EFFECT OF FLASH RELEASE TREATMENT ON THE POLYPHENOL COMPOSITION OF MUSTS AND WINES

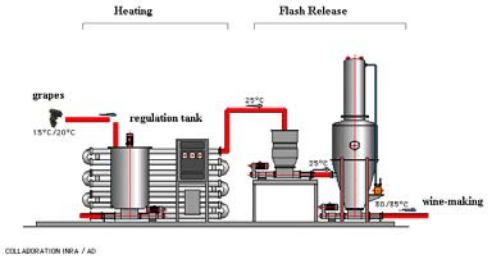
MOREL-SALMI C., SOUQUET J.-M. and V. CHEYNIER

Institut National de la Recherche Agronomique, Unité Mixte de Recherche Sciences pour l'Oenologie (INRA-SPO)
2 place Viala 34060 Montpellier cedex 2, France
E-mail: morelc@ensam.inra.fr

Phenolic compounds are an important group of substances that contribute to major wine sensorial characteristics such as colour, flavour, astringency and hardness.
The aim of this study is to improve existing technologies for wine production as well as to establish novel enzyme and physical treatments to produce healthier wines enriched in phenolic compounds.

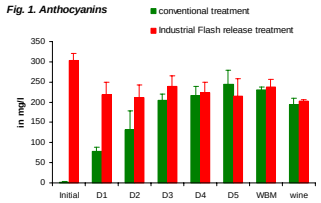
MATERIALS AND METHOD

Wines, elaborated from *Vitis vinifera* var. Grenache harvested in Gruissan (France) in 2003, have been obtained by classical winemaking techniques and with flash release technology. Flash release treatment was used on grapes after harvest. In flash release, the treated material is rapidly heated and then suddenly vacuum chilled. This technique is expected to degrade the cellular structures and to increase phenolic extraction. Changes in polyphenol composition have been monitored during fermentation. Anthocyanins, phenolic acids, catechins, flavonols and flavanol anthocyanin dimer adducts have been characterized in grapes, musts and wines by HPLC analysis coupled to diode-array and mass spectrometry detection. Proanthocyanidin composition has been determined by acid-catalyzed depolymerization in the presence of nucleophilic agents and subsequent analysis of the resulting products by reversed-phase HPLC (1).

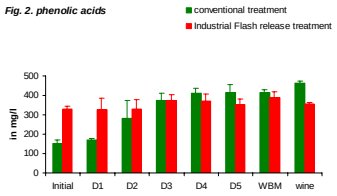


RESULTS AND DISCUSSION

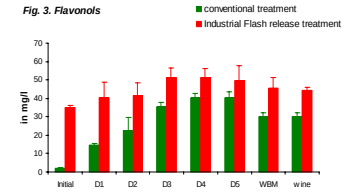
Anthocyanins, phenolic acids, flavonols, catechins and proanthocyanidins were identified and quantified in products during the fermentation (musts, wines) with different treatments (control, industrial flash release). The evolution for different classes of polyphenols is shown in Figures 1-5 (**D1** : day 1, **D2** : day 2, **D3** : day 3, **D4** : day 4, **D5** : day 5, WBM : wine before malolactic fermentation. Values are the average of four replicates).



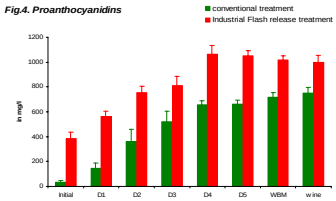
Evolution of anthocyanins (Fig. 1.) : In the control, the anthocyanins were extracted slowly and their concentration increased throughout fermentation. Must obtained after flash release treatement contained a large amount of anthocyanins meaning that the treatment allowed early extraction of a large quantity of anthocyanins. At the end, the FR treated wine contained the same quantity of anthocyanins as the control wine.



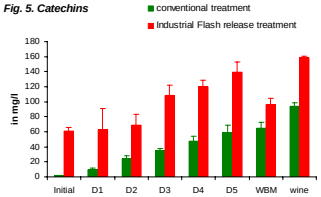
Evolution of phenolic acids (Fig. 2.) : In the control, phenolic acids were present from the beginning as expected from their occurrence in pulp. Their concentration increased until day 4, presumably due to extraction from skins, and then was stable until the end of fermentation. After the flash release treatment, a larger quantity of phenolics acids was extracted suggesting that no extraction nor oxidation took place during fermentation after flash release.



Evolution of flavonols (Fig. 3.) : In the control, flavonols were extracted slowly during fermentation. The flash release treated must contained a larger quantity of flavonols. During fermentation, their concentration increased slowly and then remained stable. The treated wine contained more flavonols (46%) than the control wine.



Evolution of proanthocyanidins (Fig. 4.) : Must obtained after flash release treatment contained 4 fold more proanthocyanidins than the control must. During fermentation, their concentration increased for both treatments so that the difference was gradually reduced. However, the treated wine contained more proanthocyanidins (33%) than the control wine.



Evolution of catechins (Fig. 5.) : After the flash release process, catechins were extracted more that in the control. Catechin content increased throughout fermentation in both treatments. At the end, the wine made with flash release contained 70 % more catechins than control wine.

Table 1. Tannin to anthocyanin ratio and flavonol anthocyanin dimer adducts in wine

Treatment	Tannin to anthocyanin ratio	Flavanol anthocyanin dimer adducts (in mg/l) eq Mv-3gl
Control	3.9 ± 0.6	1.6 ± 0.1
Industrial Flash release	4.9 ± 0.2	1.9 ± 0.2

In summary, the flash release treatment resulted in faster extraction of all classes of phenolic compounds. The differences in flavonols and flavanols concentration were maintained throughout fermentation and in the wines so that the F.R. treated wines contained larger amounts of these compounds than the control. In contrast, F.R. and control wines contained similar amounts of anthocyanins and phenolic acids.
Consequently the tannin to anthocyanin ratio present in wine was modified by the flash release treatment (Table 1). This ratio was increased by 25% for the industrial process. This is expected to lead to different organoleptic and nutritional quality and might also induce changes in content of derived tannins resulting from reactions between anthocyanins and flavanols (pigmented tannins). Flavanol anthocyanin dimer adducts formed by these reactions were quantified by HPLC-DAD for all treatments. Tannin anthocyanin dimer adducts actually increased with the F.R. treatment (Table 1). The larger quantity of tannins presumably favoured the formation of flavanol anthocyanin dimer adducts.
Similar assays were carried out on the mourvedre variety in two set of trials. Although the initial composition of grape polyphenols was different, the flash release treatment produced similar effects, increasing noticeably flavanol (56%) and flavonol (88%) contents and anthocyanin concentration (15%) only slightly. Tannin to anthocyanin ratio and flavanol anthocyanin dimer adduct contents were also increased in the flash release treated wines.

Acknowledgements

This study has been carried out with the financial support from the Commission of the European Communities, specific RTD programme "Quality of Life and Management of Living Resources", proposal number QLRT-2002-02364 "Novel enzyme-aided extraction technologies for maximized yield and functionality of bioactive components in consumer products and ingredients from by-products", acronym Maxfun. It does not reflect its views and in no way anticipates the Commission's future policy in this area.

Reference

(1) Vidal S., Cartalade D., Souquet J-M., Fulcrand H. and V. Cheynier *J. Agr. Food Chem.* **2002**, *50*, 2261-2266.