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Cellulose Gum: a new additive for wine tartaric stability.

Tentative of structures determination involved in the haze formation after CMC addition in wine.

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Context

Cellulose gum (or sodium carboxymethylcellulose / CMC) is a new additive permitted by the European Community for tartaric stabilization (maximum dosage: 10g/HL). CMC is known to have a high efficiency for potassium bitartrate and calcium tartrate crystallization inhibition in white and sparkling wines. Hypotheses suggest an inhibition of the nuclei growth at the beginning of their formation.

However some problems remain, such as the formation of a low increase of the turbidity in white wine (from 0,1 to 0,4 NTU at room temperature) requiring a filtration step and the formation of a high lumps volume when CMC is used in some red wines.

The goal of the following experiments was to determine which molecules are involved in the haze formed in white or red wines.



Experiments

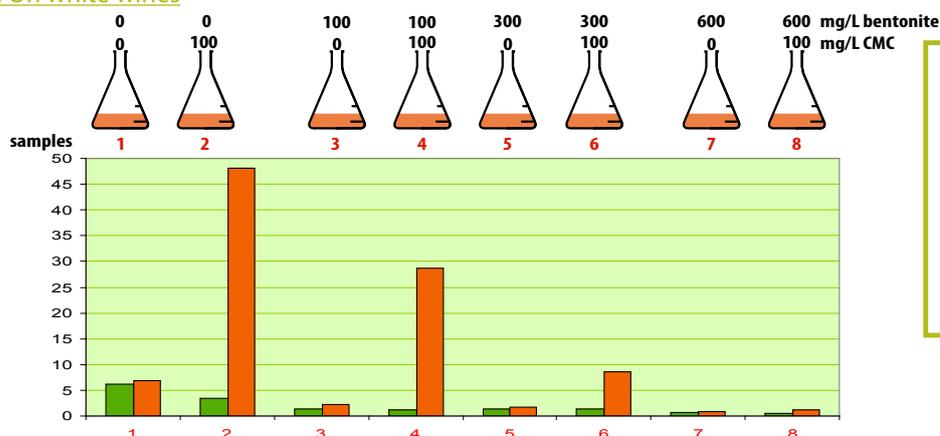
1. On white wines: A unique Sauvignon wine is treated from 0 up to 600mg/L of activated bentonite. After filtration, each batch was added (or not) with 100mg/L of CMC previously dissolved in tap water (conc.:50g/L). After 1 week of storage at 13°C, samples were heated at 80°C during ½ h and then stored at RT during 24h before running turbidity.

2. On red wines: 1L of red wine (blend of Cinsault, Merlot and Cab. Sauvignon) was added with 100mg/L of CMC (see above) and stored at -4°C for 4 days. After this time, the wine showed a high level of red clouds. At negative temperature, the deposit was filtered on 0.2 µm nitrocellulose filter membrane and extensively washed with a hydro-alcoholic solution (12% ethanol v/v – pH: 3,5/HCl) kept at -4°C. The membrane was then dried under vacuum and the deposit was collected and exchanged 3 times with D2O for H1-NMR study (HRMAS).



Results & Discussion

1. On white wines

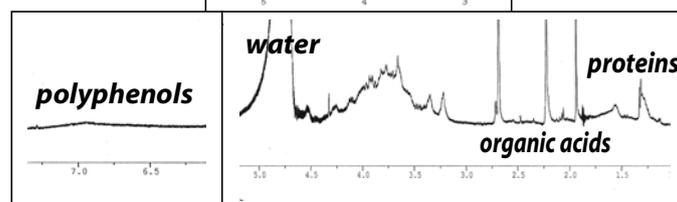
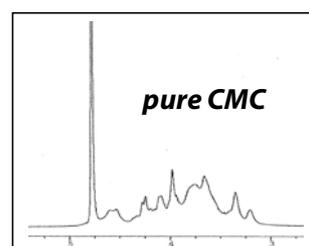


Depending on the bentonite content, the turbidity decrease whatever the CMC level after heating. This highly indicates that the haze formed with CMC in wine is concentration-dependent of the proteins. Even at room temperature (without heating / blue bar) we can notice a slight but significant decrease of the turbidity as a function of the bentonite increase (protein decrease).

2. On red wines

Using CPMAS, we can qualify all organic molecules participating to the deposit coming from the reaction between CMC and other wine molecules. In this experiment CMC appears to be the main component with other peaks attributed to proteins and a broad band to polyphenols compounds. Organic acids are also present in this deposit. The quantitative composition can be estimated as:

- CMC: 80-90%
- Proteins: 5-10%
- Organic acids: 5-10%
- Polyphenols: <5%



Conclusion

For both white and red wine, proteins seem to be involved in the haze formed after CMC addition. At wine pH, CMC is partially negatively charged at the opposite of the proteins, essentially positively charged. These ionic interactions can explain – at least in part – the adducts formed after CMC addition and subsequently haze formation in white or red wine.