

INFLUENCE OF THERMAL REGIMES DURING FERMENTATION-MACERATION PROCESS ON FOAMING PROPERTIES OF WINE MATERIALS FOR RED SPARKLING WINE PRODUCTION

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Abstract: At formation of foaming properties are participating a whole range of a chemical compounds, content of which largely depends of grape variety, cultivation area, technology of sparkling wines production, etc. Foaming properties of the wines also are related not only to the composition and quantity of the chemical compounds, but also is influenced by interaction of these substances.

This factors may increase or decrease foaming properties after blending wines from different grape varieties. From these reasons, study was conducted on raw materials red wines, from classical European varieties Merlot, produced using different fermentation-maceration temperature regimes on the foaming parameters. In result technological parameters of fermentation-maceration process during production of raw material red wines which improve basic foaming parameters for red sparkling wines production were established.

Keywords: raw material red wines, quality, chromatic indices, physical-chemical indices, foaming indices.

Introduction

Wine is a beverage exclusively obtained by alcoholic fermentation of grape must and is directly influenced by used raw material wines, production process, technologic, treating and curing regimes [1, 3, 4]. Also red sparkling wines are distinguished by chemical composition, organoleptic parameters, redox properties, higher viscosity, more stable and foaming indices which are particularly for sparkling wines. This is due largely to excessive concentrations of phenolic substances and coloring [2].

From the literature it is known that the main factors which contribute to improve the pearling and foaming properties in sparkling wines are surface-active substances such as proteins, pectins, amino acids, phenolic substances and so on, which through hydrogen bonds with carbon dioxide, ensuring long pearling and foaming of sparkling wines[2]. Taking into account that foaming properties of red sparkling wines essentially depends of the raw material red wines characteristics and especially chemical background which is formed during fermentation-maceration process [5].

This is why objective of the research was the compared study of the influence of various fermentation-maceration regimes on the physico-chemical and especially foaming indices in raw material red wines designated for red sparkling wines production. Following comparative investigation and analysis of complex data were established the optimal fermentation-maceration temperature conditions that improve foaming proprieties of raw red wines.

Materials and methods

The influence of different fermentation-maceration thermal regimes on foaming properties of wine materials was performed in micro-winemaking sector and in the laboratory «Biotechnology and Microbiology of Wine», using grape variety Merlot. In this study, musts, raw material red wines produced with different fermentation-maceration regimes were used. For grape must fermentation where used pure yeasts strains from the Collection of microorganisms for winemaking industry of Scientific and Practical Institute of Horticulture and Food Technologies (SPIHFT).

During research modern methods for analysis of physical and chemical indices of must, raw material red wines were used.

Determination of specific indices for sparkling wines: the maximum height of foam height of foam stabilization and foam stabilization time was performed using special installation "Mosalux» (France).

Results and Discussion

From harvested grapes cultivated on proving grounds of SPIHFT were processed in conditions of micro-winemaking with various fermentation-maceration thermal regimes have been prepared samples of raw material red wines for red sparkling wines production.

Basic physico-chemical indices of raw material wines for red sparkling wines produced with different fermentation-maceration temperatures are shown in Table 1.

Table 1. Influence of different fermentation-maceration temperatures on physico-chemical indices of raw material red wines for sparkling wines production (SPIHFT, h.y. 2014)

№	Fermentation-maceration temperature, °C	Alcohol concentration, % vol	Mass concentration of, g/dm ³ :		pH	Red-ox potential, mV
			titratable acids	volatile acids		
1	20±1°C	12,9±0,1	7,4±0,06	0,30±0,03	3,32±0,01	203±9
2	24±1°C	12,8±0,1	6,6±0,08	0,46±0,04	3,34±0,01	203±6
3	28±1°C	12,7±0,1	7,7±0,07	0,30±0,03	3,34±0,01	202±8
4	32±1°C	12,6±0,1	7,1±0,1	0,30±0,03	3,34±0,01	202±8

From the results presented in table 1, it is clear that increasing of fermentation-maceration temperature slightly decreased alcoholic concentration, by up to 0,3% vol., It being explained that with increasing of the temperature fermentation alcoholic occurs faster and its efficiency have a little decrease in formation of ethanol.

Titrate acidity and volatile acidity ranges in all samples but not observed a regularity that can be attached to temperature regime, changes of pH value is not observed, also with increasing of fermentation-maceration temperature we see a minor reduction of red-ox potential.

Also in obtained raw material red wines where determinate chromatic indices, phenolic and anthocyanins content, obtained results are represented in table 2.

Table 2. Influence of different fermentation-maceration temperatures on phenolic content and chromatic indices of raw material red wines for sparkling wines production (SPIHFT, h.y. 2014)

N ^o	Fermentation-maceration temperature, °C	Amount of phenolic compounds, mg/ dm ³	Total anthocyanic content , mg/dm ³	Colour intensity, (Ci=A ₄₂₀ +A ₅₂₀ +A ₆₂₀)	Color tone, (Ct=A _{420nm} /A _{520nm})
1	20±1°C	1048±10	187±6	9,5±0,3	0,49±0,2
2	24±1°C	1498±12	257±7	10,2±0,3	0,54±0,2
3	28±1°C	1585±12	280±6	12,3±0,3	0,50±0,2
4	32±1°C	1627±15	321±8	17,1±0,3	0,51±0,2

Analyzing data presented in Table 2, we observe that with increasing of fermentation-maceration temperature value of chromatic indices are rising, the most considerable increase of Ci was recorded at highest studied fermentation-maceration temperature of 32 ± 1 ° C and confirms data from literature [5]. Ct indices are ranging between 0.49 and 0.54, which corresponds to young wines because most of anthocyanins are in their reduced form.

Also was established that the greatest influence of temperature on extraction of phenolic substances is in rising the temperature of fermentation-maceration from 20 ± 1 ° C to 24 ± 1 ° C, increasing the efficiency of extraction of phenolic substances with 40%, as well the further increase of thermal regimes represent a positive dynamic of phenolic substances extraction but with lower yield. For anthocyan extraction the most vaubell leap are recorded at fermentation-maceration temperature of 24±1 and 32±1 ° C.

Also, in raw material red wines where determinate specific foaming parameters using special installation “Mosalex” (France). Obtained results are presented in fig. 1.

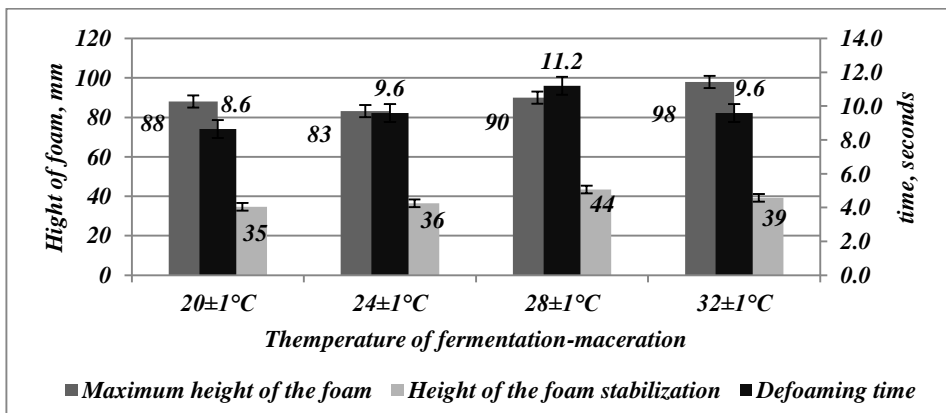


Fig. 1. Influence of different fermentation-maceration temperatures on foaming indices of raw material red wines for sparkling wines production (SPIHFT, h.y. 2014)

According to data from figure 1, the highest indices of foaming were determined in raw material red wines produced at fermentation-maceration temperature of 28±1°C, these wines have registered highest foam stabilization of 44 mm and most long period of defoaming time. The second place has occurred wine produced with fermentation-maceration at 32±1°C also these wines have reached highest points of foam formation

but leaser quality of foam stabilization. The lower foaming indices were determined in wines produced with fermentation-maceration temperature at $20\pm 1^{\circ}\text{C}$ and $24\pm 1^{\circ}\text{C}$. From obtained results is hard to correlate other physico-chemical indices, phenols or anthocyanins content to foaming proprieties of obtained red wines but is clear that different thermal regimes during fermentation-maceration process at red wines production have lower impact on specific foaming indices then on phenolic content.

Conclusions

This study allowed establishing that fermentation-maceration temperature of $28\pm 1^{\circ}\text{C}$ in process of production of raw material red wines for red sparkling wines production is having most efficient impact on foaming indices. But also it is necessary to highlight that the foaming indices in all samples haven't critical differences and can't be related to particular chemical compound from raw material red wines but is clear that rising of fermentation-maceration temperature not only increase dynamic of phenolic compounds extraction, increase color intensity and anthocyanins content and also have positive outcome on all foaming indices.

References

1. **Taran N.**, Current situation and perspectives of wine production in Republic of Moldova.: Chisinau, **2008**.
2. **Taran N., Soldatenco E.**, "Tehnologia vinurilor spumante, Aspecte moderne", Chisinau 2011, page 152-174.
3. **Rusu E.**, Oenologia moldavă. Realitatea și perspectivele. Chișinău, Tip. AȘM, 2006, 267 p.
4. **Târdea C.**, Chimia și analiza vinului. Editura "Ion Ionescu de la Brad", Iași – 2007, pag. 978-1026.
5. **A. Макаров**, „Производство шампанского”. Симферополь, Таврия – 2008. ст.126-139, ст.293-306.