

# Examination of non-volatile organic compounds in red wines made in Eger

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## Abstract

At present the analytical investigation of human consumption products, with special regard to the environmental and health connections, is basically important all over the world. Recently in several countries it was almost impossible to sell wine without a certificate of quality, based on modern, instrumental analytical methods. There is well-known medical–biological evidence, which has proved the antioxidant and vein wall-protecting effects of the wines in the case of frugal ingestion. On the other hand, they also play a part in the prevention of heart attacks. Regarding these biological effects the most important constituents of wines are the flavonoids, anthocyanidins, and their glycosides. Anthocyanins can be identified first of all in red wines. The organic constituents have characteristic antioxidant effects, which can play an important role in health protection. During our investigation we have studied the volatile and non-volatile organic compounds in different types of wines made in Eger and Tokay (Hungary). In our opinion these types of research projects have unique importance, from the economic viewpoint and in that they are not negligible in a national context. The separation and determination of volatile compounds was carried out by applying a Finnigan GSQ GC-MS apparatus and the non-volatile ones with HPLC-DAD and FAB MS techniques. © 2000 Elsevier Science B.V. All rights reserved.

*Keywords:* Red wine; Phenolic compounds; Liquid extraction; MS-FAB

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## 1. Introduction

In the last few years in Hungary, similarly to the traditional wine producing European countries, the quality of wine production and its con-

sumption has become of more and more importance. This problem in an economical context has special importance in guiding origin/quality control and health considerations.

Today's researchers have proved the important role of wines in healthcare. It is well known that the phenolic compounds in wines and grapes have important and some times characteristic physio-

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logical effects [1]. For example, flavonoids have an antibacterial, P vitaminic and cardiovascular effect [2]. On the other hand, the natural antioxidants, like flavonoids and stilben derivatives as resveratrol, have some cytostatic activity in vitro and in vivo experiments [3,4].

During our research work we have studied the non-volatile and extractable organic compounds of red wines of Eger (Hungary) by using MS FAB techniques.

The wine growing area of Eger is located in the north-east part of Hungary, at the hill side of the south-west part of the Bükk mountains and is approximately 4000 ha in size. This part of Hungary has a very continental climate, where the spring comes late. It has good quality but variable soil, the most characteristic of which is the brown soil.

The main aims of our research work were to get information about the characteristic compounds of the red wines of Eger, to study the influences of the weather and the type of grapes

on the composition of the characteristic compounds, like phenols and flavonoids.

## 2. Materials and methods

### 2.1. Samples and sample preparation

Samples of red wines from Eger, Bull's Blood ('Egri Bikavér', medium dry) 1995, 1996, 1997, Blaufrankisch ('Kékfrankos', dry), 1997 and Medina (medium sweet), 1997, were used.

#### 2.1.1. Sample preparation:

A wine sample of 200 ml was concentrated by a vacuum-rotary evaporator at 40°C to remove alcohol without destroying the phenolic compounds [5].

The fractionation of the phenolic compounds is shown in Fig. 1. The sample was adjusted to pH 7.0 with saturated  $\text{NaHCO}_3$  and was extracted with  $\text{CHCl}_3$ . The organic phase containing hydro-

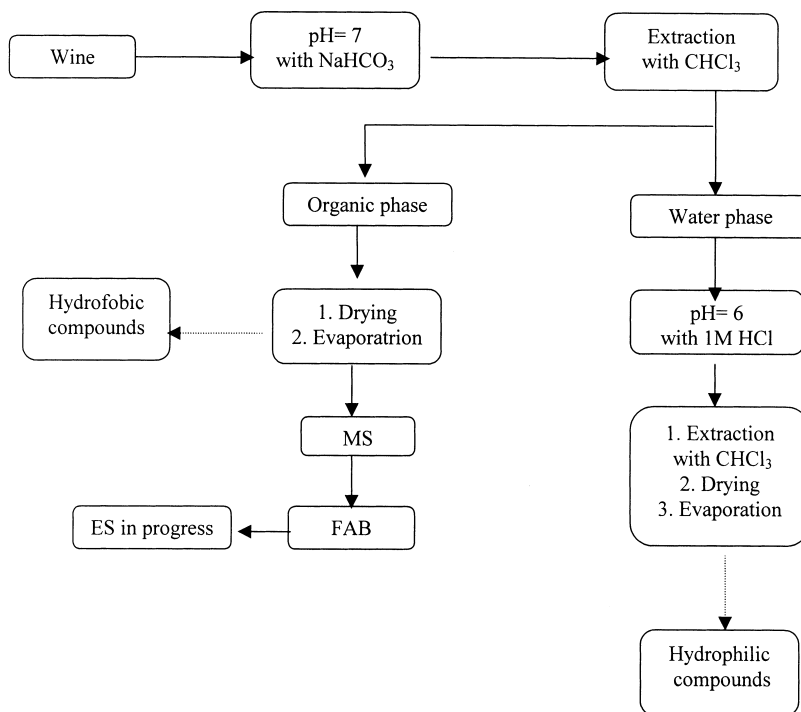


Fig. 1. A flow diagram of the sample preparations.

drophobic compounds was dried with sicc  $\text{Na}_2\text{SO}_4$ . The organic solvent was removed by vacuum evaporation.

The water phase was adjusted to pH 6.0 with 1 M HCl and extracted with  $\text{CHCl}_3$ . The organic phase containing hydrophilic compounds was dried and evaporated.

## 2.2. Instrumentation

### 2.2.1. Measuring conditions:

The experimental conditions were as follows: FAB: VG 70 HS mass spectrometer (Micromass Ltd., Manchester, England) was used and glycerol was the FAB matrix. An IonTech FAB gun at 8 kV (1 mA) was used with xenon gas as the reagent.

## 3. Results and discussion

On the basis of our experimental results we can state that the studied red wines of Eger contain an important number of characteristic phenolic

compounds in relatively large quantities (Table 1). The CID (He) measurements confirmed the chemical structures of the identified compounds. The total phenolic content is 1000–4000 mg/l, depending on the type of grape and the age of the wine.

It can be found that monomer and dimer forms of some leucoanthocyanidins which polymerize, are the colour of the plants (Fig. 2). Research to obtain more information about these polymers by MALDI-MS, is in progress.

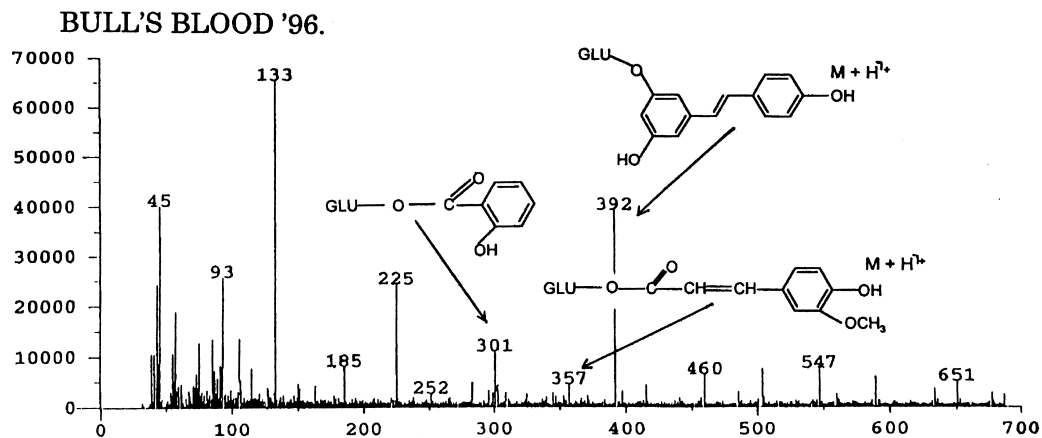
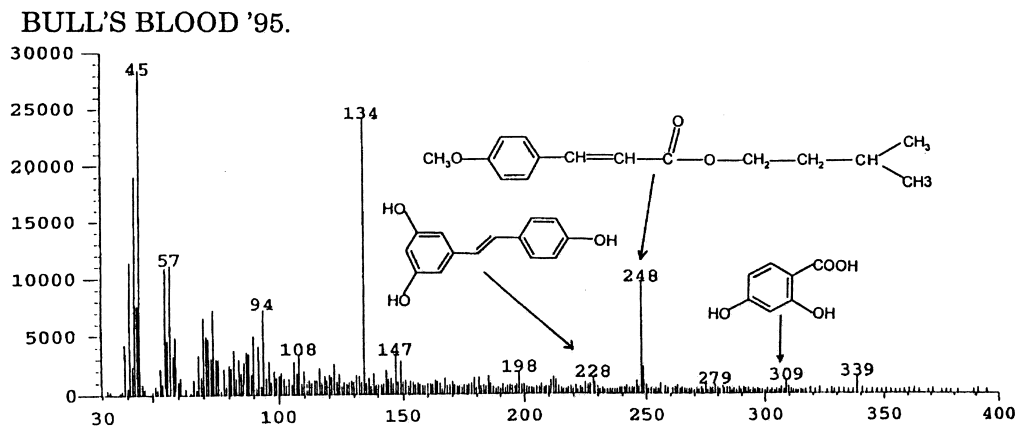
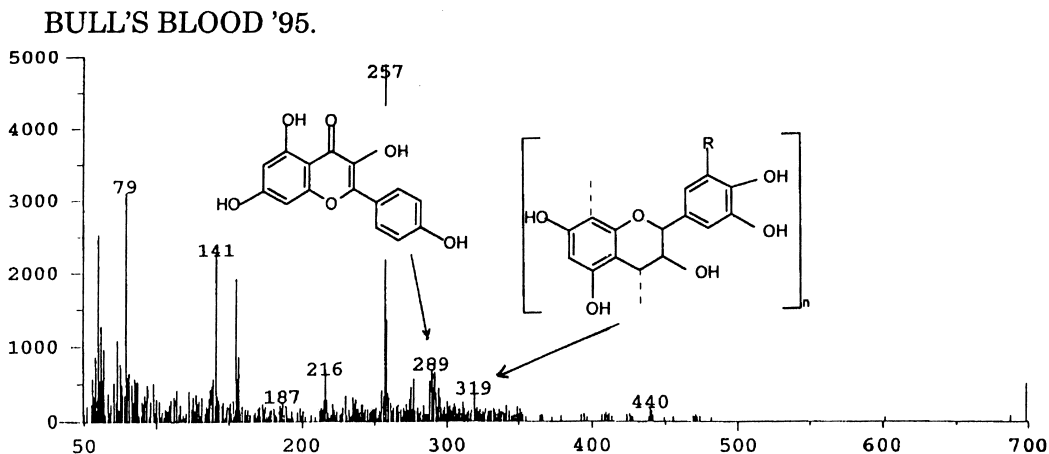
In every studied wine sample we have proved the presence of resveratrol in glucosidic and aglycone forms (Fig. 3).

It was found that the number and quality of the polyphenol constituents strongly depends on the type of grapes and the harvesting year. We have found some characteristic compounds (such as 3,4-dimethoxy-cinnamic acid), which can be found only in the wines of 1997 (Fig. 4).

The most polyphenolic compounds were found in the Egri Bikavér (Bull's Blood) from year 1995. According to our results the Egri Bikavér (Bull's Blood) has proved to contain the most examined compounds, in type and quantity and the Medina

Table 1  
The identified compounds in the studied red wines

No.	identified compounds	Studied wine samples (year)				
		Bull's Blood 1995	Bull's Blood 1996	Bull's Blood 1997	Blaufrankisch 1997	Medina 1997
1	<i>trans</i> -Resveratrol	+		+	+	
2	<i>trans</i> -Resveratrol-glucoside	+	+	+	+	
3	3,4-Dimethoxy-cinnamic acid			+	+	+
4	Coumaric acid-glucoside		+	+		
5	Ferulic acid-glucoside		+			
6	Quercetin-diglucoside	+	+		+	+
7	Kaempferol	+				
8	Kaempferol-glucoside	+		+	+	+
9	Petunidin		+			
10	Delphinidin-glucoside	+				
11	Catechin	+				+
12	Epigallocatechin				+	
13	Myricetin	+				
14	Gentisic acid	+		+		
15	Galic acid	+				
16	Proanthocyanidin-dimer	+	+	+	+	
17	Chlorogenic acid		+			



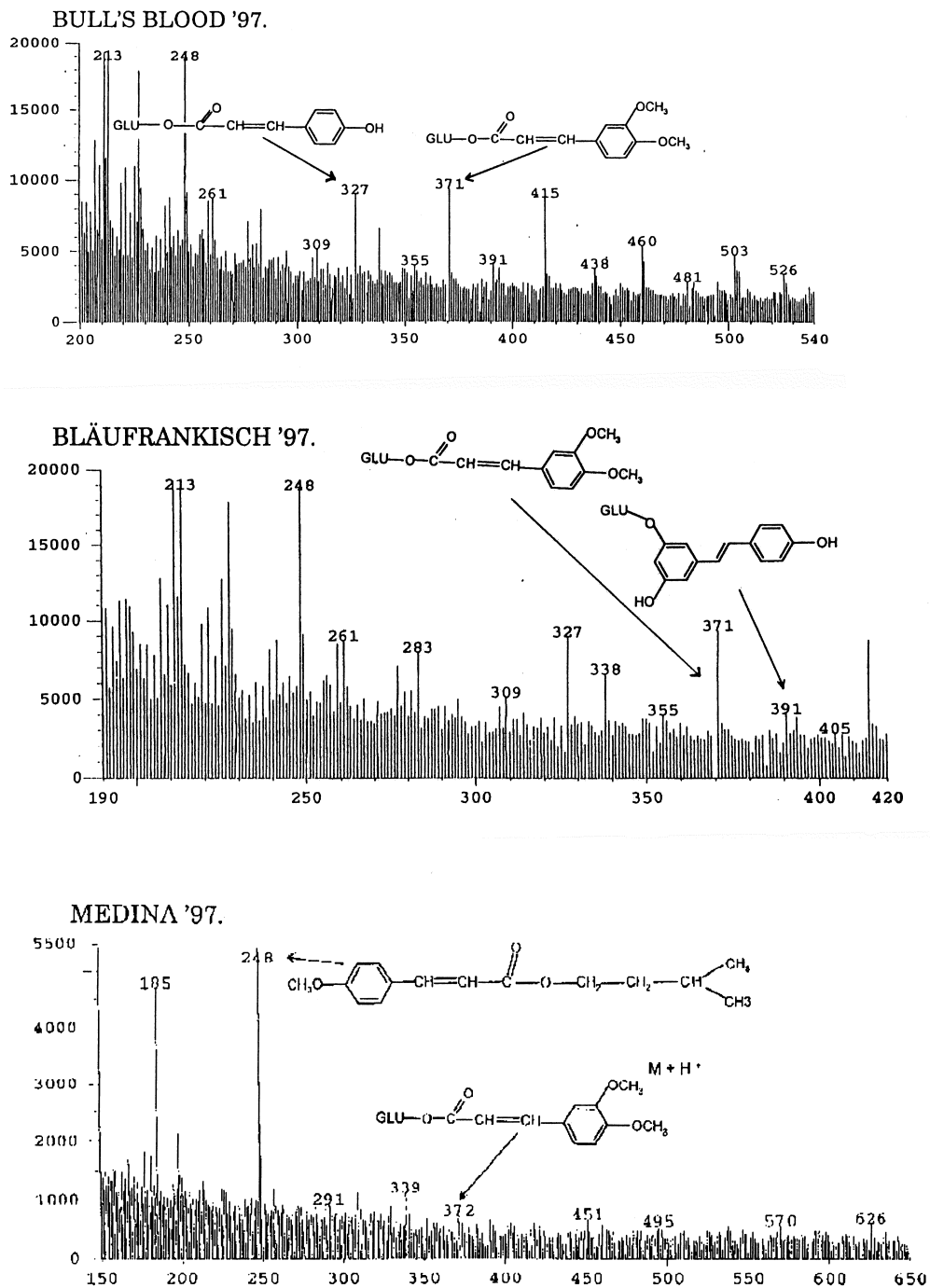


Fig. 4. The 3,4-dimethoxy-cinnamic acid content in the different wines of 1997.

(Medoc) had the least amount, from this point of view. Our work for the identification of new compounds (like flavonoid glucosides) in Eger red wines, is now in progress using HPLC-ES-MS.

#### **Acknowledgements**

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