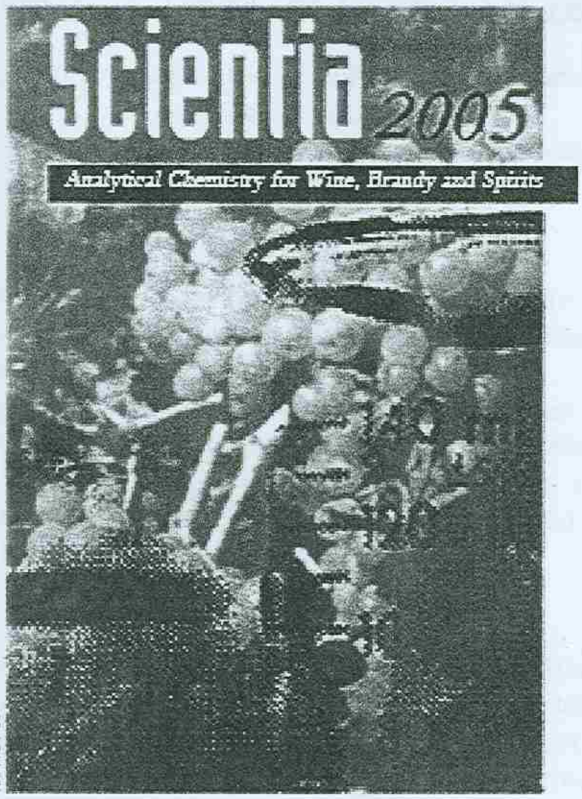
In Vino Analytica Scientia 2005



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Program and abstracts
Index of authors
List of participants

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Poster 59

A colour study in the early stages of fermentation of a *Vitis vinifera* Tempranillo grape must: a comparative assessment under different climatic conditions

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Vitis vinifera Tempranillo grapes were collected in two consecutive crops (2002 and 2003) and monitored in their early stages of fermentation undel 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 feermentation. Shiftings of the maximum wavelenghts 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

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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[1]. 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 quelate some metallic cations like Al^{3+}, Fe^{3+}, Cu^{2+}, Mg^{2+}. Spectrophotometrical techniques are commonly used in colour measurements and two different methodologies can be applied to calculate characteristic values: Glories standard parameters[2] and CIELAB parameters[3]. CIELAB space allows a much more precise definition of the colour of wine than the Glories standard parameters[1]. 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 parameters1.

OBJECTIVES

In the present work we will focus on the chromatic analysis of three vintages -from 2002 to 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)[2] and CIELAB parameters (measured at 450, 520, 570 and 630nm, using D65 illuminant and 10º observer)[3] 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 a function of their chromatic indicators. Finally, colour modification will be examined on addition of Fe as a target metal.

EXPERIMENTAL

Absorbance measurements were carried out with an Heλios Gamma UV/Visible spectrophotometer. Data processing was performed with the MCSV® software[4] and the 11.0 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.

RESULTS AND CONCLUSIONS

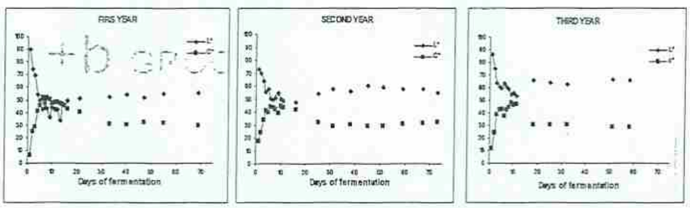


Figure A: evolution of L* and C* (CIELAB parameters) with fermentation time for three consecutive vintages.

- CIELAB AND GLORIES PARAMETERS EVOLVE IN A SIMILAR WAY WITH TIME AND VINTAGE
- CI EVOLUTION IS SIMILAR TO POLYPHENOL AND ANTHOCYANIN CONTENT EVOLUTION[5]
- 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)[6]
- 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.

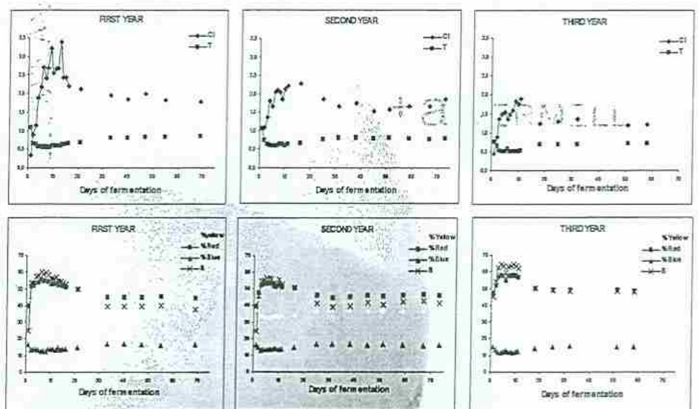
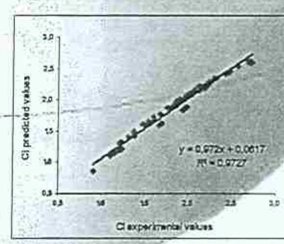


Figure B: evolution of Glories parameters with fermentation time for three consecutive vintages



$$CI = 4.993 - 5.53 \cdot 10^{-2} \cdot L^*$$

Figure C: plot of predicted CI values with mathematical found expression *vs* experimental CI values

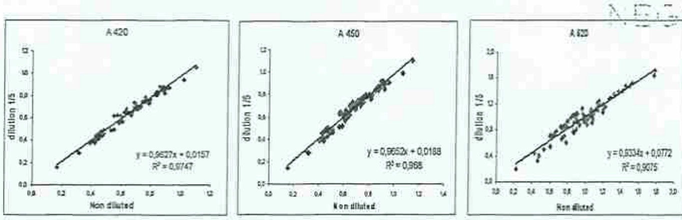


Figure D: absorbances of diluted (1:5) *vs* non diluted samples at different wavelengths, for all studied samples

- ❑ DILUTIONS MADE WITH THE pH 4, 8% ETHANOL BUFFER AFFECT MAINLY THE BLUE COMPONENT OF THE WINE COLOUR, POSSIBLY DUE THE BREAKING OFF COPIGMENTED ANTHOCYANINS BY THE ALCOHOL PRESENT IN THE BUFFER
- ❑ THE USE ON NON BUFFERED SOLUTIONS AFFECTED ALL COLOUR COMPONENTS, BECAUSE OF THE HIGH ALCOHOL CONTENT OF THE SOLVENT AND THE CHANGES IN THE pH INDUCED BY THIS SOLVENT
- ❑ COMMERCIAL WINES SHOWN THE BEST RESULTS WHEN DILUTED WHITH BUFFER-15% ETHANOL, SINCE THIS SOLVENT MIMICS THE pH and ALCOHOL CONTENT OF THOSE SAMPLES

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

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EVENA

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