

**COMPARATIVE STUDY OF HUNGARIAN WHITE AND RED  
WINES ON THE BASIS OF FREE AMINO ACID AND  
BIOGENIC AMINE CONTENTS**

PHD THESES

*Elemér Csomós*  
*MSc in Bioengineering*

*Supervisor:*  
*Livia Simon-Sarkadi, PhD*  
*Associate Professor*

Budapest University of Technology and Economics  
Department of Biochemistry and Food Technology  
2003

**INTRODUCTION**

Wines are known to contain many biologically active compounds, such as free amino acids and biogenic amines.

Amino acid composition has great importance in wine production, since they serve as substrate for aroma compounds in wines and also for the production of biogenic amines. Among biogenic amines, polyamines are beneficial to health but consumption of beverages rich in histamine and tyramine can lead to inconvenient symptoms (e.g. headache, skin rash, intestinal problems).

Quality of wines is affected by many factors. The most important factors are wine-making technology, geographical origin (wine-making region), grape variety and year of vintage.

There are 22 wine-making regions in Hungary. In these regions both world famous grape varieties and local varieties (characteristic for Hungary) are grown. Due to various wine-making technologies, wines have different taste and character.

Composition of wines is important concerning both quality-assurance and determination of authenticity.

The aim of my research was to collect data of Hungarian white and red wines concerning free amino acid and biogenic amine contents according to wine-making technology, geographical origin (wine-making region), grape variety and year of vintage to compare wines based on these aspects using chemometric techniques.

**MATERIALS AND METHODS**

113 white and 74 red wines (at all 187 wines) were investigated. According to applied wine-making technology (and Hungarian regulations) wines represented 4 groups: quality white wines, white wines of special quality (white liquor wines), quality red wines and red wines with barrique-aging.

White wines originated from 18 wine-making regions, 19 varieties and 9 years of vintage, while red wines originated from 10 wine-making regions, 9 varieties and 6 years of vintage.

Determination of free amino acids and biogenic amines was accomplished by ion-exchange chromatography (amino acid analyser). Free amino acids and biogenic amines were separated by stepwise gradient elution. For determination of components a post-column derivatization with ninhydrin reagent was used.

Among statistical techniques linear discriminant analysis (LDA) and principal component analysis (PCA) were applied to data.

## NEW SCIENTIFIC RESULTS

1. The total content of free amino acids in red wines (1273 mg/dm<sup>3</sup>) was higher than in white ones (1095 mg/dm<sup>3</sup>). The dominant free amino acids were proline and arginine. Ratios of proline to arginine were successfully used to differentiate between white and red wines (1.98 in white wines, 14.38 in red wines). Significant differences were found between wines made by different wine-making technologies. Proline/arginine ratios were useful to distinguish them.
2. The total content of biogenic amines in red wines (7.2 mg/dm<sup>3</sup>) was higher than in white ones (4.8 mg/dm<sup>3</sup>). The main biogenic amines were putrescine and tyramine. Ratios of putrescine to tyramine were successfully used to differentiate between white and red wines (0.48 in white wines, 2.44 in red wines). Significant differences were found between wines made by different wine-making technologies. Putrescine/tyramine ratios were useful to distinguish them.
3. This was the first chemometric study on large number of Hungarian wines, concerning free amino acid and biogenic amine contents. Using linear discriminant analysis the best classifications were achieved based on all variables (both free

amino acid and biogenic amine contents), while the worst classifications were achieved on the basis of biogenic amine contents. Wine-making technology had greater effect on classification of wines than geographical origin, grape variety and year of vintage. Principal component analysis gave good differentiation between white and red wines, and between wines made by different wine-making technologies, too. Based on results of chemometric analyses, free amino acid and biogenic amine contents seemed to be useful to differentiate wines according to wine-making technology, geographical origin (wine-making region), grape variety and year of vintage, too.

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