

INFLUENCE OF ENZYMES TREATMENT ON THE QUALITY OF SAUVIGNON BLANC WINES

INFLUENȚA TRATAMENTELOR ENZIMATICE ASUPRA CALITĂȚII VINURILOR SAUVIGNON BLANC

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Abstract. Enzyme preparations are currently used in modern wine technology for diverse biotransformation reactions from pre-fermentation to fermentation, post-fermentation and wine aging stage. Industrial enzymes gives quantitative (increased juice yields) and qualitative conveniences (improved color extraction and flavor enhancement) and processing benefits (shorter maceration, settling and filtration time). This study investigates the effects of enzyme treatments on physical-chemical, chromatic and organoleptic parameters of white wines obtained in Iasi vineyard. The grapes representing Sauvignon blanc variety were processed in autumn 2018 by the classic method for obtaining white wines. For this study, five commercial enzymes with different activities were used, such as β -glycosidase and pectinases, thus contributing to release aroma compounds, and six variants were obtained. Laboratory analysis of the wine samples was performed according to International Organization of Vine and Wine. Significant influence in the composition of the analyzed samples was observed, depending on the type of enzyme used as pre-treatment. The study results are useful in improving wine-making process and final products quality.

Key words: glycosidase, pectinases, physical-chemical parameters, Sauvignon blanc

Rezumat. Preparatele enzimatică sunt frecvent utilizate în vinificația modernă pentru diversele reacții de biotransformare la care participă, încă de la faza de pre-fermentare, fermentare, post-fermentare și până la stadiul de învechire a vinului. Utilizarea enzimelor la nivel industrial prezintă numeroase avantaje de ordin cantitativ (creșterea randamentului de suc la presare) și calitativ (îmbunătățirea extracției compușilor de culoare și aromă) și tehnologice (diminuarea timpului de macerare, decantare și filtrare). Această lucrare are ca scop analiza influenței tratamentelor enzimatică asupra parametrilor fizico-chimici și cromatici ai unor vinuri albe obținute în podgoria Iași. Strugurii din soiul Sauvignon blanc au fost prelucrați în toamna anului 2018 prin metoda clasică de obținerea vinurilor albe. Pentru acest experiment, au fost comparate cinci enzime comerciale de tipul β -glicozidazelor și pectinazelor, destinate îmbunătățirii extracției compușilor volatili, rezultând șase variante. Analizarea în laborator a probelor de vin obținute s-a realizat în conformitate cu reglementările Organizației Internaționale a Viei și Vinului. S-a observat o influență semnificativă asupra compoziției eșantionelor analizate, în funcție de tipul enzimei utilizate ca tratament în etapa de pre-fermentație. Rezultatele studiului contribuie la optimizarea proceselor de vinificație și a calității vinurilor.

Cuvinte cheie: glicozidaze, pectinaze, parametri fizico-chimici, Sauvignon blanc

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INTRODUCTION

Enzymes, as biocatalysts, propose a wide diversity of possibilities for improving food and beverage production; their stereo-selectivity is an important advantage. Specific optical conformation may be associated to flavor properties of final products (Christer and López-Munguia, 1994). So, enzymes present significant benefits for industrial application, such as: low temperature condition for activity, which means low energy requirement for the process; less by-products; improvement of product quality; non-toxic when properly used; can be degraded biologically and can also be immobilized to reuse; increase stability and easy separation from the environment (Bayindirli, 2010). In wine-making production, enzyme activity is essential for the development of high-quality wines, principally to ameliorate clarification and filtration of must and wine, improving their stability and enriching the volatile profile or chromatic parameters of wines (Armada *et. al.*, 2010). The actions of the endogenous enzymes are limited to the pH values and SO₂ conditions associated with the wine-making process. Since the grape enzymes are neither efficient nor sufficient under wine-making conditions, commercial enzymes are widely used as additions (Rensburgand Pretorius, 2000). Commercial enzyme products are eco-friendly and present consistent economic benefits (Mojsov, 2013). The use of enzymes in wine production in the European Union is regulated by the International Organisation of Vine and Wine (OIV). Specific resolutions define general aspects of enzymes in wine-making, permitted enzyme activities, mode of application and enzyme activity measurements.

The experiment aimed to analyze the impact of enzymatic preparations on physical-chemical (ethanol content, density, pH, acidity, malic acid, lactic acid, total sugars, free and total SO₂, total dry matter and non-reductive dry extract), chromatic and sensorial parameters of Sauvignon blanc wine samples, obtained from grapescultivated in Iași vineyard. The results of this research are usefulin improving the wine-making process and the sensorial quality of final product.

MATERIALS AND METHODS

Grapes samples and winemaking. Sauvignon blanc grapes were harvested in autumn of 2018 at full maturity from Iași vineyard and processed by classic white wines technology. *Saccharomyces* yeast (Levuliaesperide®, AEB) at a dose of 20 g/hL and 30 g/hL yeast nutrient (Fermo Plus CH®, AEB) were inoculated and the mixture was separated in six aliquots. Five different commercial enzymes based on pectolytic and β-glycosidase were added to musts before alcoholic fermentation, intended to improve the extraction of volatile components (EndozymThiol®, AEB – V1; Endozym β-Split®, AEB – V2; Zymovarietal aroma G®, SODINAL – V3; Endozym Ice®, AEB – V4; Zimarome®, BSG WINE –V5 and no enzyme– V6), at dose of 3 g/hL (enzymes were diluted with must 1:10) and 3 mL/hL respectively. The doses administered are in correlation with usage specifications of oenological products and with the legislation in

force. The fermentation was carried out at 16-18 °C for three weeks. When the alcoholic fermentation was finished, each variant was filtered through sterile membrane filters followed by sulfur dioxide addition (to preserve wine from microbiological degradation) and bottled. The samples were kept under controlled conditions (constant temperature, zero UV exposure, stable humidity) and analyzed after 5 months.

Physical-chemical parameters were performed according to the International Organization of Vine and Wine Compendium methods of analysis: total and volatile acidity, alcoholic strength, real acidity (pH) density, total sugar, free and total sulfur dioxide, malic and lactic acid, total dry extract and non-reducing extract.

Chromatic parameters were studied in accordance with the Commission Internationale d'Eclairage (CIE, 1976), promoted as the OIV standard method for wine color determination. The system uses characteristics of specific qualities of visual sensation: clarity, tonality, chromaticity, saturation, luminosity, tint. Evaluation of chromatic characteristics was made using a Specord UV-VIS spectrophotometer. CIELab system characterizes color variations as perceived by the human eye, representing a uniform 3-dimensional space defined by colorimetric coordinates L^* , a^* , and b^* . The vertical axis noted with L^* measures from 0 – completely opaque, to 100 - totally transparent, and parameters “+a*” red, “-a*” green, “+b*” yellow, “-b” blue were registered (OIV, 2019). Distilled water was used as control.

Sensorial characteristics. The panel of tasting was composed of members of the laboratory or external tasting specialists, persons with advanced theory training on the fundamental concepts related to taste. The selected odors are connected or normally appearing in white wines, such as honey, citrus, vegetal, ripe fruits, green fruits, hay, roses, etc. The parameters were evaluated with ratings from 0 to 5 and the means were calculated.

Reagents and standard solutions were of analytical grade and were purchased from Merck, Germany.

RESULTS AND DISCUSSIONS

Effects of enzymatic pre-treatment on basic parameters of wine. The analyzed samples were dry wines with 16.2 % vol. The ethanol content in wines was not affected by the type of administrated enzymes as pre-treatment.

Wine's acidity is essential for its preservation and sensory features. These parameters may be influenced by grape variety, ripeness, climatic conditions, wine-making technology and storage conditions (Samoticha et. al., 2017). The total acidity of the major of variants was 3.3 g of tartaric acid (V1, V3, V5, V6), and 3.2 g of tartaric acid at V2 and V4.

The total dry extract mentions to all non-volatile composites under specified physical conditions (OIV, 2019). The values registered varies between 30 (V2) and 30.7 (V5 and V6) g/L.

The content of the non-reductive extract of wines obtained from Romanian vineyards fluctuates among 13 and 35 g/L, according to variety, grapes health situation, wine-making technology and applied treatments (Cotea, 1985). The non-reductive dry extract was 20 g/L for V2, V3, V4, V5 and 20.1 g/L for V1 and V6.

Table 1

Physical-chemical parameters of analyzed wines

Sam-ple	Total Acid. g/L C ₄ H ₆ O ₆	pH	Alc. % vol.	Malic Acid	V.A. g/L C ₂ H ₄ O ₂	Den-sity	Total Sugar g/L	Lac-tic Acid	Free SO ₂ mg/L	Total SO ₂ mg/L	TDE g/L	NE g/L
V1	3.3	3.4	16.2	0.5	0.29	0.9911	2.2	1.3	15	61	30.2	28
V2	3.2	3.4 2	16.2	0.3	0.29	0.9910	1.9	1.6	18	61	30	28. 1
V3	3.3	3.4 2	16.2	0.3	0.28	0.9911	2.1	1.6	18	59	30.2	28. 1
V4	3.2	3.4 2	16.2	0.3	0.29	0.9912	2.4	1.5	15	61	30.5	28. 1
V5	3.3	3.4 2	16.2	0.3	0.3	0.9913	2.6	1.4	18	64	30.7	28. 1
V6	3.3	3.4 4	16.2	0.3	0.32	0.9913	2.7	1.6	18	60	30.7	28

Enzymatic treatment influenced the chromatic parameters of analyzed samples to varying degrees. All variants presented a high level of clarity, with more yellow and green shades. The parameter “a*” presented the highest value at V5 sample (-1.02) and the lowest at V1 (0.58). The highest values of “b*” (yellow shade) was recorded at the V1 sample and the lowest at V2.

Table 2

Chromatic parameters of analyzed samples

Sam-ple	Clarity L	Chromaticity		Saturation Chroma C	Tonality H	Lumino-sity	Tint	Colori-metric difference	Tonality difference
		a	b					ΔE	ΔH
V1	98.44	-0.58	6.77	6.8	-85.13	0.12	4.21	3.71	2.38
V2	98.62	-0.7	6.48	6.58	-83.84	0.11	4.55	3.72	2.5
V3	98.63	-0.78	6.65	6.69	-83.32	0.12	4.67	3.87	2.58
V4	98.68	-0.76	6.51	6.55	-83.33	0.11	4.73	3.81	2.56
V5	98.86	-1.02	6.63	6.7	-81.28	0.11	5.59	4.14	2.82
V6	98.54	-0.63	6.5	6.53	-84.46	0.12	4.31	3.64	2.43

Some differences were measured for “L*” parameters, related to brightness. It was manifested by less red and blue color of the wine. The luminous intensity of color - i.e., its degree of lightness - is called its value. Colors can be classified as light or dark when comparing their value. In figure 1, comparative organoleptic graphics of the analyzed samples are represented. Tonality has registered negative values for all samples.

A perceptible color difference between sample treated with enzymes and control samples can be observed, suggesting that enzyme preparation had an important influence on colorimetric properties. Delta values represent the color difference as compared with the control. Thus, the largest colorimetric difference (ΔE values) was recorded on sample V5, followed by V3, V4, V2, V1 and V6.

Also, ΔH values show the largest tonality difference in the V5 variant, followed by V3, V4, V2, V6 and V1.

Chroma describes the vividness or dullness of color - in other words, how close the color is to either gray or the pure hue. The tint is how we perceive an object's color (red, orange, green, blue, etc.) and is partially affected by the pH level of the wine. The tint values of analyzed samples ranged from 4.21 (V1) to 5.59 (V5) and chroma values ranged from 6.53 (V6) to 6.77 (V1).

Following the sensory analysis, significant differences can be observed due to the type of enzyme used as pre-treatment.

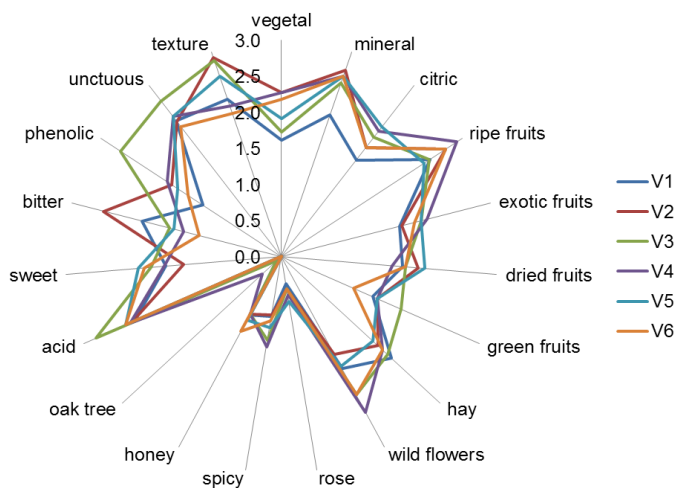


Fig. 1 Comparative organoleptic analysis of wines

This study shows how the general sensory descriptors of the Sauvignon blanc wine can be influenced by enzyme preparations as pre-treatment. Wine texture is counted to be a major product differentiator for wine style and value in the marketplace. Also, clarity and color stability (absence of haze development and the retention of color) are usually measured to be pre-requisites to market success. V1 sample was noted by intense ripe fruits flavor, hay and mild wildflowers, with a great texture, unctuous and a little bitter. V2 sample showed mild ripe fruits bouquet, vegetal notes and dried fruits taste, with a good texture, and slightly bitter. V3 revealed ripe fruits and wild flowers notes, with a great texture and unctuous. V4 sample presented the most intense wild flower touch, fruity notes and medium unctuous degree. V5 stood out by medium fruity notes and less vegetal scent. V6 was noted by ripe fruits fragrance, wild flowers and less green fruits. V1 and V3 variants were appreciated as having the highest acidity. A discreet spicy fragrance was noted especially on V3 and V4 samples. All wines showed a high mineral palate.

CONCLUSIONS

1. The process of winemaking depends on the activity of enzymes. Pre-fermentative treatments applied for this experiment didn't show a relevant effect on the standard physical-chemical parameters of wines.

2. Enzymatic preparations affected chromatic parameters of analyzed samples to varying degrees.

3. By applying enzymatic treatments, an increase in the sensorial complexity and variability of sensorial indices of the samples were obtained.

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