to grind the stems

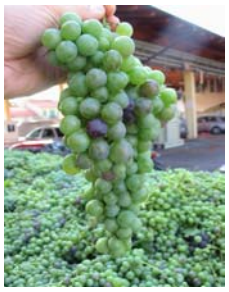
Pressing with pneumatic press

Juice separation (~70 %)

(Possible Clarification)

Addition of Stabilizing agent (200 ppm SO2)

Storage in Tank



Harvest of the cluster after thinning

Cluster rending with a stem grinder

Pressing with pneumatic press and juice collection (~70 % yield)

Average composition of the obtained juice was the following: total acidity 35,5 g/L (as tartaric acid), malic acid 25,7 g/L, tartaric acid 5 g/L, ºBrix 5, Abs 280 nm 30, pH 2,54.
The juice was produced at low cost using material available in the winery, and enhancing the value of a natural by-product of the viticulture productive thread.
A knife mill is perfect to produce little amount of juice. For large scale production it is possible to use the stem grinder already present in many wineries. The acidity of the juice obtained in this way make it fully sufficient to acidify, up to 2 g/L, all the wine produced with the grapes left in the vineyard at maturity, or to acidify other products. In the winery, possible needs of acidification are fully satisfied by the cluster thinning removed grapes, without other additions.
Because of its composition, the acid juice is easy to preserve. As precaution, it is suggested to add sulfur dioxide to avoid any kind of fermentation. It is also recommended to clarify the juice with high adsorbing agent, in order to avoid any kind of residual of pesticide and the undesired phenolic compounds of the stem. In this way the oxidation of polyphenols is also avoided.
The juice composition appears interesting because of its high malic acid content.

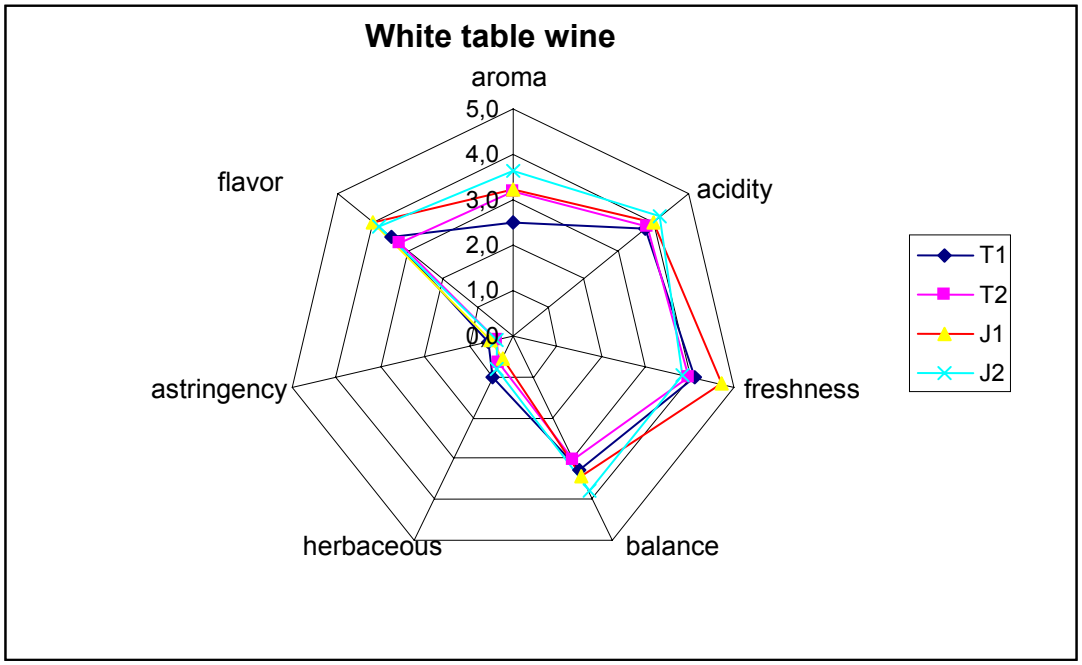
Results and discussion

Wine added with acid juice do not show significant precipitate compared to the controls added with tartaric acid.
In all the wines, the acidification achieved with addition of tartaric acid provoked a strong decrease of pH compared to the acid juice. From the sensory point of view, the results achieved with the acid juice were more interesting.
The wine freshness improved by the addition of natural malic acid lead to a higher general appreciation of the wines, also more significant because the pH decrease is less drastic than in the wine added with tartaric acid.

Sensory analysis of the wines

We were particularly interested to the descriptors “herbaceous” and “astringent” because the acid juice was produced from the stems, which could have had a negative impact on the wine. At the sensory analysis, the wines added with acid juice were positively evaluated for all the descriptors.

Cabernet Franc : the wine added with acid juice were characterized by freshness, harmony and a good olfactory quality; taste quality showed to be better than the control; herbaceous and astringency were not higher than the control.
Red Table Wine: among all the descriptors, freshness was found higher in the wine added with higher amount of acid juice. This fact confirms the positive role of the added malic acid.
Sauvignon: olfactory quality was found higher in the samples added with tartaric acid, but the taste of the wine added with acid juice was preferred. Also in this case, herbaceous sensation and astringency were not significantly different.
White Table Wine : in the scheme ,1 the sensory character of the samples added with acid juice was generally improved.
In other experiences carried out on industry scale, the acid juice was used to correct the acidity and to increase the freshness of the white wines of one vintage: the results showed a clear improvement of the sensory characteristics of the product without any significant change of the wine composition.



Scheme 1 : Results of sensory analysis of a white table wine after 1 and 2 g/l of acidity increment using tartaric acid (T1 e T2) or acid juice (J1 e J2)

Conclusions

The obtained product shows amount of acidity that make easier the product preservation before its use for the wine; the acidity is mostly due to the malic acid, potentially usable to correct the grape musts or the wine poor in malic acid.
Thereby, in enology, the acid juice could become a good alternative to tartaric acid in the practice of acidification.

Laboratory and industry trials allowed a positive evaluation of the wines added with this product absolutely natural and obtained from a by product of the viticulture productive thread. The treated wines showed to be organolepticaly better than the controls. Freshness is enfasized and in some case it was possible to give a balaced tastes to unbalanced wines. In the case of wines with little malic acid, it was possible to start malolactic fermentation after addition of the acid juice.

Taking into account the percentage of thinning usually applied in the vineyard, the produced juice is largely sufficient to correct the acidity of the all wine produced in the same vineyard.
The technique deserves to be evaluated by the designate body in order to allow a low cost winemaking practice capable to valorize a byproduct of the viticulture productive thread.

Abstract

The possible use in winemaking of the cluster removed in thinning performed at the color change, as source of malic acid has been studied. The grape removed during the cluster thinning in the month of July, were grinded with the related stems; the mass was therefore pressed in order to obtain an acid juice (70%-80% yield). The sensory characteristics of the treated wines showed to be improved enhancing also their freshness. Moreover, in the case of grape from vintages poor in malic acid, malolactic fermentation becomes possible. Considering the normal thinning rate, the produced juice is more than enough to correct the acidity of the all wins produced from the same vineyard. This could possibility be taken into account from the designated body in order to allow a winemaking practice at low cost that allows the use of a byproduct of the productive thread.

Bibliografia

1. Colombié S., Dequin S., Sablayrolles JM. 2003. Control of lactate production by Saccharomyces cerevisiae expressing a bacterial LDH gene, Enzyme and Microbial Technology, 33: 38-46.
2. Corte V., Ragusa M., Caridi A., et al., 2002. Confirmation of the ability of some yeasts to compensate the fixed acidità content of acid-deficient musts during winemaking in large volumes. Industrie delle Bevande, 31 (181): 438-441, 447.
3. Delfini C., Bosia PD., Martella M., Pagliata A., Gaia P., Ambro S., Moribondo G., Praz G. 2001. Experiments of acidification of musts and wine with DL-malic, DL-lactic and L(+)-tartaric acid. Bulletin de l'OIV 74 (841/842): 160-199.
4. Dequin S., Baptista E., Barre P. 1999. Acidification of grape musts by Saccharomyces cerevisiae wine yeast strains genetically engineered to produce lactic acid. Am. J. Enol. Vitic., 50 (1): 45-50.
5. Faverel JL. 1999. Acidity of musts and wines: alternatives to tartaric acid for acidification. Revue des Oenologues, 93: 23-27
6. Müller-Spath (H.), 1979. La stabilisation du tartre avec le procédé de contact. *Revue Fr. Œ.*, 73, 41-47.
7. O.I.V, 1996.Code International des Pratiques Oenologiques.
8. O.I.V, 2003, resolution œno 5/2003, acidification microbiologique
9. Umarino I., Tamborra P., Garcia-Moruno E., Di Stefano R. 2002. Acidification trias with L(+)-lactic acid. Effects on composition of wines. L'Enologo, 38 (6): 105-118.
10. Wurdig (G.) et Muller (T.), 1982. Méthode pour caractériser la stabilité du vin vis-à-vis du tartrate par détermination de la Tsat. *Bull. O.I.V.*, 55(613), 220-229.
11. Zironi R, Buiatti S., Celotti E., Amati A.. 1992. Study on periodical harvesting of grapes. Note I: composition of juices. *Vitic. Enol. Sci.*, 47, 5, 165-171.