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INFLUENCE OF *NON-SACCHAROMYCES* YEASTS ON WHITE DRY WINES

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Abstract: It was demonstrated a positive action of the non-Saccharomyces yeasts on the organoleptic properties of wines. Also, their participation in fermentation process did not involve an excessive accumulation of volatile acidity or other taste and aroma defects. The involvement of the non-Saccharomyces yeasts in practical oenology that keeps on recent achievements in oenological biotechnologies allow an increase of aromatic intensity (floral, fruitful etc.) in varietal wines and preserve the varietal identity of obtained wines.

Key words: yeasts, non-Saccharomyces, *Saccharomyces cerevisiae*, alcoholic fermentation, kinetics of alcoholic fermentation, white dry wines.

INTRODUCTION

The last years the *non-Saccharomyces* yeasts have become increasingly studied due to those technological proprieties. Many works refer to those benefic influences on the white dry wines [2, 3, 4, 5, 7].

In view of the above, several *non-Saccharomyces* strains were proposed for co-fermentation process in association with *Saccharomyces cerevisiae*. French Institute of Vine and Wine (Nantes) last ten years were studied the fermentation process, its kinetics and also organoleptic and physico-chemical characteristics of produced wines from Melon B and Sauvignon varieties.

MATERIALS AND METHODS

The research objective supposes the association of non-Saccharomyces yeasts with *Saccharomyces cerevisiae* in sequential seeding to prove the positive changes involved by these strains.

Non-Saccharomyces strains targeted in this study are: *Candida pyralidae*, *Metschnikowia pulcherrima*, *Torulaspora delbrueckii*.

Candida pyralidae is a selected strain that was studied earlier at the French Institute of Vine and Wine (Nantes). It has an oenological interest in enriching wine with aroma. The other two tested strains (*Metschnikowia pulcherrima* and *Torulaspora delbrueckii*) are already recommended to be produced and marketed.

During this study were used three Lots of different varieties and geographical provenience: LOT 1: Melon de Bourgogne, LOT 2 : Sauvignon de Poitou, LOT 3 : Sauvignon de Touraine.

Given the trends of last years of substitution of manual harvest with mechanical, in all three Lots the harvest was performed using the combine and received as marc (Melon B) and must (Sauvignon).

The success of implantation of the strains was verified by performing an implantation control when the density of musts was ranged between 1,020 and 1,030 g/dm³. Biomass analysis was realized by amplification Polymerase Chain Reaction (PCR). The genetic profile of biomass recovered from must, compared with referential strain allow the validation of successful yeast implantation. In order to determine the basic physical and chemical indexes were used recommended a standardized methods proposed by OIV [6].

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RESULTS AND DISCUSSIONS

The analytical composition of every lots is different and especially in assimilable nitrogen. In order to ensure a reliability of alcoholic fermentation, in this study it was proceed to an increase of nitrogen content by using alcoholic fermentation activators „Go Ferm,, and „Fermaid E,, in two halves. Table 1 presents an analytical composition of 3 lots of must.

Table 1: Analytical composition of musts

Indexes	Melon B	Sauvignon de Poitou	Sauvignon de Touraine
Total acidity, g/l H ₂ SO ₄	4.0 (82 me/l)	6.42 (131 me/l)	5.0 (102 me/l)
pH	3.20	3.08	3.17
Assimilated nitrogen, mg/l	66	190	55
Tartric acid, g/l	2.9 (38 me/l)	3.9 (52 me/l)	4.1 (54 me/l)
L-malic acid, g/l	5.7 (85 me/l)	8.8 (131 me/l)	7.0 (104 me/l)
Turbidity, NTU	100	50	110
Potential alcohol concentration, % vol	10.0	10.0	12.0
Carbohydrates concentration, g/l	166	166	195

Analysis results show a fundamental difference in assimilable nitrogen concentration, ranging from 55 to 66 g/l for Touraine Sauvignon and Melon B but up to 190 g/l for Poitou Sauvignon. Also, the total acidity range from 4,0 g/l in Melon B must up to 6,42 g/l in those obtained from Poitou Sauvignon.

Chemical composition of must, as well as the interactions that occur between pairs of strains involved in every fermentative process influence first of all the duration of the fermentation (table 2).

Table 2: Comparative characteristics of fermentative activity of yeasts

Yeasts strains	Melon B			Sauvignon de Poitou			Sauvignon de Touraine		
	Alcoholic Fermentation, days		Residual sugar before sulfite, g/l	Alcoholic Fermentation, days		Residual sugar before sulfite, g/l	Alcoholic Fermentation, days		Residual sugar before sulfite, g/l
	Latency	Duration		Latency	Duration		Latency	Duration	
1	2	3	4	5	6	7	8	9	10
<i>Saccharomyces cerevisiae</i>	1	20	1.8	2	16	2.0	3	10	1.9
<i>Torulaspora delbrueckii</i>	2	28	1.9	2	25	2.5	4	35	2,0
<i>Candida pyralidae</i> 2%	3	20	1.9	2	23	1.9	3	24	1.9
<i>Candida pyralidae</i> 3%	3	20	1.8	2	23	2.0	3	24	1.9
<i>Candida pyralidae</i> 5%	3	20	1.9	2	25	2.5	3	10	2.0
<i>Metschnikowia pulcherrima</i>	3	22	1.9	2	16	1.5	3	10	1.8
<i>Metschnikowia pulcherrima IFV</i>	4	20	1.8	2	11	1.25	3	10	1.5

Table 2 results shows a difference in duration (days) of alcoholic fermentation carried out with *Saccharomyces cerevisiae* strain in 24 hours, while, under the same experimental conditions, this characteristic for *Torulaspora delbrueckii* and *Candida pyralidae* strains was respectively 48 and 72 hours. In terms of the duration of fermentation of must, it is observed only small deviations

for experimented varieties, being higher in Melon B and quasi identical in the two lots of Sauvignon.

Also, the interactions between strains and the fermentation kinetics will alter (figs 1). The curves of each series had a similar shape to that of the reference sample (seeded with *Saccharomyces cerevisiae*), but the using of *non-Saccharomyces* yeasts increase the latency period because of the concurrence between the strains. *Torulaspora delbrueckii* provides a quick beginning of alcoholic fermentation but towards the end the sugar consumption decrease and the fermentation slows compared to the previous steps. This can be seen in all launched lots. *Metschnikowia pulcherrima*, didn't involve fermentation difficulties in any sample, also its competition with *Saccharomyces* is less noticeable. Regarding to *Candida pyralidae* strain, the graphs are quasi identical, showing that the initial number of microorganisms doesn't involve changes in duration and speed of alcoholic fermentation of the musts. The alcoholic fermentation of Lot Nr2 (Poitou Sauvignon) took place in a higher speed than the other two lots but the curves of lot Nr3 (Touraine

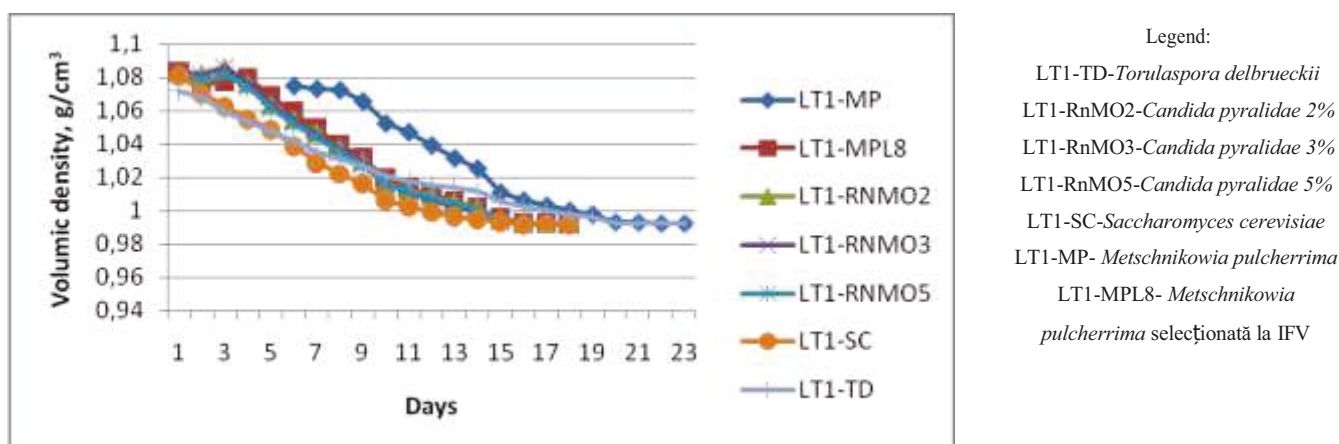


Figure 1: Alcoholic fermentation kinetics of Lot Nr1 (variety Melon B)

Sauvignon) have greater slopes at the beginning, showing that the fermentation speed decrease with the decrease of the content of sugar and increase of the content of alcohol.

A table 3 summarizes the analytical composition of produced wines.

Table 3: Analytical composition of obtained wine from variety Melon B (Lot 1)

Indexes	Melon B						
	<i>Saccharomyces cerevisiae</i>	<i>Torulaspora delbrueckii</i>	<i>Candida pyralidae</i> 2%	<i>Candida pyralidae</i> 3%	<i>Candida pyralidae</i> 5%	<i>Metschnikowia pulcherrima</i>	<i>Metschnikowia pulcherrima</i> IFV
Alcohol concentration , % vol	12.48	12.37	12.43	12.43	12.32	12.79	12.35
Glucose+Fructose, g/l	1.3	0.6	1.2	0.9	1.3	<0.4	1.2
Total acidity (in H ₂ SO ₄), g/l	4.19	4.15	4.02	4.11	4.01	4.10	4.14
Volatile acidity corrected (in H ₂ SO ₄), g/l	0.21	0.51	0.24	0.23	0.23	0.33	0.27
pH IRTF	3.23	3.28	3.25	3.23	3.24	3.24	3.22
L-malic Acid, g/l	5.0	4.1	4.4	4.3	4.5	4.6	4.7
Tartric Acid, g/l	1.4	1.6	1.3	1.4	1.4	1.4	1.5
Total sulfure dioxide (total SO ₂), mg/l	89	24	113	83	107	14	100

According to table 3, the alcoholic fermentation was finished in all samples (residual sugar <2 g/l). Meanwhile, the alcohol by volume of obtained wines do not show much difference, except the lot seeded with *Metschnikowia pulcherrima*, that the analysis may be supposed an error. The total acidity of samples was within normal limits for the product. Despite the existing opinion, the results show that the seeding with non-*Saccharomyces* do not involve a rising of volatile acidity of wines. Although the sample seeded with *Torulaspora delbrueckii* has a higher volatile acidity than other samples of the same series (0,51 g/l), but its value is within the limits allowed for white wines. The activity of non-*Saccharomyces* yeast involved a high consumption of tartaric and malic acids (reducing concentrations with 1,0-1,5 g/l in relation to the initial content of these acids in must).

The sensorial analysis of wines at this stage cannot give the definitive results on the quality of products but provides an objective opinion on the ulterior development of wine during maturation. The samples do not show important organoleptic defects. The intensity of aroma and taste of the products was determined both by yeasts activity and aromatic varietal potential of grapes. Overall, the most appreciated was the Lot 2 (Poitou Sauvignon) because of more pronounced secondary aroma and a balanced taste (figure 2).

The results of organoleptic analysis are listed in figure 2.

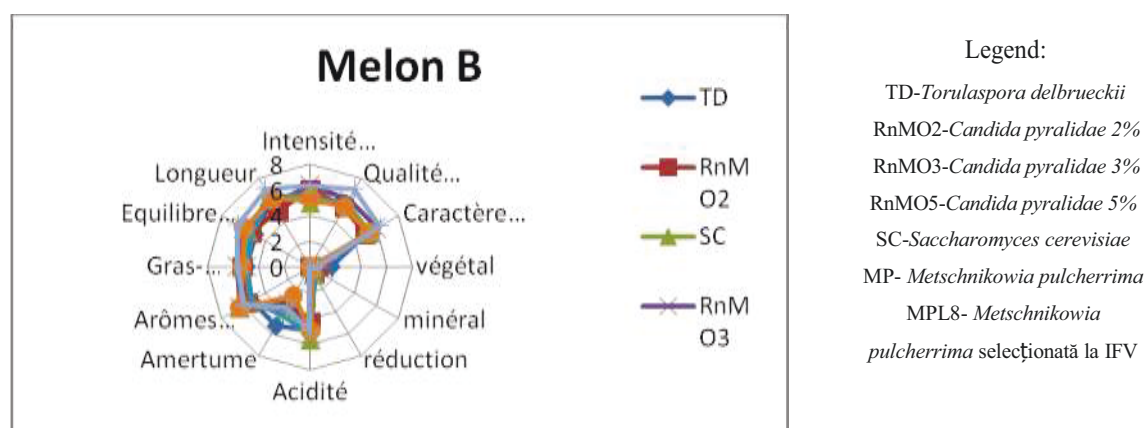


Figure 2: Sensorial analysis of wines (Lot 1)

CONCLUSION

It was demonstrated the positive action of non-*Saccharomyces* yeasts on the organoleptic characteristics of wines. At the same time, their involvement in fermentation process doesn't achieve an excessive volatile acidity and other defects of aroma and taste. The involvement of non-*Saccharomyces* strains in practical oenology that keeps recent achievements in oenological biotechnologies allows an increase of aroma intensity (floral, fruitful etc.) in varietal wines with preservation of varietal aromas and taste in natural dry wines.

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