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RESEARCH REGARDING BIOTECHNOLOGICAL POSSIBILITY TO REDUCE VOLATILE ACIDITY IN WINES

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Abstract

The forming of volatile acidity in the time of primary wine making is influenced by biological and physic-chemistry factors in complex interaction. Volatile acidity can be limited through: using selected yeasts, sulphur added in legal doses, the homogeneity of grapes juice phases, the using of fermentation activators.

Key words: *free acidity, biotechnology, enzymes, selected yeasts, volatile acidity*

Introduction

From among wine components, which allow the estimation of wine quality, an important place had acid volatile contents, know like volatile acidity name. Louis Pasteur realised the oldest scientific observation in this area (1880) that considered that determination of volatile acidities of wine in necessary for estimation of wine healthy.

A lot of research worker studied the volatile acids contents of wine and the limits of their acceptation on market van Zyl (1995), Valuico (1959), Ough and Amerine (1967), J. Ribereau-Gayon (1972) uphold that normal wine obtained through healthy fermentation contents maximum 0.4-0.6 acetic acid.

The forming of volatile acidity in the time of primary wine making is influenced by biological, physic-chemistry and technological factors in complex interaction.

Experimental

The research was realised in 2001 and 2003 with Merlot grapes from Banu Mărăcine, Drăgăşani and Sâmbureşti-Olt vineyard.

For the control of volatile acidity in the times of fermentation-maceration there was formulated and applied 7 experimental models:

- The influence of sugar contents of the grape juice yeasts on basic characters of wine with special attentions on volatile acidity proportion.

- The influence of nature yeast on volatile acidity contents from obtaining wine;
- The influence of sulphur added and yeasts on basic characters of wine included volatile acidity
- The influence of fermentation temperature on volatile acidity forming.
- The influence of homogeneous process of the two phases of grape juice in the time of fermentation-maceration, following in special the length of fermentation-maceration along with the density of liquid phases 1010 and the proportion of volatile acidity.
- The influence of fermentation activators in the transformation of grape juice in wine and the forming of volatile acidity.

Looking the action of biological factors (yeast) and biochemical factors (pectolitic enzymes) as definitely points of red wine by biotechnology obtaining. In this time was following the action of indigene yeast and selected yeast and the action of pectolitic enzymes.

It was research the effects of this intervention on the next elements: the length of maceration-fermentation, the alcohol percent, the contents of residual sugars, the glycerol contents, no reduced extract, efficiency of fermentation, the proportion in yellow, red and blue pigments like absolutely values, the proportion in yellow, red and blue pigments like relative value, the anthocianic contents, the proportion of flaviliu cations, the shining power of anthocians, total poliphenol (g/l), total tannins (g/l), ionization index.

Results and Discussion

In the tables 1 – 6 are presented results obtained from research effectuated. The data from the (Table 1) show that either when we use yeast from the spontaneous microflora (native yeast) or add selected yeast, the more the carbohydrates content in must increases, the more it takes must to turn into wine by fermentation (effervescence). There are also differences between the two types of yeast, the durations of fermentation (effervescence), for all levels of carbohydrates contents, being lower (smaller) when we add selected yeast. In respect of the contents in volatile activity, they are, in all cases, bigger when/if yeast from the spontaneous microflora acted, in which there are important proportions of wild yeast of Kloekera and Torulopsis types, that are more active producers of volatile acids, in comparison with yeast of Saccharomyces type.

The higher alcoholic power and the lower productivity of volatile acids of selected yeast are clearly shown in the data from Table 2. Those having Killer factor produce 0.4% more alcohol and 0.23 g/1 (H_2SO_4) less acidity comparing with native yeast (11.7 vol.% alcohol and 0.59 g/1 volatile acidity).

In similar conditions in what concerns the carbohydrates and acidity contents of must, volatile acidity had lower proportions when selected yeast acted for all levels of sulphur added. As the doses of sulphurs increase, the volatile acidity decreases for the both ways of yeasts added (Table 3).

Table 1. Influence of sugar contents in grape juice and of yeasts from basic characteristics of wine including volatile acidity

Sugar (g/l)	Acidity	Yeasts added	Fermentation period in day	Alcohol vol. %	Total acidity g/1H_2S0_4	Volatile acidity after fermentation. g/1 H_2SO_4	Volatile acidity after 6 mounths g/1H_2SO_4
182	4.65	Indigene	7	10.2	4.86	0.52	0.64
		Selected	5	10.4	4.72	0.47	0.58
197	4.52	Indigene	6	11.3	4.88	0.56	0.60
		Selected	5	11.5	4.74	0.44	0.51
211	4.43	Indigene	1	12.0	4.62	0.54	0.62
		Selected	5	12.3	4.55	0.47	0.55
256	4.16	Indigene	12	12.5	4.34	0.55	0.61
		Selected	10	15.7	4.58	0.48	0.52

The abundant ventilation (airing) that takes place in open vats and open concrete basins promotes bigger proportions of volatile acids comparing with the situation in which the industrial Roto method is used for maceration-fermentation, when the process takes place in closed spaces, in an abundant CO2 atmosphere (Table 4).

By means of its level, the temperature of fermentation significantly influences the setting of the volatile acidity. For the wine making in white and also for wine making in red, the duration of fermentation decreases as the temperature of fermentation gets higher (increases). But also the volatile acidity is higher at higher levels of fermentation, reaching 0.58 g/1 if the temperature is of 28°C for the red wine making.

The conditions of incorporating the "hat/cap" in the liquid phase for the wine making in red by the classical method (Table 6) is extremely important for the setting of the volatile acidity. As a consequence of their superior power of fermentation, selected yeast leaves less residual sugar in

wine, but the proportion of residual sugar in wine, for the same kind of yeast, varies depending on the fermentation activator we chose, fact that suggests that the parameters of chemical composition we analyzed vary not only according to the yeast that achieves fermentation but also according to the process of stimulating it.

Table 2. Influence of yeast type from wine concentration in volatile acidity

Yeasts type	Sugar (g/l)	Total acidity g/1 H_2S0_4	Alcohol vol. %	Volatile acidity g/1 H_2S0_4
Indigene yeasts	206	4.26	11.7	0.59
Selected yeasts without Killer factor	206	4.26	11.9	0.43
Seleced yeasts with Killer factor	206	4.26	12.1	0.36

Table 3. Influence of sulphur and the yeasts on principal characteristics of the wine including volatile acidity

Sulphur dose mg/1	Sugar in grape juice g/1	Yeasts added	Alcohol vol.%	Volatile acidity at the end of fermentation (g/l)
Nonsulphur (Witness)	200	Indigene	11.2	0.54
		Selection	11.4	0.48
50	200	Indigene	11.1	0.46
		Selection	11.4	0.40
100	200	Indigene	11.2	0.45
		Selection	11.3	0.40
150	200	Indigene	11.3	0.46
		Selection	11.4	0.39
200	200	Indigene	11.2	0.46
		Selection	11.4	0.40

Table 4. Influence of maceration-fermentation process from principal characteristics at red wines including volatile acidity

Technologic process of wine making	Yeasts	Sugar	Total acidity	Alcohol vol.%	Volatile acidity g/lH_2S0_4
Fermentation-maceration in open containers	Indigene	212	4.35	11.9	0.58
	Selected	212	4.35	12.0	0.51
Fermentation-maceration in open basins	Indigene	212	4.35	11.8	0.59
	Selected	212	4.35	11.9	0.50
Fermentation-maceration in ROTO tank	Indigene	212	4.35	12.0	0.40
	Selected	212	4.35	12.2	0.38

Table 5. Influence of fermentation temperature about volatile acidity formatting (micro wine making)

Technology of wine	Temperature of fermentation °C	Period of fermentation (days)	Alcohol vol.%	Volatile acidity g/lH_2S0_4
In white	16	9	11.6	0.42
	20	7	11.7	0.44
Witness	24	6	11.7	0.51
	28	5	11.4	0.58
In red	21	8	12.0	0.47
	24	7	12.1	0.45
	27	5	12.3	0.49
	29-30	4	12.2	0.60

Table 6. Influence of homogenisation regime of two phases of grape juice during the fermentation-maceration process at red wine making

Nr. homogenisation/day	Yeasts added type	Period of fermentation-maceration (day)	Volatile acidity g/lH_2S0_4
Without homogenisation (Wt)	L.S.	8	0.66
2	L.S.	6	0.53
4	L.S.	6	0.49
6	L.S.	5	0.45
8	L.S.	4	0.39

If selected yeast does not leave in wine more than 6,5 g/1, native yeast leaves 8-13,2 g/1 residual sugar. The actibiol product, through its chemical composition, (ammonium phosphate bibasic 23%, ammonium sulfate 63%, thyamina chlorhidrated 0,2%) exerts a powerful stimulating activity on the yeast reproduction and on its fermentative ability, fact that stimulates/provokes a much more earlier start of fermentation than in the non-added variants and, as a consequence, no matter what type of yeast is used, the fermentation ends much earlier (1-5 days in the case of the variants having L.S.A and 1-6 days in the case of native yeast). The Cellular Walls product, recommended by specialists for the specific property of protecting yeast from the toxic action of certain yeast inhibitors (fat acids with average chain C8, C10, C12) acts, contrary to the other activator (Actibiol), at the end of fermentation, when the conditions from (of) the fermentation environment, characterized by contents full of alcohol, get extremely unfavorable for the survival of yeast. The variants for (in)

Which this activator was used show the highest alcoholic contents and the least regarding residual sugar, a natural consequence Of the fact that

yeast endured better the difficult conditions of the fermentation end in the presence of yeast cellular walls. The fact that the fermentation lasted one more day than for the added variants with Actibiol can be explained by the specific different actions of those two fermentation activators: while the Actibiol product influences/stimulates the development of yeast and an earlier start for fermentation, the cellular walls influence the survival of yeast, provoking the fermentation of the last remainders of sugars according to the alcohol power.

Conclusions

The volatile activity, the parameter that reflects mostly the quality of the material - grapes, the possibilities of vinification and the wine- making hygiene state and finally the quality of wine, can be limited by:

- The using of selected yeasts with higher alcohol power from Saccharomyces Ovivormis (var. Bayanus).
- Sulphur added in legal doses, applied from the first steps of primary wine making.
- Keeping of lower fermentation temperature for white wine making (18-22°C) and a little higher at red wine making (not highs than 29-30°C), but not lower than (25-26°C).
- The using in the most part of "Roto system" at red wine making. The homogeneity of grape juice phases for many times by day when it is using the classic method of red wine making.
- The using of fermentation activators (Actibiol and cells walls) together with selected yeasts for white and red wine making.

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