Influence of low temperatures in the clearing process of white wines

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Abstract
The wine samples were tested in the laboratory, after a period of 30 days at 4ºC. The wines were tested before and after refrigeration. The analyses of the wines were determined in time, monitoring the potassium bitartrate precipitation.

Keywords: refrigeration, wine, potassium bitartrate

1. Introduction
The grapes are rich tartaric acid and potassium. The grape juice and the wine have high concentrations of potassium bitartrate. The wine quality is not altered by the presence of this crystalline settlement. It is always necessary to remove the excess of potassium acid tartrate before bottling the wine, with a view to satisfying the consumer’s preferences.

One of the techniques used to prevent potassium acid tartrate is that of cool stabilization.

This process consists in refrigerating the wine down to a temperature of 0.5 to 1°C above freezing point.

This paper deals with the effects of low temperatures in the white wines clearing process.

The wine samples were tested in the laboratory before and after refrigeration.

2. Materials and Methods
The study was carried out using the following types of wines: Chasselas 2006 and Chasselas 2007.

The wines were obtained in accordance with the usual procedures of wine making.

Necessary equipment:
- Cooling device, equipped with measuring and control gauge,
- Tannin,
- Oxygenated water 10%,
- Wines,
- Installation equipped with vacuum tromp.

Refrigeration of wine: The wine is refrigerated in colourless bottles, 250 ml, filtered at 10% volume and it is stored at 4°C.

Two or three days later, when well cooled, the potassium acid tartrate crystals were added, finely ground, in quantities allowed by the ear lock. It was homogenized and kept refrigerated for another 30 days. The appearance of the tartrate crystals shows the crystalline instability of the wine.

3. Results and discussions
After 30 days of being stored under refrigeration, the wines presented a visible layer of potassium acid tartrate. When precipitating, the potassium acid tartrate excess reduces acidity, giving the wine a certain suppleness.
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Alcohol grades</td>
<td>8 – 16% vol.</td>
<td>10% vol.</td>
<td>10% vol.</td>
</tr>
<tr>
<td>2</td>
<td>SO2 – free</td>
<td>max. 50mg/l</td>
<td>3.04mg/l</td>
<td>3.84mg/l</td>
</tr>
<tr>
<td>3</td>
<td>SO2 – total</td>
<td>max. 200mg/l</td>
<td>3.969mg/l</td>
<td>3.84mg/l</td>
</tr>
<tr>
<td>4</td>
<td>Volatile acidity</td>
<td>max. 0.5g/l acetic acid</td>
<td>0.045 g/l acetic acid</td>
<td>1.5g/l acetic acid</td>
</tr>
<tr>
<td>5</td>
<td>Total acidity</td>
<td>3.0 – 6.0 g/l H2SO4</td>
<td>3.381 g/l H2SO4</td>
<td>1.715g/l H2SO4</td>
</tr>
<tr>
<td>6</td>
<td>Total dry extract</td>
<td>15 – 23 g/l</td>
<td>16 g/l</td>
<td>15g/l</td>
</tr>
<tr>
<td>7</td>
<td>pH</td>
<td>2.8 – 3.8</td>
<td>4.82</td>
<td>3.44</td>
</tr>
<tr>
<td>8</td>
<td>Density</td>
<td>0.9830 – 1.003</td>
<td>0.9859</td>
<td>0.9820</td>
</tr>
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As a result of refrigeration, by precipitating one gram of potassium acid tartrate, the title acidity is reduced by 0.399 g/l, approx. 0.4 g/l in tartaric acid.

Precipitation of potassium acid tartrate leads to a change in the pH. With wines having a pH below 3.6 this precipitation of potassium acid tartrate causes a reduction of pH values.

The quantity of sulphuric anhydride is not influenced by the effect of refrigeration; it is used in the making and conditioning of wines, due to its reductive, antioxidant properties and its high antiseptic effect.

Alcohol concentration of wine remains constant during refrigeration process, as shown in figure 1A. In the time of stabilization process, the refrigeration didn’t influence of wine density.

![Figure 1. Variation of ethylic alcohol (A) and of density (B) in refrigeration process](image1)

![Figure 2. Variation of volatile acidity (A) and total acidity (B) in refrigeration process](image2)
Volatile acidity accumulated in fermentation process with a maximum of 0.5 g/l acetic acid, but in accidentally cases can be higher that 1 g/l acetic acid at white wines.

Precipitation of potassium acid tartrate excess reduces acidity and it gives certain suppleness to white wines.

By 1 g potassium acid tartrate precipitation, titrable acidity is reducing with 0.399 g/l approximately 0.4 g/l express in tartric acid.

Precipitation of potassium acid tartrate determines pH modification. At wines with reduces pH smaller then 3.6, precipitation of potassium acid tartrate determines a pH decrease.

Total dry extract content doesn’t vary, it remain constant and isn’t influenced by refrigeration, like shown in figure 3.

The quantity of SO₂ isn’t influenced by refrigeration effect; it is utilized at wine obtaining a conditioning because of its reducing and antioxidant properties and because of high antiseptic effect.

Figure 3. Variation of total dry extract (A) and pH (B) in refrigeration process

Figure 4. Variation of total SO₂ (A) and free SO₂ (B) in refrigeration process

4. Conclusion

The results of this study show that, owing to the complexity in wine composition, the stability of potassium acid tartrate is difficult to predict. The consequences of this phenomenon on wine characteristics must be still studied.

References

AA. VV., 1999. Il vino Manuale del sommelier, Giunti, Firenze – Milano;
AA. VV., 1980. Tratato di scienza e tecnica enologica, vol III: la vinificazione e la trasformazione del vino, AEB, Brescia;
Ceobotărescu, I.D., Neagu, C., Bibire, Luminăța, 1997, Utilaj tehnologic pentru vinificare, Editura Tehnică, București;
Jianu, I., Trașcă T.I., 2000, Utilaje în industria alimentară, Editura Vanessa, Timișoara;
Nămolășanu, I., 1998. Tulburările produse de fier în vinuri și tratarea lor, Gazeta Podgorenilor nr.3;
Tofan, I., 2005. Lanțul frigorific al produselor alimentare perisabile, Editura Agir, București;
Tofan, I., 2002 et.al. Tehnica frigului și climatizării în industria alimentară – Îndrumar pentru activități aplicative, Ed. Agir, București;
York: A. A. Knopf, 1990;
Paronetto, L., 1997. Stabilita e controllo biologico del vino, AEB, Brescia;
Popa, A., Teodorescu, Șt., 1990, Microbiologia vinului, București;
Stoian, V., 2001. Marea carte a degustării vinurilor, Editura Artprint, București;