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A STUDY OF FRACTIONING AND HEAVY METAL COMPLEXATION IN WINES

M. CALVO, I. ESPARZA, I. SALINAS, C. SANTAMARÍA, J.M FERNÁNDEZ

Universidad de Navarra, Irunlarrea s/n, 31080 Pamplona, Navarra (Spain)

a Department of Pharmacy and Pharmaceutical Technology.

b Department of Chemistry and Edafology. jmfdez@unav.es, csanta@unav.es

This work is concerned with the loss of colour observed in some of the red wines of Navarra. Flavonoid compounds are responsible for the structure and wine colour and can be found in the skin, seeds and pulp of the grapes. The colour and stability of these pigments depend on the pH and the presence of several metallic cations. In must, metals like Zn, Cu, Mn and Fe, present in low concentrations, act as cofactors of vitamins and enzymes, the latter being precursors of compounds responsible for the colour of wine. Some other metals like Pb and Cd are toxic and Cr, Mn, Ca, Zn, Cu and Se have been described as inorganic nutrients and so their presence in wine is considered as positive in terms of consumers health.

Recent papers report the determination of the total metal content in wines produced in Galicia (Spain), in several regions of Slovenia, with Monastrell variety grapes and with young wines produced in the region of Murcia (Spain). In other cases, the anthocyanin content of wine was evaluated depending on the time of contact of the skin of grapes with the wine during the fermentation process or directly measured in the skin of grapes and in the corresponding wine.

The present work deals with the identification and quantification of the metallic complexes responsible for the colour of wine and the study of their evolution with time throughout the fermentation of grapes. A method has been optimised to perform a chromatographic separation of the different polyphenolic fractions of wine, keeping constant chemical parameters like pH, alcoholic degree. After separation, samples were digested under microwave and strong acidic media and their total metal concentration in Zn, Cu, Fe and Mn determined by atomic absorption spectroscopy.

The studied samples were must and wine, both fermented at different times ranging from 0 to 360 days, being 0 the time when grapes was introduced in the vessel where fermentation will take place. The evolution with time of the total metal content for each sample, shows a sharp decrease during the period 0-10 days, reaching the metal concentration a constant value from that day on.

The analysis of the separated fractions obtained by chromatography indicate a preferential accumulation of certain metals (Zn, Cu, Mn) in the first fraction recovered, while iron was identified, at different concentrations, in most of the fractions. This behaviour points to anthocyanines as the main ligand compounds for some of the metallic cations present in our samples.
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REFERENCES


A STUDY OF FRACTIONING AND HEAVY METAL COMPLEXATION IN WINES. HISTORY OF A WINE.


INTRODUCTION

Phenolic compounds are responsible for the colour of wine. These organic species are present in the skin, pulp and seeds of grapes but mainly in the skin (the skin is much more coloured than the other parts of the grape). The colour of these pigments and their stability depend mainly on the pH and the presence of several metallic cations. In must, metals such as Zn, Cu, Mn and Fe are present at low concentrations and function as co-factors of vitamins and enzymes precursors of these phenolic compounds.

The present work deals with the identification and quantification of the metallic complexes responsible for the colour of wine and the study of their evolution with time throughout the fermentation of grapes.

METHODS

The studied samples were grape (V. vinifera) cv. Tempranillo grown in Navarre, must and wine, the last two fermented at different times ranging from 0 to 225 days, being 0 the time when grapes were introduced in the vessel where fermentation will take place.

Phenolic compounds were quantitated spectrophotometrically at 720 nm after samples were filtrated and dried.

Metals were identified and quantitated by ICP-AES. Previously, samples were fully digested with nitric acid, aided by microwave radiation.

Samples were collected with the following frequency: days 1 to 15 daily; days 21 to 100 weekly and days 160 to 225, every two months. The last two samples were collected from two different barrels: one clarified (filtrated) and the other one without treatment (wine ferments in the presence of the skin, pulp and seeds of original grapes). All these samples were treated following the previously described method.

RESULTS

Figure D.- TLC for different extracting solvents containing phenolic compounds from grape skin.

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