An EPR and Antioxidant study of Some Brandies

G.J. Troup[a], Melissa Latter[b], I Cheah[b], D.R.Hutton[a], J.F.Boas[a], S.J.Longford[b],

[a] School of Physics, and [b] School of Chemistry, Monash University,
Clayton,Victoria 3168, Australia

Introduction

After investigating whiskies with the above techniques [1], it seemed worthwhile to investigate brandies, which certainly belong to the wine industry, in the same way: i.e, by Electron Paramagnetic Resonance (EPR), and for antioxidant efficiency.
Brandy is distilled from wine. After the whisky experience, the EPR spectrum of brandy was expected to show a Cu2+ signal from the still, and a free radical signal due to the gallates from the oak casks in which the brandy was aged.

Experiments and results

Initially, two brandies, one made in Australia (A1) and one made in France and bottled in Australia (F1) were obtained . 100ml of each was cold evaporated to 10 ml. Individual samples were placed in standard special quartz EPR tubes, internal diameter 2mm (Wilmad). A Bruker X-band (~9.4 GHz) EPR spectrometer, operating at ~ 120K was used. The spectrum of each brandy showed both Cu2+ and Mn2+spectra. The Cu2+ spectrum was expected, as in the whisky situation, but the Mn2+ was not, even though all wines contain Mn. The EPR spectrum of A1 is shown in Fig.1.
An antioxidant efficiency measurement was made on each brandy, using the same system as was used for the whiskies [1]. Vitamin E gave 96%, vitaminA, 74%, brandy F1 88%, and A1, 79%. This is comparable with the whiskies, which ranged from 75% to 99%. All values quoted have an error of plus or minus 3%
Four more more brandies were then obtained: one Australian (A2), and 3 more French ones, one bottled in Australia (FC) and the other two, F2 and FH in France.
All 3 French brandies showed Cu2+ signals, but only FC and FH showed Mn2+. A2 showed no EPR signal at all! Its antioxidant efficiency was measured as 37%.
The expected free radical signal was very difficult to see in all cases where Cu was present, basically because it was small, and because of the structure of the total spectrum.

Discussion

This last result shows that the antioxidant efficiency of the previous brandies is at least partly due to the Cu and Mn present. The undetectability of Mn2+ in
F2 could simply be due to lack of a sufficiently high Mn content in the original wine or wines from which F2 was distilled.. We have no explanation of the total absence of Cu and Mn EPR signals in A2. This is only, therefore, a report of work in progress: clearly, much more needs to be done. However, we *can* say that if a brandy contains amounts of Cu and Mn detectable by EPR, then a shot of it, like a shot of the whiskies examined in [1], will give the equivalent ‘antioxidant potential’ to the daily recommended intake of vitaminC.

Acknowledgements
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References

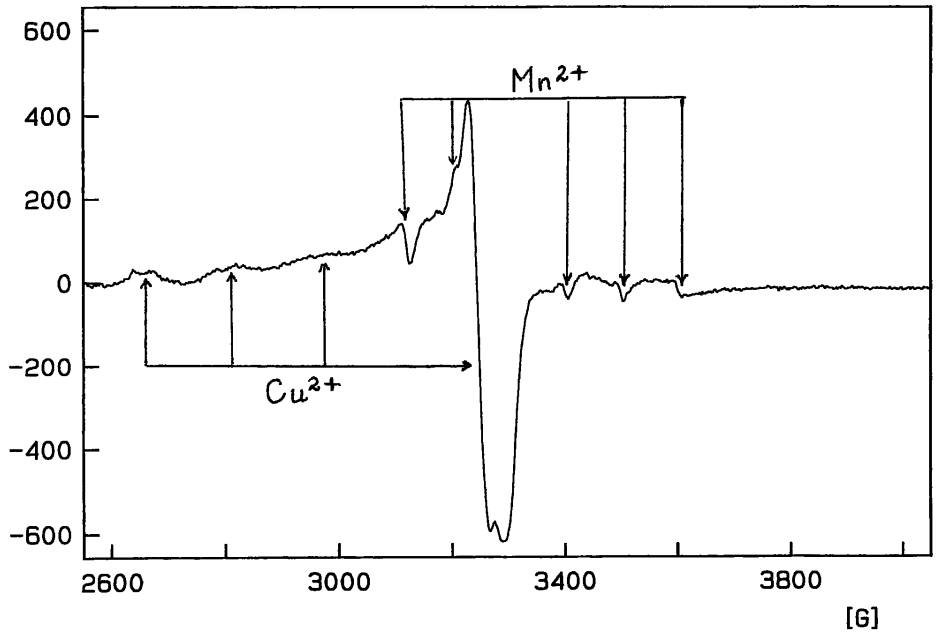
1. I.Cheah, J.Kelly, S.J.Langford and G.Troup, AIM Digest **12**(1),14 (2003).

Figure captions

Fig.1. EPR spectrum of brandy A1. Horizontal axis: magnetic induction in Gauss. Vertical axis: signal strength in arbitrary units.

Fig. 2 EPR spectrum of a French brandy with Mn(2+).

Fig. 3. Epr of a French brandy showing no Mn(2+).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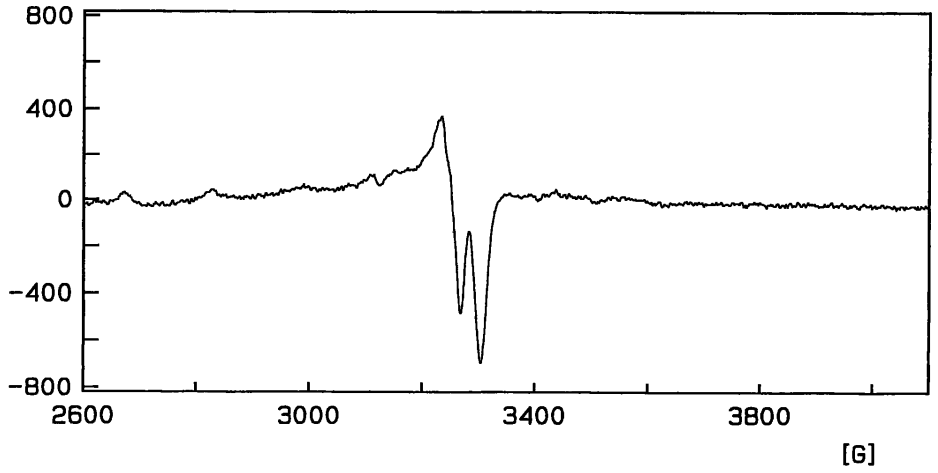
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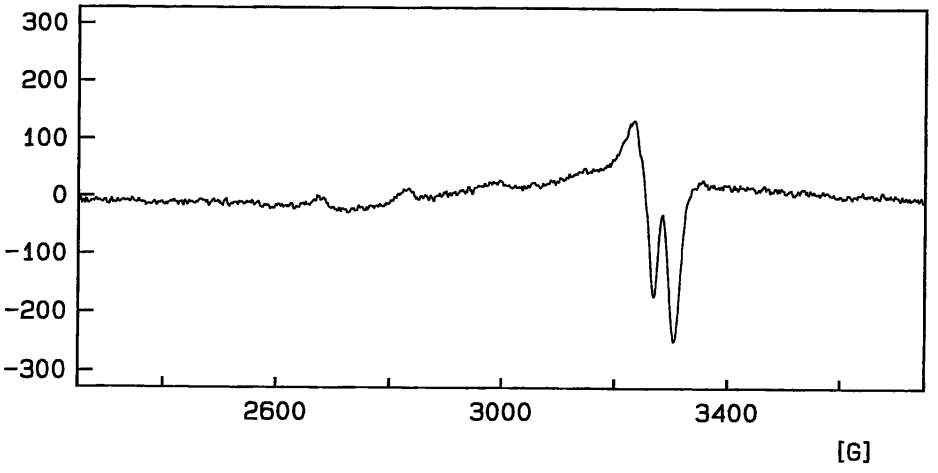
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Fig.3