

**RESEARCH ON THE INFLUENCE OF THE
PEDOCLIMATIC CONDITIONS FROM DEALU
BUJORULUI, COTNARI AND IAȘI VINEYARDS ON THE
PHYSICO-CHEMICAL CHARACTERISTICS OF THE
FETEASCĂ ALBĂ AND BUSUIOACĂ DE BOHOTIN WINES**

**CERCETĂRI PRIVIND INFLUENȚA CONDIȚIILOR PEDOCLIMATICE
DIN PODGORIA DEALU BUJORULUI, COTNARI ȘI IAȘI ASUPRA
CARACTERISTICILOR FIZICO-CHIMICE ALE VINURILOR DE
FETEASCĂ ALBĂ ȘI BUSUIOACĂ DE BOHOTIN**

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***Abstract.** This study pursues the influence of the pedoclimatic conditions on the physico-chemical characteristics of the wines obtained in “Vasile Adamachi” Research Station of Iași. Fetească albă and Busuioacă de Bohotin wines were obtained by the same wine-making technologies and in the same year of production (2012 for Fetească albă wine and 2013 for Busuioacă de Bohotin wine). Therefore, it can be followed only the influence of the pedoclimatic conditions from the vineyards where the grapes were used for winemaking. The main parameters that will be followed to determine the physico-chemical composition of wines studied are: sulfur dioxide, volatile acidity, total acidity, density, concentration of alcohol, reducing sugars, total dry extract, non-reductive extract, phenolic compounds and chromatic characteristics. By analyzing these parameters it can be established the degree of influence that have the pedoclimatic conditions on typicity of the grape variety and on the quality of wines produced from them.*

***Key words:** pedoclimatic conditions, tipicity, spectrofotometry, compositional characteristics.*

***Rezumat.** În studiul de față se va urmări influența condițiilor pedoclimatice asupra caracteristicilor fizico-chimice ale vinurilor obținute în Stațiunea didactică experimentală “Vasile Adamachi” din Iași. Vinurile de Fetească albă și Busuioacă de Bohotin au fost obținute prin aceleași tehnologii de vinificație, având același an de producție (2012 pentru vinul de Fetească albă și 2013 pentru vinul de Busuioacă de Bohotin). În acest mod se poate urmări influența pe care o au doar condițiile pedoclimatice ale podgoriilor de unde s-au utilizat strugurii pentru vinificație. Principalii parametrii care se vor urmări pentru determinarea compoziției fizico-chimice ale vinurilor studiate sunt: dioxidul de sulf, aciditatea volatilă, aciditatea totală, densitatea, concentrația alcoolică, zaharurile reducătoare, extractul sec total, extractul nereducător, compușii fenolici și caracteristicile cromatice. Prin analizarea acestor parametrii se va*

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putea stabili și gradul de influență pe care îl au condițiile pedoclimatice asupra tipicității soiului precum și asupra calității vinurilor obținute din acestea.
Cuvinte cheie: *condiții pedoclimatice, tipicitate, spectrofotometrie, caracteristici compoziționale.*

INTRODUCTION

You can not mention the climatic conditions of a vineyard without remembering about the concept of terroir (Olteanu et al., 2002). Terroir is a highly important concept in viticulture because it relates the sensory attributes of wine to the environmental conditions in which the grapes are grown (Van Leeuwen et al., 2004). However, terroir is difficult to study on a scientific basis because many factors are involved, including climate, soil, cultivar and human practices, and these factors interact. (Van Leeuwen and Seguin, 2006).

MATERIAL AND METHOD

Fetească albă wines were obtained by applying the general technology in white wine and for Busuioacă de Bohotin wines were applied the specific technology for the aromatic wines, therefore was included and the technological stage of maceration (Cotea et al., 2009).

Analysis of the usual physico-chemical parameters (sulfure dioxide, volatile and total acidity, relative density, concentration of alcohol, reducing sugars etc.) were made in conformity with european standards and the norms set by the O.I.V (OIV, 2011).

Phenolic compounds in the studied wines were determined using total polyphenolic index (I.P.T or D280) and Folin Ciocâlțeu Index (I.F.C).

IPT expresses the total content of phenolic compounds (phenolic acids, tannins and dyeing substances) of the wines and is based on the level of ultraviolet light absorbance at 280 nm of the benzene nuclei of the specific phenolic compounds.

Folin-Ciocâlțeu Index it is specific to phenolic compounds with reducing properties and it is based on the fact that in medium basic and in the presence of the phenols, the mixture of phosphotungstic and phospho molybdic acids are reduced to blue oxides of tungsten and molybdenum and its reading is performed at 720 nm.

The two indices were determined using Shimadzu UV-1800 spectrophotometer (Waterhouse, 2002).

The determination of the chromatic parameters was performed according to the method CIELab76 (depending on their absorption spectrum) using UV-VIS spectrophotometer Carl Zeiss SPECORD coupled with an IBM-PC computer.

Therefore, was made the automatic numbering and recording of the spectrum absorption on a file stored on the computer. Digitized spectral data were processed with the program "VINCO" to obtain the chromatic parameters L, a, b, c, and H^o.

RESULTS AND DISCUSSIONS

In this article were studied wines that were obtained from two different varieties (Fetească albă and Busuioacă de Bohotin), each variety having different years of production (2012 and 2013), and the grapes were harvested from different vineyards, therefore, it was followed the influence of the vineyards on the typicity and quality of these wines.

Fetească albă wines from the the year 2012 has an alcoholic strenght exceeding 11% vol.alcohol, the wine from Cotnari vineyard having the highest value of 12,68% vol.alcohol.

In terms of the content in reducing sugars, Feteasca albă wine from Dealu Bujorului vineyard has a content of 1,46 g/L and Feteasca albă wine from Cotnari vineyard presents 1,12 g/L nefermentescible sugars, beeing clasified in dry wines category.

The sample of Fetească albă from Iași vineyard was the only wine that was clasified in the semi-sweet category, with a content of reducing sugars of 36,30 g/L.

The high content in sugars could be first of all due to favorable climatic conditions: high annual average temperatures correlated with a lower amount of rainfall but also due to the specific conditions of the vineyard.

Total acidity of the Fetească albă wines from the three vineyards showed low values, with a minimum of 3,75 g/L for Fetească albă sample from Dealu Bujor vineyard and a maximum of 4,94 g/L for Fetească albă sample from Iași vineyard.

The lower total acidity values can be due to high thermal balance for the year 2012 but due to low level of rainfalls. Therefore, for the Fetească albă sample from Dealu Bujorului vineyard, very low acidity level can be due to the lowest level of rainfall of 490,1 L/m² of three vineyards and the average annual temperature of 10,9°C.

Table 1

Monthly and annual average temperatures of air (°C)

| Meteorological Station Cotnari- 2012 | | | | | | | | | | | | |
|--------------------------------------|------|-----|------|------|------|------|------|------|------|-----|------|---------------|
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | (\bar{x}) |
| -1,9 | -8,4 | 5,0 | 12,6 | 17,5 | 22,0 | 25,2 | 22,7 | 18,6 | 11,8 | 5,6 | -3,2 | 10,6 |
| Meteorological Station Iași- 2012 | | | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | (\bar{x}) |
| -2,5 | -9,5 | 4,0 | 13,0 | 18,2 | 23,3 | 26,3 | 23,1 | 18,9 | 11,9 | 6,6 | -3,7 | 10,8 |
| Meteorological Station Bârlad- 2012 | | | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | (\bar{x}) |
| -2,4 | -8,8 | 3,9 | 12,9 | 17,6 | 22,4 | 26,2 | 23,7 | 19,2 | 12,7 | 6,4 | -3,1 | 10,9 |

Table 2

Monthly and annual precipitation amounts (L/m²)

| Meteorological Station Cotnari- 2012 | | | | | | | | | | | | |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|-------|--------------|
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Σ |
| 16,2 | 62,1 | 14,4 | 71,3 | 90,4 | 44,2 | 27,8 | 28,2 | 12,2 | 27,9 | 27,6 | 103,8 | 526,1 |
| Meteorological Station Iași- 2012 | | | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Σ |
| 12,0 | 61,0 | 19,4 | 56,2 | 98,2 | 16,3 | 22,2 | 32,1 | 50,1 | 34,7 | 22,5 | 83,0 | 507,7 |
| Meteorological Station Bârlad- 2012 | | | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Σ |
| 29,0 | 66,9 | 20,6 | 60,8 | 87,0 | 28,4 | 12,4 | 24,0 | 12,6 | 34,0 | 11,5 | 102,9 | 490,1 |

For the Busuioacă de Bohotin wine form the year 2013, alcohol concentration has exceeded 12% vol.alcohol, with a content in reducing sugars of

11,95 g/L for Busuioacă de Bohotin wines from Cotnari vineyard and 2,42 g/L for Busuioacă de Bohotin wine from Iași vineyard.

The high value of the reducing sugars content in the Busuioacă de Bohotin wine from Cotnari vineyard is caused by low amounts of precipitations of 533,5 L/m² un to 1824,6 L/m² recorded at Iași vineyard causing a intense dehydration of the grapes and thus the concentration of sugars in berry juice.

Table 3

Monthly and annual average temperatures of air (°C)

| Meteorological Station Cotnari- 2013 | | | | | | | | | | |
|--------------------------------------|------|-----|------|------|------|------|------|------|------|---------------|
| I | II | III | IV | V | VI | VII | VIII | IX | X | (\bar{x}) |
| -2,6 | -0,3 | 1,0 | 11,9 | 18,0 | 19,8 | 20,9 | 21,2 | 14,3 | 11,4 | 11,56 |
| Meteorological Station Iași- 2013 | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | (\bar{x}) |
| -3,4 | 1,0 | 2,7 | 12,5 | 19,0 | 20,8 | 21,3 | 21,4 | 14,7 | 10,8 | 12,08 |
| Meteorological Station Bârlad- 2013 | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | (\bar{x}) |
| -3,0 | 1,0 | 3,1 | 12,4 | 18,7 | 20,4 | 21,4 | 21,8 | 14,9 | 10,9 | 12,16 |

Table 4

Monthly and annual precipitation amounts (L/m²)

| Meteorological Station Cotnari- 2013 | | | | | | | | | | |
|--------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|------|--------|
| I | II | III | IV | V | VI | VII | VIII | IX | X | Σ |
| 30,5 | 31,0 | 65,4 | 52,0 | 59,2 | 150,2 | 53,0 | 47,0 | 40,0 | 5,2 | 533,5 |
| Meteorological Station Iași- 2013 | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | Σ |
| 71,6 | 60,2 | 140,4 | 207,9 | 273,7 | 237,2 | 282,1 | 279,9 | 145,4 | 126 | 1824,6 |
| Meteorological Station Bârlad- 2013 | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | VIII | IX | X | Σ |
| 41,8 | 35,5 | 46,2 | 36,2 | 96,0 | 134,6 | 45,2 | 62,2 | 54,8 | 38,2 | 590,7 |

Volatile acidity expressed in g/L C₂H₄O₂ of the analyzed wines showed normal values, being a evident proof for the correct technological process.

Table 5

Physico-chemical characteristics of the analyzed wines

| Wines considered | SO ₂ mg/L | | Vol. acidity (g/L C ₂ H ₄ O ₂) | Total acidity (g/L C ₄ H ₆ O ₆) | Relative density | Alch. conc. (% vol.) | Reductive subst. (g/L) | T.D.E. (g/L) | N.E. (g/L) | pH |
|----------------------------|----------------------|-------|--|---|------------------|----------------------|------------------------|--------------|------------|------|
| | Free | Total | | | | | | | | |
| Fetească albă –Iași 2012 | 42.42 | 84.54 | 0.57 | 4.94 | 1.0049 | 11.78 | 36.30 | 53 | 16.7 | 3.46 |
| Fetească albă- Târgu Bujor | 6.19 | 46.76 | 0.23 | 3.75 | 0.992 | 11.45 | 1.46 | 18.5 | 17.04 | 3.49 |

| | | | | | | | | | | |
|------------------------------------|-------|-------|------|------|-------|-------|-------|-------|-------|------|
| 2012 | | | | | | | | | | |
| Fetească albă-Cotnari 2012 | 6.19 | 34.37 | 0.18 | 4.27 | 0.990 | 12.68 | 1.12 | 17.12 | 16.08 | 3.54 |
| Busuioacă de Bohotin-Cotnari 2013 | 11.14 | 59.76 | 0.36 | 5.96 | 0.997 | 12.74 | 11.95 | 35.4 | 23.45 | 3.51 |
| Busuioacă de Bohotin-Adamachi 2013 | 6.19 | 28.18 | 0.24 | 4.38 | 0.990 | 12.87 | 2.42 | 17.7 | 15.28 | 3.36 |

Real acidity or pH of the studied wines have normal values ranging from 3,36 for the Busuioacă de Bohotin sample from Iași vineyard (2013) to 3,54 for Fetească albă sample from Cotnari vineyard (2012).

Analyzing I.P.T and I.F.C parameters determined by spectrophotometry showed a variation of them, their values being strongly correlated with climatic conditions from those vineyards and with the grape variety used.

Table 6

I.P.T, I.F.C values and chromatic parameters obtained for samples analyzed.

| Analyzed Wines | IPT (D280) | IFC | CieLab-76 | | | | | | |
|-----------------------------------|------------|-------|-------------|--------|--------|------------|---------|------------|-------|
| | | | Tristimulus | | | Chrome (C) | Hue (H) | Brightness | Shade |
| | | | L (clarity) | a | b | | | | |
| Fetească albă-Iași 2012 | 0.51 | 4.58 | 99.38 | -0.312 | 2.508 | 2.527 | -82.915 | 0.0490 | 4.010 |
| Fetească albă-Târgu Bujor 2012 | 0.63 | 6.10 | 97.18 | -0.114 | 8.657 | 8.658 | -89.239 | 0.188 | 3.245 |
| Fetească albă-Cotnari 2012 | 0.75 | 4.76 | 97.21 | -0.147 | 7.419 | 7.419 | -88.863 | 0.169 | 2.842 |
| Busuioacă de Bohotin-Cotnari 2013 | 2,58 | 10.34 | 84.94 | 18.429 | 10.755 | 21.338 | 30.268 | 0.615 | 0.926 |
| Busuioacă de Bohotin-Iași 2013 | 2,51 | 8.33 | 89.06 | 17.048 | 16.486 | 23.716 | 44.040 | 0.536 | 0.857 |

Therefore, the highest values of phenolic compounds for Fetească albă wines presented the one from Dealu Bujorului vineyard and for Busuioacă de Bohotin wines the one from Cotnari vineyard.

After analyzing chromatic parameters it was found that Fetească albă wines from Iași vineyard and Busuioacă de Bohotin wines from Cotnari vineyard had the best colour features.

Parameter a, which represent the coordonate of the complementary colours of red and green has frequently negative values for white wines that are dominant green tones and pozitiv values for red wines from which red tones are in majority.

Parameter b, is the coordonate of the complementary colours of yellow and blue; for wines, the values of this parameter are often pozitiv, because yellow shades prevail against the blue.

Chroma it is in correlation with parameter b, and the tone is in correlation with parameter a, having the same variation tendencies.

Parameters a and b varies inversely proportional with clarity (L) beeing strongly correlated with the content in phenolic compounds, therefore, Busuioacă de Bohotin wine (2013) from Cotnari vineyard has the lowest value of clarity (84.94) in comparison with Fetească albă wine from Iași vineyard (99.38).

CONCLUSIONS

Analyzing the wines taken in this study it was observed a major influence of the pedoclimatic conditions of the each vineyard on their qualitative characteristics.

Therefore, for Fetească albă wines, the wine with the best compositional characteristics it is the one from Iasi vineyard and for Busuioacă de Bohotin wines, the one from Cotnari vineyard.

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