“LUCIAN BLAGA” UNIVERSITY OF SIBIU

FACULTY OF AGRICULTURAL SCIENCES, FOOD INDUSTRY AND ENVIRONMENTAL PROTECTION

Doctoral Dissertation

SUMMARY

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SIBIU 2015

"LUCIAN BLAGA" UNIVERSITY OF SIBIU

FACULTY OF AGRICULTURAL SCIENCES, FOOD INDUSTRY AND ENVIRONMENTAL PROTECTION

DEFINING AND EVALUATING THE AUTHENTICITY AND TYPICALITY FROM SOME LOCAL VARIETIES FROM CONSECRATED WINE REGIONS

ACKNOWLEDGEMENTS

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AUTHOR'S OPINION

This PhD thesis entitled *„**DEFINING AND EVALUATING THE AUTHENTICITY AND TYPICALITY FROM SOME LOCAL VARIETIES FROM CONSECRATED WINE REGIONS**"* aims to conduct a study on the authenticity of Romanian wines.

So, there were followed two main lines of research: first focused on the study of documents, the second regarding the experimental part.

Bibliographical research and experiments were carried out during the years 2012 - 2015, the being condensed in this thesis, comprising 177 pages, 14 tables and 123 figures.

The content of the thesis is structured in two parts: the first, bibliographic part includes three chapters, which present the current state of research on evaluating the authenticity of wines, the eco-climatic characterization and terroir of the vineyards of the intra and extra-Carpathian regions, the technology of the production of red and white wines from wine regions intra and extra-Carpathian and the second, the experimental part, highlights the profile of the wines from these regions, each with its specific particularities, the interdependence of eco-climatic and soil factors with specific genuine footprint. The thesis also includes annexes with chromatograms, references, notations used, a list of figures and tables that can be found in the text.

THANKS

I was assisted in this work by the Ph.D.Eng. Ovidiu Tita, the Scientific Thesis leader, whom I wholeheartedly warmest thank. With me were Mr. Ioan Ștefănescu Ph.D. director of the Institute of Cryogenics and Isotopic Separations Rm Vâlcea and colleagues in the department of Research and Development, especially Mrs. Ph.D.eng. Roxana Ionete Mrs. Phys. Ph.D. Diana Costinel, Mrs. Ph.D. Phys. Andreea Maria Iordache and Mrs. chem. Ph.D. Violeta Niculescu I wish to particularly thank them this way. Also I want to express my gratitude to the staff of the Centre for Research in Biotechnology and Food Engineering from the Lucian Blaga University of Sibiu, especially Mrs. Ph.D. Eng. Catherine Lengyel who supported me in achieving microbiological determinations, to my family and all those who helped directly or indirectly to accomplish this thesis.

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THE SCIENTIFIC OBJECTIVES OF THE PHD THEISIS

Wine as a wine product must be characterized by typicality and bears the specific stamp printed by the factors underlying its implementation: variety, natural conditions and production technology (Bulancea, 2002). It is therefore necessary to study the scientific aspects that determine the origin and quality of wines and researchers' concerns must be aimed at making it an objective concept, concrete, specific.

In this context the thesis has as main objective the creation of a workable authentication system for the intra and extra regional Carpathian wines

To achieve this goal required the following steps:

In this context the thesis aims to reach the following scientific objectives:

- Evaluation of polyphenolic components in white and red wines from intra and extra Carpathian wine regions;
- Geographical and varietal differentiation through profiling of volatile compounds in white and red wines from intra and extra Carpathian wine regions;
- Geographical and varietal differentiation by using stable isotopes of white and red wines from intra and extra Carpathian wine regions;
- Improving the wine microorganisms genofund in order to obtain higher quality wines from local areas vineyards;
- Evaluation of mineral profile of white and red wines from intra and extra Carpathian wine regions;
- Geographical and varietal differentiation through the polyphenolic components and heavy metals.

OWN CONTRIBUTION

By developing this work there were identified authentication methodologies of indigenous varietal wines from central and southern Romania, based on typical aromatic profile resulting from the investigations. There were found new data on the aromatic potential of local wines, depending of the climatic and terroir conditions specific to the region, regarding the

establishment of the wine bouquet. There was given scientific data regarding the aromatic and olfactory profile of the wines to identify its typicality. There were isolated and characterized indigenous yeasts from typical areas in order to create a bank of native selected yeasts, but also was established the influence of trace elements on qualitative characteristics of different types of wines, for the first time.

EXPERIMENTAL PART

THE EVALUATION OF THE POLYPHENOL COMPONENT IN WHITE AND RED WINES FROM INTRA AND EXTRA CHARPATIAN WINE REGIONS

Evaluation of the concentrations of polyphenols in white wines

Materials and methods

White wines from vineyards from Ștefănești, Drăgășani, Sâmburești, Corcova, Severin, Murfatlar, Ploiești (Halewood Wineries), Jidvei, Sebeș, 2011, 2012, 2013 harvests.

Quantitative evaluation of polyphenols was performed through the Folin-Ciocalteu modified method

Results and discussion

Assessing the amount of polyphenols in white wines Sauvignon Blanc, Chardonnay and Italian Riesling from vineyards Ştefăneşti, Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Ploiesti (Halewood Cellars) Jidvei and Sebes, the harvest of 2011, 2012, 2013 is visible in Figure 1.

Conclusion

White wines from the varieties Sauvignon Blanc, Chardonnay and Riesling Italian present a wide variety of polyphenols, values which can be 3-4 times higher one from another.

Determined values, put in order, lead to the following classification:

Corcova>Severin>Drăgășani>Ștefănești>Sâmburești>Murfatlar>Jidvei>Ploiești>Sebeș

The results have shown that polyphenols are indispensable components in wines, their concentration is mostly related to the provenance of the wine and not necessarily of its kind.

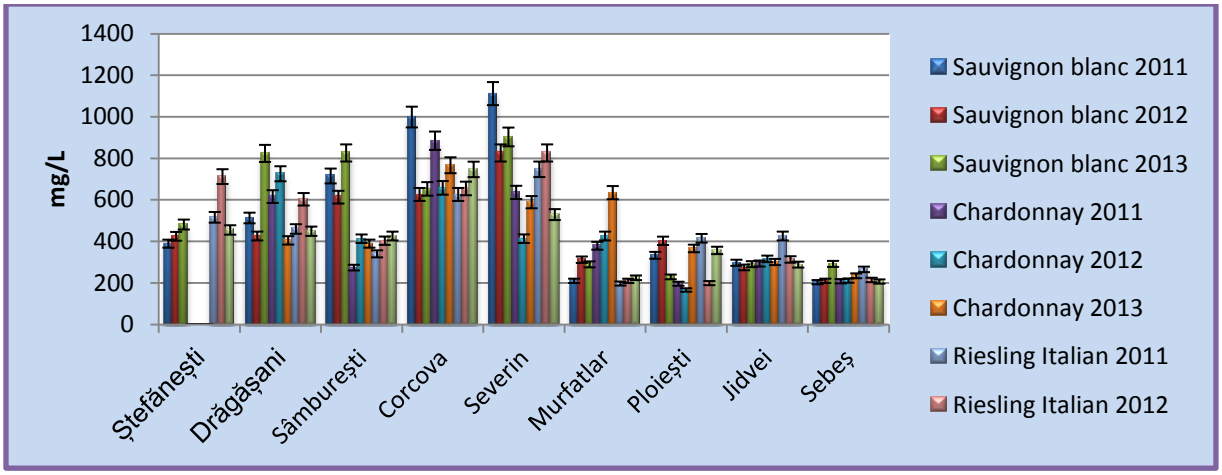

Figure 1. Assessing the amount of polyphenols in white wines harvest years 2011, 2012 and 2013

The evaluation of the concentrations of polyphenols in red wines

Materials and methods

Red wines from the vineyards Ștefănești, Drăgășani, Sâmburești, Corcova, Severin, Murfatlar, Ploiești (Halewood Wineries) and Jidvei, harvest of 2011, 2012, 2013.

Results and discussion

Red wines show a much higher concentration of polyphenols than white wines.

These values exceed 4-6 times the amounts determined in white wines, which is normal because of high concentrations of anthocyanins, which give the red wines not only the sensory attributes but also the red color.Assessing the amount of polyphenols in red wine Cabernet Sauvignon, Pinot Noir, Merlot from vineyards Ştefăneşti, Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Ploiesti (Halewood Cellars) and Jidvei harvest years 2011, 2012, 2013 is shown in Figure 2.

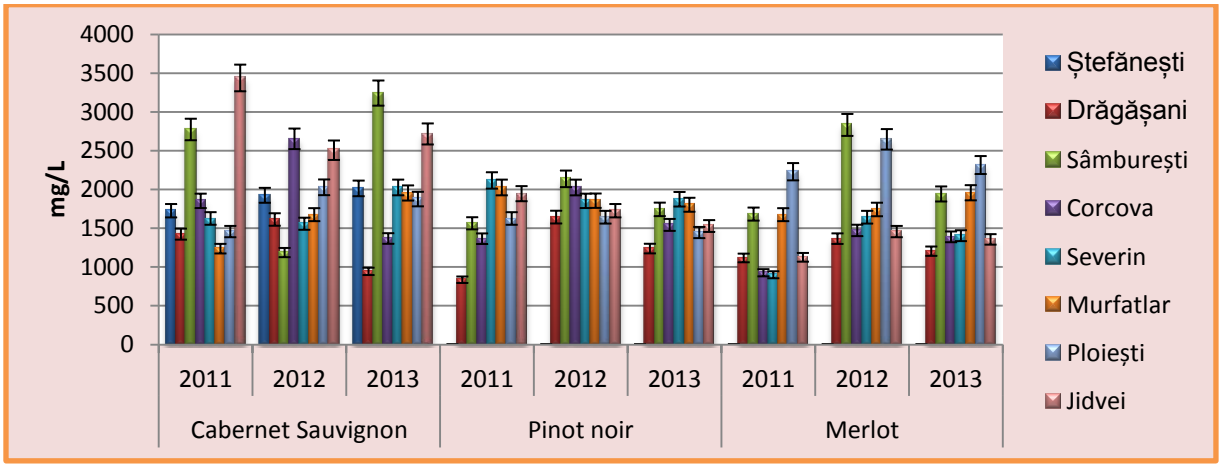

Figure 2. Assessing the amount of polyphenols in red wine harvest of 2011, 2012, 2013

Conclusion

Red wines from the vineyards Ștefănești, Drăgășani, Sâmburești, Corcova, Severin, Murfatlar, Ploiești (Halewood Wineries) and Jidvei, harvest of 2011, 2012, 2013 showed significant amounts of polyphenols, they contribute to color formation, stability and sensory characteristics thereof. From the results obtained we can say that Pinot Noir has a lower astringency, same as Merlot. Cabernet Sauvignon wines from Sâmbureşti and Jidvei may be tougher characters, astringent, compared with those from Corcova and Murfatlar, where values are lower in polyphenol. All these elements contribute to establishing benchmarks in their authentication process.

GEOGRAPHICAL AND VARIETAL DIFFERENTIATION THROUGH PROFILING OF VOLATILE COMPOUNDS IN WHITE AND RED WINES FROM INTRA AND EXTRA CARPATHIAN WINE REGIONS

The influence of variety on the accumulation of volatile compounds in wine

Materials and methods

Red and white wine varieties: Sauvignon Blanc, Chardonnay, Italian Riesling, Cabernet Sauvignon, Pinot Noir and Merlot harvest years 2011, 2012 and 2013 from Oltenia:

Ștefănești, Drăgășani, Sâmburești, Corcova, Severin; Dobrogea: Murfatlar; Muntenia: Wineries Halewood/Ploiești; Transilvania: Jidvei and Sebeș.
The samples taken were analyzed by the GC / FID system (gas chromatography coupled with flame ionization detector using the HeadSpace method in advance.
The system included Varian chromatograph gas coupled with Varian 240 MS, mass spectrometer model (Varian Inc - California, SUA), equipped with a capillary column TG-WAXMS Thermo Scientific (Waltham, MA USA) (60m x 0.32 x 0.25 pm).

Results and discussions
Characterization of aromatic white wines from intra and extra-Carpathian regions

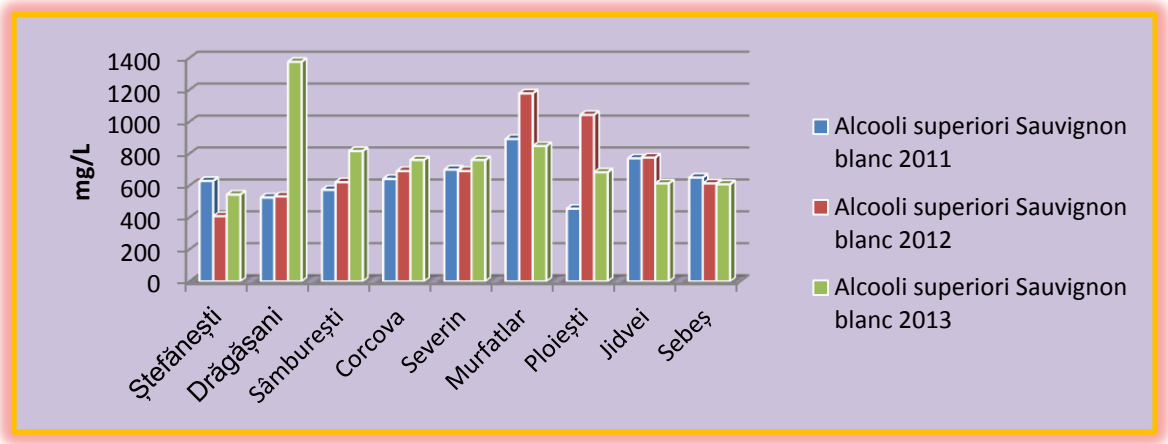

Figure 3. Evaluation of the content of higher alcohols in white wines from Sauvignon blanc Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Halewood Cellars / Ploiesti, Jidvei and Sebes, the harvest of 2011, 2012, 2013

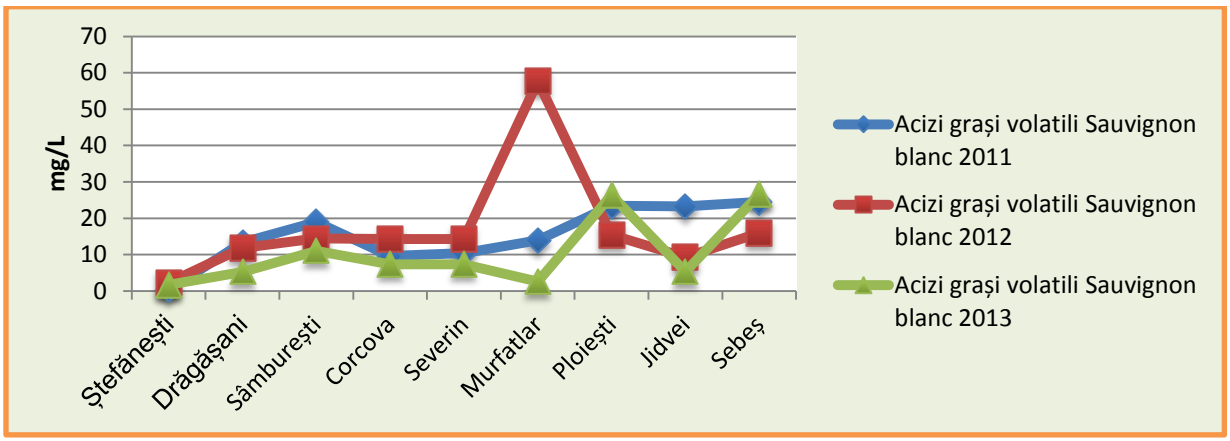

Figure 4. Evaluation of the content of volatile fatty acids in white wines from Sauvignon blanc Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Halewood Cellars / Ploiesti, Jidvei and Sebes, the harvest of 2011, 2012, 2013

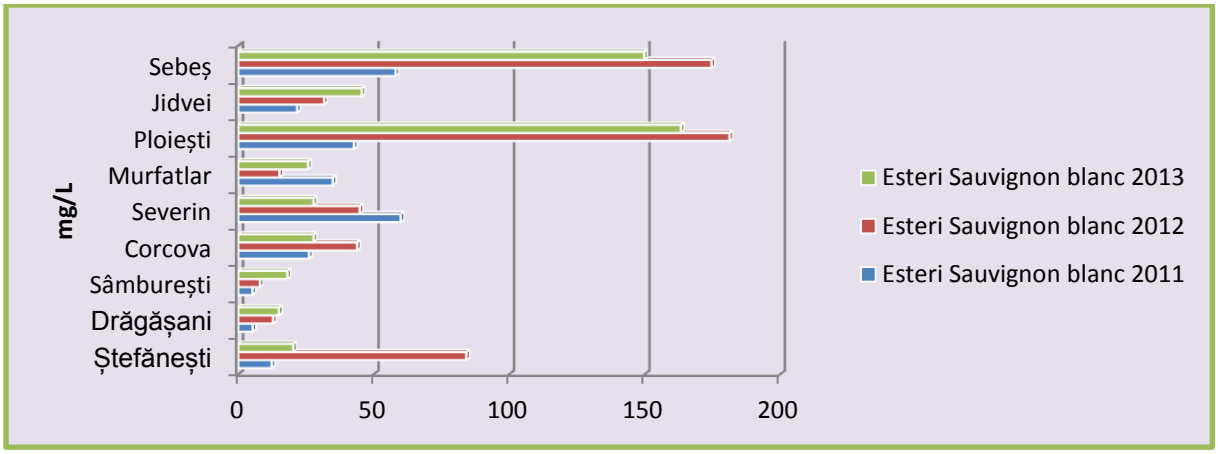

Figure 5. Evaluation of ester content in white wines from Sauvignon blanc Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Halewood Cellars / Ploiesti, Jidvei and Sebes, the harvest of 2011, 2012, 2013

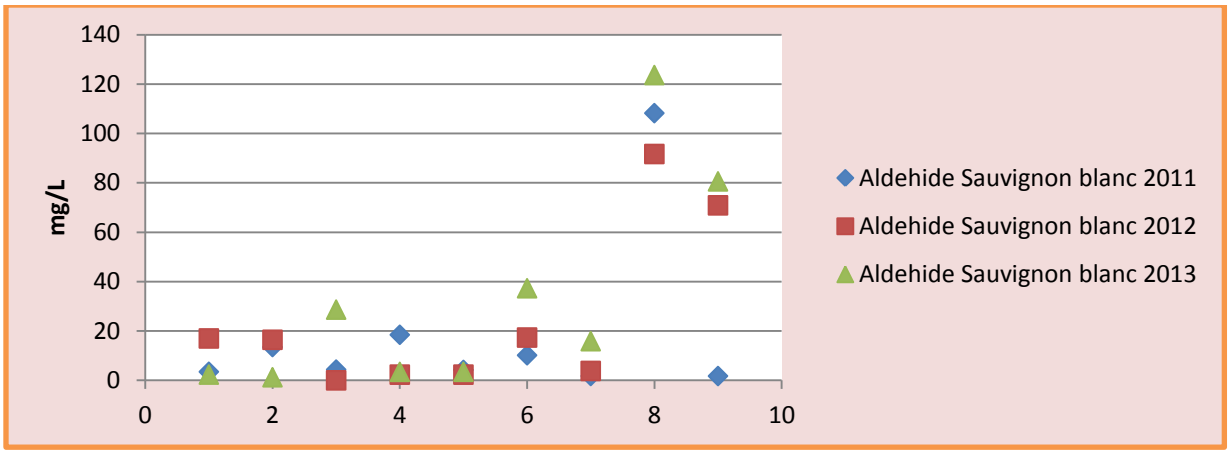

Figure 6. Rating aldehyde content in white wines from Sauvignon blanc Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Halewood Cellars / Ploiesti, Jidvei and Sebes, the harvest of 2011, 2012, 2013

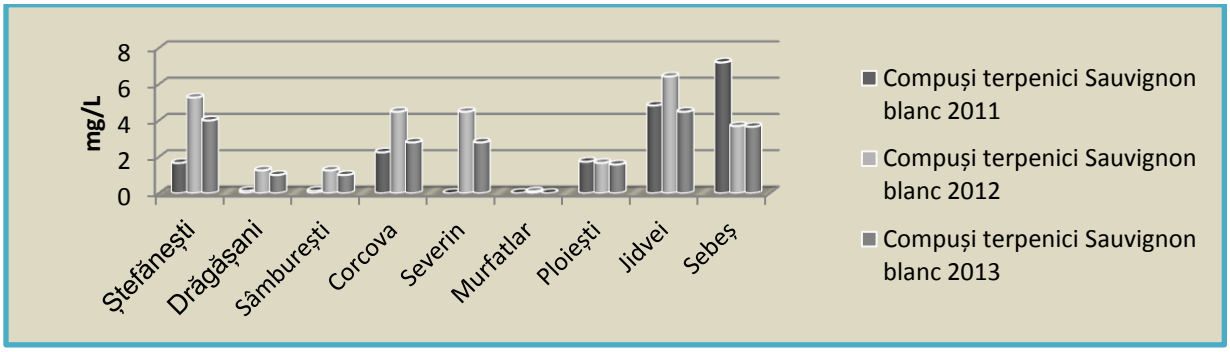

Figure 7. Assessing the terpene compounds in white wines from Sauvignon blanc Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Halewood Cellars / Ploiesti, Jidvei and Sebes, crop years 2011, 2012, 2013

Conclusion

Summarizing the results, we can say that white wines from Dobrogea present the highest level of higher alcohols, followed by those from Muntenia, then the ones from Oltenia, and the

lowest are found in wines from Transylvania. Regarding the volatile fatty acids, these are found in significant quantities in the wines from Dobrogea, followed by those in Muntenia and Transylvania, last place is occupied by those from Oltenia. The ones that give the most substantial flavors are found in higher amounts in white wines from Muntenia and Transylvania, followed by those coming from Oltenia and Dobrogea.
Aldehydes present similar values in Oltenia, Dobrogea and Muntenia, and significantly higher in Transylvania.
Terpene compounds, which give the flavor of muscat, rose, floral wine are found in higher amounts in samples of Transilvania, Muntenia, Oltenia and very low in Dobrogea. Regarding the red wines, the most significant amounts of higher alcohols are in samples from Dobrogea, Oltenia followed by those from Muntenia and Transylvania.
Volatile fatty acids present very similar values in wines from Oltenia, Dobrogea, Muntenia and significantly superior values in wines from Transylvania. Wines from Dobrogea and Muntenia present the most significant amount of esters, followed closely by those in Transylvania; the lowest content of esters have the ones from Oltenia.
The aldehydes were identified in high concentrations in red wines from Transylvania, followed by those in Oltenia, Dobrogea and Muntenia, and terpene compounds were found in wines from Muntenia and Transylvania. Lowest temper compounds quantity was identified in red wines from Dobrogea. It can be said that depending on the region which these wines are from, although it is the same variety, their aromatic structure sometimes differ greatly.

THE EVALUATION OF THE CONCENTRATION OF CARBOHIDRATES IN WHITE AND RED WINES FROM INTRA AND EXTRA CARPATHIAN WINE REGIONS

Materials and methods

White wines from the vineyards of Ştefăneşti Drăgăşani Sâmbureşti, Corcova, Severin, Murfatlar, Ploiesti (Halewood Cellars) Jidvei harvest of 2011, 2012, 2013.
Carbohydrates were determined by (HPLC-IR) the high performance liquid chromatography method coupled with refractive index detector. The HPLC system that was used to determine (the Shimadzu model) comprises LC-10AD pump, DGU-14A degasser, autosampler for SIL-10AV VP, refractive index detector RID-10A, 30^{o}C temperature thermostat regulator CTO-10AS VP of separation column Alltech (Altima Amino 100A 5 µm, containing modified amino silica gel, 250 mm x 4.6 mm). The wines were injected only with a previous Millipore 0.45 µm filtration.
The mobile phase was represented by acetonitrile / water (80:20 v / v) with a flow rate of 1.3 ml / min.
The volume of injection was 10 µl and the column temperature was maintained at 30 ° C.

Conclusion

- The sugars found in the studied white wines, put them in the dry and semi-dry category, the resulting values can be included in the standard areas;
- Glucose concentrations which are substantial compared to the fructose, but added together they can characterize a wine;

- The concentration of sugars, depends on the technology used and also on the yeasts involved in the alcoholic fermentation;
- Changes in sugar values for the same sort of wine, in different years, can be explained by climatic conditions specific to the ripening and maturation period of the grapes, precipitation and temperature variations;
- The identified concentrations of trehalose, can be explained by the fact that this is a backup sugar, which was not completely consumed by the yeast in the stum, its degradation being partial (higher concentrations in the case of musts rich in carbohydrates, lower in those with lower values of carbohydrates);
- Glycerol ranges from 5 to 15 g / L in wine, according to the harvest condition, type of wine or the used SO_2 content (Târdea, 2007). The values obtained in this study correspond to those in specialty literature;
- The sugars found in the red wines we studied, put them in the dry and semi-dry category, the resulting values can be included in the standard areas;
- Glucose shows close values to fructose, as a result of biochemical processes occurring during alcoholic fermentation;
- The concentration of sugars, depends on the technology used and also the yeasts involved in the alcoholic fermentation;
- Changes in sugar values for the same sort of wine, in different years, can be explained by climatic conditions specific to the ripening and maturation period of the grapes, precipitation and temperature variations;
- The identified concentrations of trehalose, can be explained by the fact that this is a backup sugar, which was not completely consumed by the yeast in the stum;
- Glycerol ranges from 5 to 15 g / L in wine, according to the harvest condition, type of wine or the used SO_2 content (Târdea, 2007). The values obtained in this study correspond to those in specialty literature, with few exceptions that may be insignificant;
- Red wines Cabernet Sauvignon from Murfatlar, Pinot Noir from Jidvei and Merlot from Murfatlar had the most significant amounts of glycerol, so from the sensory point of view they can be characterized as unctuous wine, full bodied and with a sweet taste effect;
- The most significant amount of glycerol, during the study period and in terms of origin are obtained by Pinot Noir wines.

GEOGRAPHICAL AND VARIETAL DIFFERENTIATION BY USING STABLE ISOTOPES OF WHITE AND RED WINES FROM INTRA AND EXTRA CARPATHIAN WINE

The specific procedure through mass spectrometry *IRMS*

Mass spectrometers-type ***IRMS*** are modern appliances that are usually registered an ionic current (proportional to the number of ions), in the form of a spectrum, depending on the mass of ions and their relative abundance (concentration in percent). The principle of mass spectrometry consists in the ionization of the sample by electron bombardment in high vacuum, focusing and sending ions and fragmentation products in an analyzer (depending on the ratio of the mass / charge by applying a magnetic and / or electrically), then collecting and measuring quantities of each ion select by a detector.

Results and discussions

Isotopic fingerprinting wines involves several aspects, such as determining the geographical origin, year of harvest, wine grower and quality. It is therefore necessary that the proof of authenticity of the wine to be based on specific parameters of that origin does not change during vinification or are difficult to forge namely stable isotopes: oxygen-18 and carbon 13. The statistical analysis of the principal component (PCA) were considered fingerprints isotope (carbon 13 and oxygen 18) of wines produced in vintage years 2011-2013 the wine areas of Jidvei Drăgășani Sâmbureşti, Ştefăneşti hills of Dobrogea, Corcova , Sebes related to multi-element analysis (heavy metals content), noting discrimination samples after harvest year after the viticultural area.

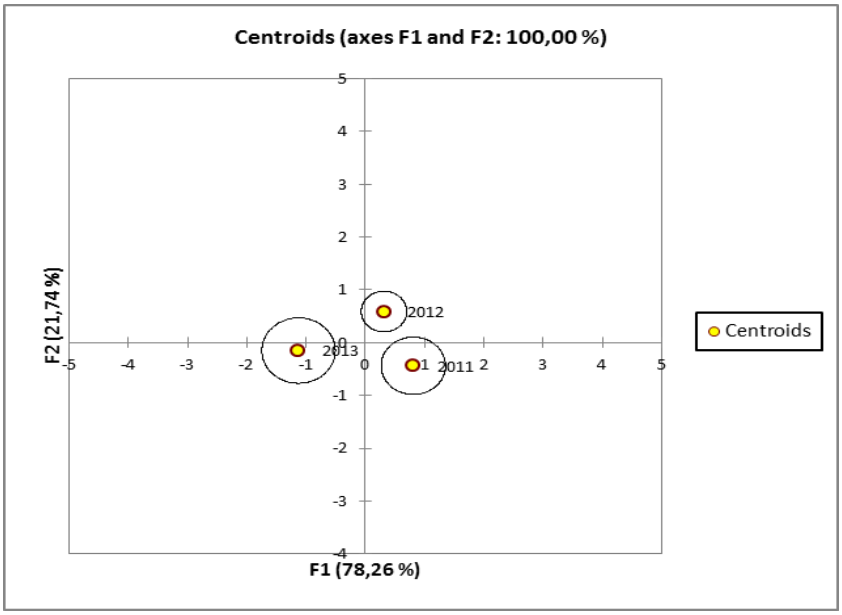

Figure 8. Discrimination of the Romanian wines produced in the years 2011, 2012 and 2013 using principal component statistical analysis (PCA)

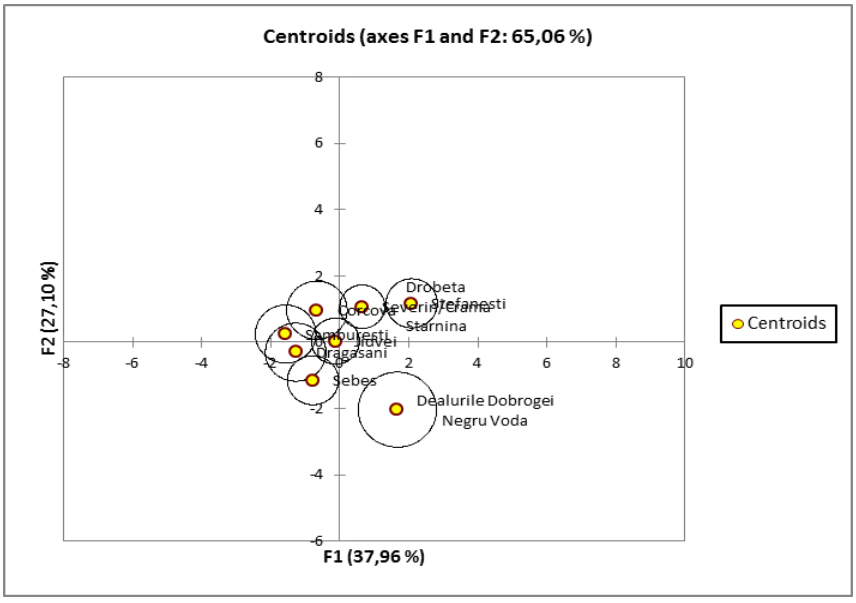

Figure 9. Discrimination of the Romanian wines after the viticultural area using principal component statistical analysis (PCA)

Conclusion

In this chapter it is demonstrated that determination of natural composition in stable isotops (Carbon 13 and oxygen 18) of a wine, coupled with multi element analyzes, (eg. the determination of heavy metals), represents an efficient application of analytical chemistry in the authentication of Romanian wines, and establishing and widening of a database with these values represents a priority at national and international levels.

The results obtained by these studies lead to a database of wine authentication in the studied regions.

MICROBIOLOGICAL FEATURES OF WHITE AND RED WINES FROM THE INTRA AND EXTRA CARPATHIAN WINE REGIONS

Improving the genofund of autochthonous grapevine microorganisms

Materials and methods

- Grape coming from vineyards Ciumbrud, Drăgăşani Jidvei Recaş Segarcea;
- Fermenter with a volume of 2 L equipped with:
- O2, CO2, pH, temperature, biomass, conductivity sensors;
  Double jacket, water recirculation pump, thermostat bath;
- Fermentation temperature was set at 18^0C;
- The period of the yeast harvest: daily, for 10 days starting with the third day of fermentation;
- The speed of the fermenter blade was set at 200 rev / min;
- API 20C AUX test, Biomerieux, France for identifying yeasts;
- M1 culture environment MMA (agar malt mash Sharlau, Barcelona), YPG (yeast-peptone-glucose), sucrose 5%, ammonium sulfate 0.5 mg / l;
- M2- culture environment MMA (agar malt mash Sharlau, Barcelona), YPG (yeast-peptone-glucose), sucrose 10%, ammonium sulfate 0.5 mg / l;
- M3- culture environment MMA (agar malt mash Sharlau, Barcelona), YPG (yeast-peptone-glucose), sucrose 15%, ammonium sulfate 0.5 mg / l;
- Blades, blades, Keyance fluorescence microscope, Biozero.

Results and discussions

After carrying out the processes of fermentation and harvesting of successive samples could be isolated and identified by testing the API 20C AUX, 125 strains of the yeast Saccharomyces cerevisiae, which have been denoted by the initial area of origin followed by numbers from 1 to 25. strains subsequently seeded nutrient medium described above were then selected based on cultural aspects, cell size. Since culturally these yeasts has a light color with a glossy cream for bombs. Obsevând microscopic dimensions were selected only those strains that showed maximum values.

Thus remained in question following strains: C12, C16, C24, D13, D15, D19, J7, J11, J21, R5, R10, R18, S14, S15, S25.

Conclusion

Isolated stains can lead to the formation of a library of culture derived only from domestic strains to preserve the typicality and authenticity of variety in our country. By isolating the wine yeast from indigenous varieties and improving their biotech qualities, by optimizing culture environments we can obtain starter cultures, typical to the areas of origin. The results lead to the recommendation for using these strains in the winemaking processes, to eliminate the standardization of taste, caused by the imported strains.

THE EVALUATION OF MINERAL PROFILE OF WHITE AND RED WINES FROM INTRA AND EXTRA CARPATHIAN WINE REGIONS

Tests on metal concentration in white and red wines

Materials and methods

For this study there have been selected samples of white wine Sauvignon Blanc, Chardonnay and Italian Riesling , Royal Fetească , and samples of red wine Cabernet Sauvignon, Merlot, Burgund and Pinot Noir, harvests in the years 2011, 2012, 2013 originating in the following areas: Ștefănești, Drăgășani, Sâmburești, Corcova, Severin, Halewood Cellars. For the selected samples were found the following metals: cadmium, lead, manganese, nickel, zinc, aluminum, barium, copper, with authorized methods by laboratory of physical and chemical determinations of ICSI Vâlcea, using atomic absorption spectrometry with graphite furnace ICP-MS VARIAN 820. Ultra-pure water was used, HNO3 69% (w / v), concentrated with HF and HCl, and purified water with resistivity of maximum18,2 MΩcm-1, obtained from a Millipore Milli-Q (Bedford, MA, USA) system. A small amount of sample or reference solution is placed within the hollow graphite tube. It is heated to a temperature program to remove, burn, impurities. For quantitative measurements, there was obtained a calibration curve for each element.

By benchmarking the relative abundance of the elements in wine by region of origin, their tendency is classification:

for wines produced in Murfatlar and Jidvei Cd <Pb <Ni <Cr <With <Zn

for wines produced in Recaş Cd <Pb <Ni <Cr <With <Zn

If we compare the relative abundance of elements depending on the variety of wines is observed the following trend:

for wine Chardonnay: Cd < Pb < Ni < Cr < Cu < Zn

for wine Muscat Ottonel: Cd < Cr < Pb < Ni < Cu < Zn

for Pinot Noir: Cd < Pb < Ni < Cr < Zn < Cu

This classification is specific only to this study can not be generalized because the concentrations of wine is influenced by many factors including inter alia the area of origin, type of soil, grape variety, climate (terroir) and oenological practices and wine.

The results correspond to those reported in a previous study on wines from regions Dobrogea / Murfatlar, Muntenia / Valley Călugărească and Moldova.

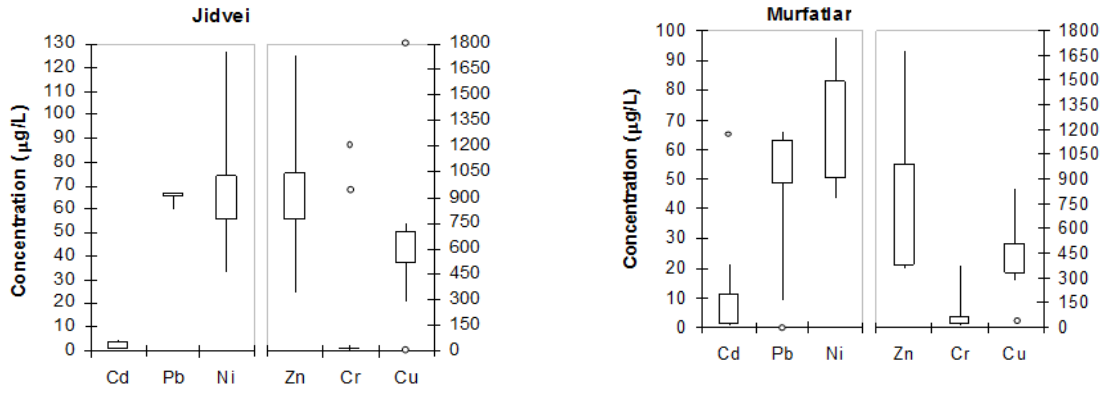

Figure 10. Global overview concentrations (ug /L) elements in wines produced in the wine regions considered in this study.

Conclusion

- The method for determination of metals using atomic absorption spectrometry with graphite furnace ICP-MS VARIAN 820 leads to very precise results regarding micrograms;
- The nickel level showed in this study does not exceed the maximums allowed by regulations, even if there have been reported significant fluctuations between vineyards and the studied various wines, the maximum values recorded for white wines were at Halewood Cellars and for the red wines at Sâmbureşti;
- Copper and zinc are essential micronutrients for the human body, and the concentrations detected in studied wines are benefic from this point of view, without exceeding normal limits. Concentration peaks in white wines were found at Severin and Drăgăşani and for red wines at Sâmbureşti;
- There is no evidence to lead to soil contamination hypothesis in any of vineyards , even if values fall within the generous margins;
- The highest concentration of cadmium is found in white wines at Sâmbureşti, and red wines ones at Dragasani, but doesn't exceed the maximum accepted limit imposed by OIV;
- The highest concentration of plumbum in white wines was found at Dragasani, and in the red wines at Corcova, without exceeding the maximum imposed by law;
- The manganese was found with the highest concentration in white wines at Dragasani, and in red wines at Sâmburești;
- The maximum concentration of aluminum for white and red wines was found at Halewood Cellars, without providing a negative report to the wine;
- Barriers reported the highest concentration for white wines at Halewood Cellars, while red wines reported the highest concentration at la Severin.

ASSESSMENT IN AUTHENTICATION CHARACTERISTIC MARKER WINES

Identify specific components of the area from which the wine has a major significance for its authentication, precisely because constituents are typical.The concentration of polyphenols

depends on the variety, ripening conditions of grapes, wine applied technologies and in particular climate. Popularity presents the practices vine specific works and splashing, and soil composition and groundwater. Additions of alcohol in wine, sugar or glycerol can be easily detected by isotopic fingerprinting, a method increasingly used in laboratories. Authentication is an important goal geographical origin as growing zones have a known reputation, and manufacturers are tempted to sell cheap wines under a false name. The vine grows in different geographical areas so that the grapes, even if they are of the same variety has different characteristics. Isotopic fingerprinting lead to determine precisely the area of origin wines because it prints a typical configuration, which can lead to differentiation. The content of heavy metals is also a key element in authentication of wines by the very fact that they can come from life itself (geographical), and the use of poor quality or inappropriate containers. The concentration of minerals and trace elements that are specific to a wine by its color to be involved in, present peculiarities relevant compositional and discriminatory. Contributes flavor compounds relevant to the authenticity of a wine through their concentration but also their variety. Each variety is specific to a set of flavor compounds that lead to differentiation, and there are specific compounds that only a segment of wines. This difference may result from the concentration of terpene compounds, and aromatic compounds in flavored varieties. International law provides for the harmonization and improvement of analytical methods to identify fraud and improve food control by establishing physicochemical characteristics consistent with the natural potential, restriction or banning of additions of various elements, setting the maximum in terms of the concentration of toxic compounds in wine, but and identify them according to the label. The figure 121 stands mandatory requirements in determining the authenticity of a wine based on the concentration of carbohydrates, polyphenols, flavor compounds, fingerprinting isotopic ethanol and water, the concentration of heavy metals and distinguishing elements of the process, in particular the use of yeasts and enzymes. Wine production technologies allow the use of selected yeasts and enzymes that lead ultimately to the specific characteristics of each area separately, but more relevant is that the effervescent authenticity can distinguish them from the field of potential counterfeits.

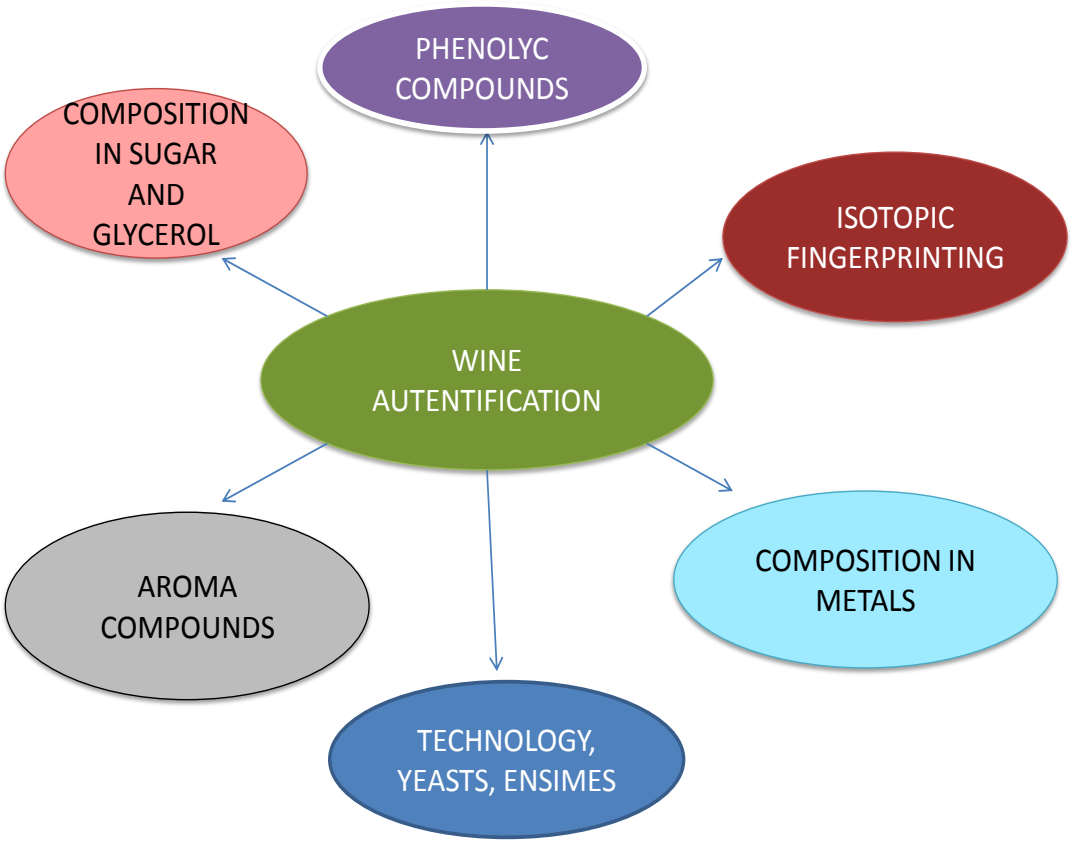

Figure 11. Elements of authentication of wines

FINAL CONCLUSIONS

- White wines from southwest presents the highest values of polyphenols, while those in the lowest center. The concentration of polyphenols is linked largely to the provenance of the wine and not necessarily of its kind.

-White wines from Dobrogea representing the highest level of higher alcohols, followed by those from Muntenia, Oltenia and then the, and the lowest are found in wines from Transylvania.

- Regarding these volatile fatty acids are found in significant quantities in the wines from Dobrogea, followed by those in Wallachia and Transylvania and in last place is occupied by those from Oltenia.

-Esters, which gives the most substantial flavors are found in higher amounts in white wines from Wallachia and Transylvania, followed by Oltenia and Dobrogea those coming from.

- Aldehydes present similar values in Oltenia, Dobrogea and Muntenia, and significantly higher in Transylvania. Terpene compounds, which gives the flavor of Muscat, rose, floral wine are found in higher amounts in samples of Transilvania, Muntenia, Oltenia and Dobrogea in the very low.

-Red wines they contain significant amounts of higher alcohols in the samples of Dobrogea, Oltenia followed by those from Wallachia and Transylvania.
-Volatile fatty acids present very similar values in wines from Oltenia, Dobrogea, Muntenia and significantly superior wines from Transylvania.
-Dobrogea and Muntenia wines from presenting the most significant amount of esters, followed closely by those in Transylvania and the lowest content of esters that from Oltenia.
- Aldehydes were identified in high concentrations in red wines from Transylvania, followed by those in Oltenia, Dobrogea and Muntenia and terpene compounds in wines from Wallachia and Transylvania.
-The amount of terpene compounds lowest identified in red wines from Dobrogea.
- It can be said that depending on the region from which these wines, although it is the same variety, their structure aromatic sometimes differ greatly.
-Sugars determined red wines studied them within the category of dry and semi-dry area resulting values were included in the current standards, glucose, fructose actually showing similar values resulting from biochemical processes that occur during alcoholic fermentation.
-variaţia sugar values for the same sort of wine in different years can be explained by climatic conditions specific ripening and maturation of grapes, precipitation and temperature variations thereof.
-Identify stable isotopes allow the authenticity of the wines studied by setting their botanical origin and geographical markers.
-Did not observe any event leading to contamination of the soil with heavy metals in any one of the vineyard.
-Is recommended strains isolated from local strains in winemaking processes so as to preserve local varieties typicality and authenticity.
Best correlations necessary varietal wines discrimination experienced phenolic compounds (gallic acid, catechin, epicatechin, rutin, quercetin and resveratrol) in accordance with specific micronutrients area of origin of the variety.

PERSPECTIVES OF FURTHER RESEARCH

- The research can be continued on the accumulation of phenolic compounds in certain varieties;
- There can be used some other tehnical methodes in order to improve the production of aromatic and semi aromatic wines;
- Research can continue on the same topic approaching other varieties specific to these vineyards;
- The study can continue in the field of aroma compounds which are found in nanogram quantities, and try to improve GC-MS procedures;
- There can be performed comparative tests with different varieties of vineyards to identify the specific of the area and to establish the aromatic differentiation criteria.

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