

MACROMOLECULAR CHARACTERIZATION OF DISEASE RESISTANT RED WINE VARIETIES (PIWI)

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Background and Aim

Pilzweiderstandsfähige (PIWI) are disease resistant *Vitis vinifera* interspecific hybrid varieties that are receiving increasing attention for ability to ripen in cool climates and their resistance to grapevine fungal diseases. Wines produced from these varieties have not been characterized, especially regarding their macromolecular composition. This study characterised and quantified colloid-forming molecules (proteins, polysaccharides and phenolics) of red PIWI wines produced in the UK.

Experimental

In 2019, 6 wines were made from the PIWI varieties Rondo, Cabernet Jura, Cabernet Cortis, Cabernet Noir, Regent and Cabertin grown at the randomised complete block design Plumpton Rock Lodge Vineyard in Sussex (UK) and harvested at similar level of maturity (TSS, pH and TA). All juice was chaptalized to the same potential alcohol of 12%. Small scale winemaking (1L) was performed in quadruplicate using Bodum® coffee plungers to manage maceration [1]. Residual sugar content, pH, and titratable acidity were monitored during fermentation. For finished wines, the protein and polysaccharide content was measured by HPLC-SEC [2], while the total phenolic content was assessed using the Folin-Ciocalteu method [3]. The protein profile of the wines was further investigated by SDS-PAGE [4].

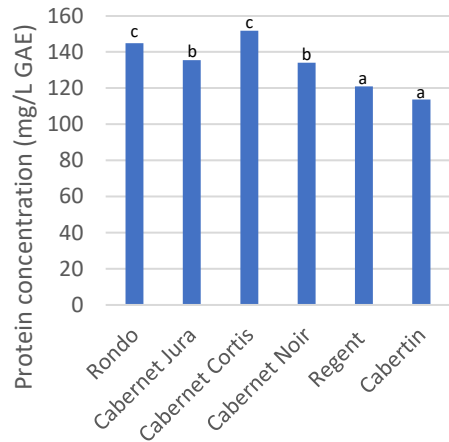


Figure 1. Grand mean of wine for protein concentration via HPLC-SEC

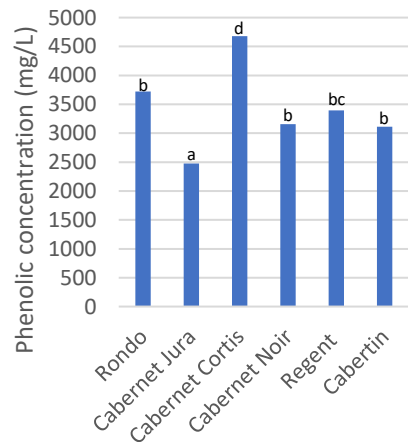


Figure 2. Grand mean of wine for phenolic concentration via Folin-Ciocalteu UV-vis

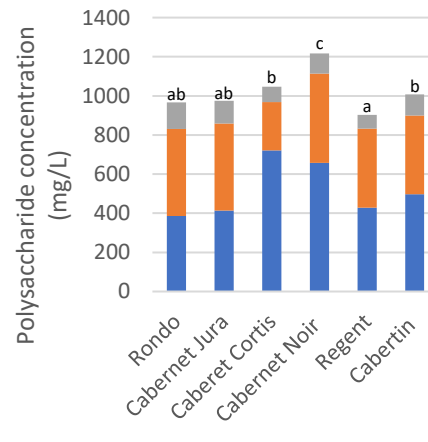


Figure 3. Grand mean of wine for polysaccharide concentration via HPLC-SEC

Protein range from 110-150 mg/L. Value higher than reported protein concentration in red *V. vinifera* varieties. Similar values to heat unstable white wines. Cabertin had the lowest protein concentration. Cabernet Cortis had the highest protein concentration.

Phenolic range from 2500-4700 mg/L, in line with full bodied *V. vinifera* red wines. The cap being submerged for the full fermentation (~168 hrs) potentially accentuated the transfer of phenolics from grape skin to wine.

The polysaccharide concentrations range from 900-1200 mg/L and The average PS total content was higher than typical *V. vinifera* wines [5]. Mostly low MW, which was also the most variable fraction. Cap management partially responsible for high values
High MW >93 kDa, Medium MW 13-93 kDa, Low MW 5-12 kDa.

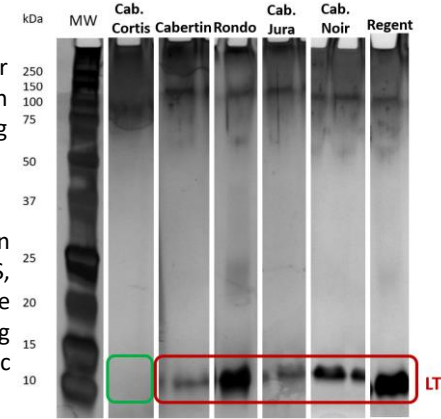


Figure 4. protein profile for each wine studied.

Protein Profile

5 out of 6 wines showed a thick LTPs protein band at 10 kDa

Lipid Transfer Proteins (LTPs):
Are occasionally found in *V. vinifera* wines in very small quantities, but are common in fruit i.e. peaches, cherries, etc.
LTPs can cause severe allergic reactions in susceptible individuals [6].

Potential health risk for PIWI wines need to be considered and removal of LTPs with bentonite fining may be beneficial
Cabernet Cortis did not contain LTPs, despite having the highest protein concentration

Conclusions

The PIWI red wines studied have the potential to produce wines with chemical composition similar to the *Vitis vinifera* → promising result for their adoption in winegrowing regions with marginal climates
PIWIs had more macromolecules than average *V. vinifera* wines. Potential practical implications include impact on colloidal formation and stability, potential protein instability risks, role in tannin retention (formation of precipitates tannin-proteins during storage)

5/6 wines contained high amounts of LTPs → potential health risk for PIWI wines (solvable by protein removal techniques).
Cabernet Cortis had very high macromolecules content with no LTPs → this variety could be used to make wines suitable also to people with allergies.

References

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