In Vino Analytica Scientia 2005

Analytical Chemistry for Wine, Brandy and Spirits

FECS Event n° 308

Montpellier (France)
7-9 July, 2005

Program and abstracts
Index of authors
List of participants
A colour study in the early stages of fermentation of a *Vitis vinifera* Tempranillo grape must: a comparative assessment under different climatic conditions

I. Esparza, C. Santamaría, I. Calvo*, J.M. Fernández

*Departamento de Química y Edafología, Universidad de Navarra, Irunlarrea, s/n, 31008 Pamplona, Spain*

*Departamento de Farmacia y Tecnología Farmacéutica, Universidad de Navarra, Irunlarrea, s/n, 31008 Pamplona, Spain*

*Vitis vinifera* Tempranillo grapes were collected in two consecutive crops (2002 and 2003) and monitored in their early stages of fermentation under real cellar production conditions at EVENA (the Station of Viticulture and Enology of Navarra). Parameters such as pluviometry, day-night contrast temperatures, pH, density, polyphenols, metals (Fe, Cu, Zn and Mn) and several colour variables were measured. A similar pattern was observed for both polyphenols and metals contents evolutions in the two years study, although different absolute values were obtained which correlate to the diverse climatic conditions occurring along the grape growing stages.

Spectrophotometric analysis were carried out of the samples at different fermentation times, and changes in colour were monitored after exogenous addition of certain metals. Metals such as Fe and Cu showed a concentration profile vs. fermentation time that resembles closely those of "blue" and "yellow" absorbances in the same period of fermentation. Shiftings of the maximum wavelengths took place and the influence of polyphenols over the "brightness" and "red" parameters was checked.
A colour study in the early stages of fermentation of a *Vitis vinifera* Tempranillo grape must: a comparative assessment under different meteorological conditions. Effect of dilution

**In Vino**

**Analytica Scientia 2005**

---

**INTRODUCTION**

Colour is one of the most important organoleptic aspects of red wines. Wineries have always been aware of its importance but recently the re-discovery of the Mediterranean diet has increased the relevance of this parameter. Phenolic content of wines, and more specifically anthocyanins, are responsible for the blue-red colour of grapes and final product. They are also able to quell some metallic cations like Al, Fe, Cu, Mn, Mg. Spectrophotometrical techniques are commonly used in colour measurements and two different methodologies can be applied to calculate characteristic values: Glories standard parameters and CIELAB parameters. CIELAB space allows a much more precise definition of the colour of wine than the Glories standard parameters. However, such parameters are useless in wineries since they involve complex mathematical calculus, and so far there is no relationship between such chromatic coordinates and the colour quality control parameters.

**OBJECTIVES**

In the present work we will focus on the chromatic analysis of three vintages (2002–2004) of *Vitis vinifera* (Tempranillo variety) grape (processed under exactly the same conditions), employing the two above described methodologies. Relationships between standard (measured at 420, 520 and 620nm) and CIELAB parameters (measured at 450, 520, 570 and 630nm, using D65 illuminant and 10° observer) will be sought, that might facilitate more precise measurements under real cellar conditions. Besides, dilution effects on samples undergoing vinification and on a few commercial wines will be studied as one of their chromatic indicators. Finally, colour modification will be examined on addition of Fe as a target metal.

**RESULTS AND CONCLUSIONS**

- **CIELAB AND GLORIES PARAMETERS EVOLVE IN A SIMILAR WAY WITH TIME AND VINTAGE**

- **CI EVOLUTION IS SIMILAR TO POLYPHENOL AND ANTHOCYANIN CONTENT EVOLUTION**

- **CI DIFFERENCES BETWEEN VINTAGES DUE TO METEOROLOGICAL CONDITIONS DURING GRAPE MATURATION: SECOND YEAR HIGH TEMPERATURES (INHIBITION OF ANTHOCYANIN SYNTHESIS), THIRD YEAR LOW CONTRAST DAY-NIGHT TEMPERATURES (REDUCES POLYPHENOL ACCUMULATION IN THE GRAPE SKIN)**

- **L* SHOWS DIFFERENCES BETWEEN VINTAGES: IT IS AFFECTED BY METEOROLOGICAL CONDITIONS AS CI BUT THEY EVOLVE IN AN OPPOSITE WAY**

- **A MATHEMATICAL CORRELATION WAS FOUND BETWEEN CI AND L* FROM WHICH A MATHEMATICAL EXPRESSION IS PROPOSED. THIS EQUATION ALLOWS THE PREDICTION OF QUALITY PARAMETERS (CI) FROM CIELAB VALUES VALID FOR ALL WINES REGARDLESS OF THE FERMENTATION TIME, INCLUDING COMMERCIAL WINES.**

**EXPERIMENTAL**

Absorbance measurements were carried out with an Hellige Gamma UV/Visible spectrophotometer. Data processing was performed with the MCSV® software and the 11.3 SPSS statistical analysis software.

Dilution solutions: 1) Unbuffered 15% hydroalcoholic solution; 2) pH 4 acetic acid-sodium acetate buffer 8% ethanol content; 3) pH 4 acetic acid-sodium acetate buffer solution with a 15% ethanol content.

![Figure A: evolution of L* and C* (CIELAB parameters) with fermentation time for three consecutive vintages.](image)

![Figure B: evolution of Glories parameters with fermentation time for three consecutive vintages](image)

![Figure C: plot of predicted CI values with mathematical found expression vs experimental CI values](image)

![Figure D: absorbances of diluted (1:5) vs non diluted samples at different wavelengths, for all studied samples](image)

---

**REFERENCES**


**FUTURE WORK:** preliminary studies on addition of Fe shown an increase in the blue component, Cl (standard parameter), b* and h* (cielab parameters) and decrease of the red component.