THE INFLUENCE OF NEW YEAST STRAINS FROM THE INDIGENOUS FLORA OF IAŞI VINEYARD ON THE ALCOHOLIC FERMENTATION PROCESS

INFLUENŢA UNOR NOI SUŞE DE LEVURI IZOLATE DIN FLORA INDIGENĂ A PODGORIEI IAŞI ASUPRA PROCESULUI DE FERMENTAŢIE ALCOOLICĂ

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Abstract. *The variability, the degree of adaptation as well as the wide spread of yeasts in different biotypes enable the isolation of new yeast strains with properties that can influence the fermentative processes, for this reason, the activity of isolating and selecting yeasts strains from the vintage microbiota of Iaşi vineyard imposed as a necessity in the research and production activity. With the purpose of being used in the current biotechnological practice, the Saccharomyces ellipsoideus F1 (200), Saccharomyces ellipsoideus S3(150) and Saccharomyces ellipsoideus C4(100) yeast strains, isolated from the indigenous flora, were tested at industrial level. The monitoring of the alcoholic fermentation involved the registration of the commencement time and the duration of the fermentation stages, as well as the dynamical evolution of the temperature, of the sugar concentration, the alcohol content and the total acidity. The new yeast strains were assessed as valuable biological material, recommendable in vine-growing practice, as they contribute to obtaining high quality wines that reflect the personality and potential of the varieties specific to Iaşi vineyard.*

Key words: yeasts strains, the alcoholic fermentation

Rezumat. *Variabilitatea, gradul de adaptare precum şi larga răspândire a levurilor în diferite biotopuri permit izolarea de noi suşe de levuri cu proprietăţi ce pot influenţa procesele fermentative. Din acest considerent activitatea de izolare şi selecţie a levurilor din microbiota vinicolă a podgoriei Iaşi s-a impus ca o necesitate în activitatea de cercetare şi producţie. În vederea utilizării în practica biotehnologică curentă, suşele Saccharomyces ellipsoideus F1(200), Saccharomyces ellipsoideus S3(150) şi Saccharomyces ellipsoideus C4(100) izolate din flora indigenă au fost testate la nivel industrial. Monitorizarea fermentaţiei alcoolice a presupus înregistrarea momentului declanşării şi durata etapelor de fermentare, precum şi evoluţia în dinamică a temperaturii, a concentraţiei în zaharuri, conţinutul în alcool şi aciditatea totală. Noile suşe de levuri testate au fost apreciate ca fiind un material biologic valoros, recomandabil în practica vinicolă, acestea contribuind la obţinerea unor vinuri de calitate ce reflectă personalitatea şi potenţialul soiurilor specifice podgoriei Iaşi.*

Cuvinte cheie: suşe de levuri, fermentatie alcoolică

INTRODUCTION

In the technology of wines production, the yeast used in the fermentation process contribute to the formation or, on the contrary, to the decrease of the wine

quality and structure characteristics. At present, because of the necessity to increase the wines quality, the selection of some yeasts that should insure, through a controlled fermentation, the obtaining of wines typical to the vine-growing region, with a more marked character of naturalness, unique as variety and personality (A. Popa et al., 2006).

The alcoholic fermentation of the mash is a complex process to which a great number of types and species of yeasts contribute (Christine Le Jeaune, et. al., 2006). The possible structure or organoleptic faults because of the fermentation in improper conditions is very difficult to correct, if ever, during the subsequent stages of evolution, negatively influencing the quality and the stability of the final wine (C.B. Câmpeanu, 2003).

MATERIAL AND METHOD

In order to optimize the alcoholic fermentation process by using some of yeast strains selected from the indigenous flora, the *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) yeast strains have been tested at an industrial level.

The mash fermentation was made in 1000 litres tanks and the following basic conditions have been provided so that the alcoholic fermentation should take place properly: the used mash was cleared, clarified and sulphated in order to eliminate the spontaneous microbiota from the mash; the selected yeasts have been introduced in tanks in quantities that should guarantee from the beginning the optimal density of yeast cells/mL, necessary for the process of fermentation and the fermentation took place at 17 - 18°C.

When monitoring the fermentation process, there were registered the moment of starting and the duration (hours/days) of the fermentation stages, the tumultuous fermentation, the calm fermentation as well as in the dynamics of the main parameters: temperature (t°C), sugar concentration (g/L), alcohol content (% vol.) and total acidity (g/L $C_4H_6O_6$). At the end of the process, the conditioned wines were analysed from a physicochemical and organoleptic point of view

RESULTS AND DISCUSSIONS

The *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) yeast strains, considered to be successful in the production of quality white wines (Ancuţa Vasile, 2009), have been verified on the musts obtained from the varieties Fetească albă, Sauvignon blanc and Chardonnay whose physical - chemical characteristics are presented in table 1.

Table 1

The physical-chemical characteristics of the musts used for experiments

The musts used	Sugars, g/L	Total acidity, $C_4H_6O_6$ g/L.	pH
Must of grape variety Fetească albă	197	7,7	3,38
Must of grape variety Sauvignon blanc	203	8,7	3,36
Must of grape variety Chardonnay	211	8,5	3,36

We have to mention that for every must lot, a witness was provided for which we used as fermentation agent a commercial compound usually used in the technology of white wine production.

The data obtained when monitoring the fermentation processes carried out with the three yeast strains are graphically presented in figures 1, 2 and 3.

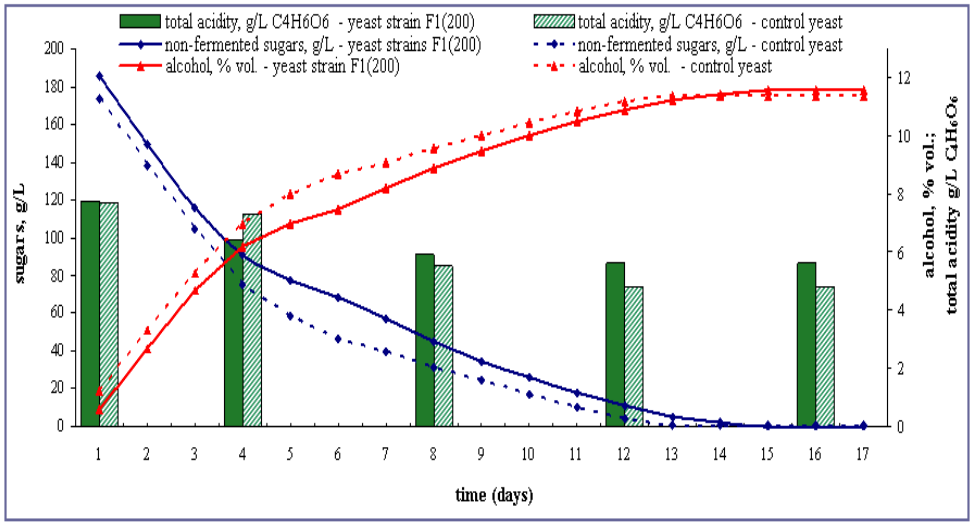

Fig 1. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the *Saccharomyces ellipsoideus* F1(200) yeast strain in comparison with the control yeast.

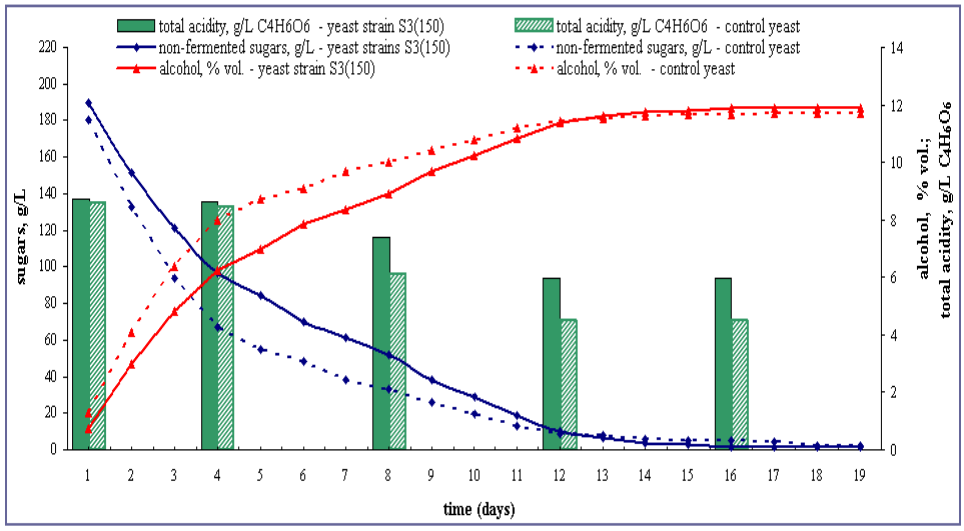

Fig 2. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the Saccharomyces ellipsoideus S3(150) yeast strain in comparison with the control yeast.

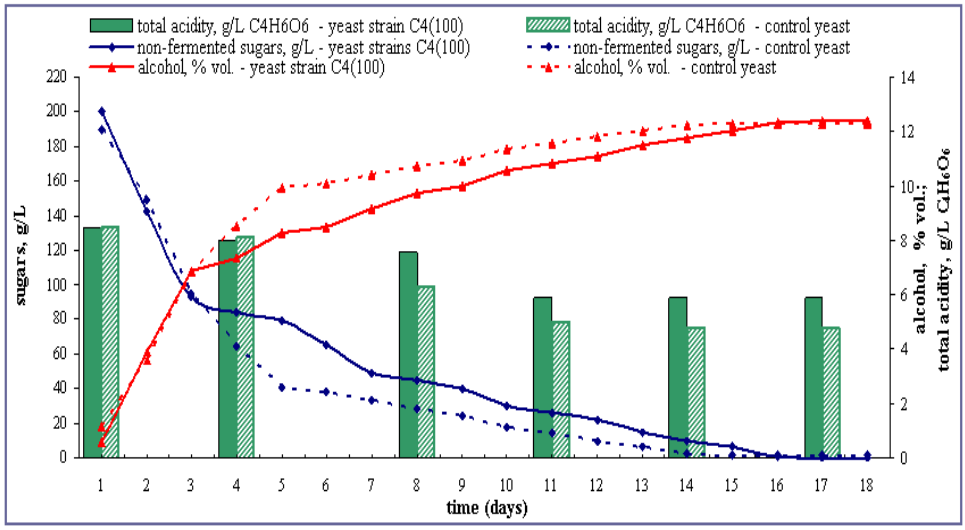

Fig 3. The dynamic of the physical-chemical parameters during the alcoholic fermentation process made by the *Saccharomyces ellipsoideus* C4(100) yeast strain in comparison with the control yeast.

After testing the oenological value at an industrial level of the new selected yeast strains *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150), *Saccharomyces ellipsoideus* C4(100), we established that they may be appreciated as biologic material useful for the wine-making practice in the production of quality dry white wines technology.

The data obtained when monitoring of the fermentation processes point out the following aspects:

- the yeast strains *Saccharomyces ellipsoideus* F1(200) and *Saccharomyces ellipsoideus* S3(150) fitted in category of yeasts with a minimal degree of foaming in the first 24 hours from the beginning of the pre-fermentation stage (after this interval, the fermentation advances without foaming) and the yeast strain C4 (200) fitted in the category of non-foaming yeasts. From the perspective of this characteristic, the tested yeast strains are valuable because they offer the possibility to use the fermentation space in full capacity.
- the new selected yeast strains started the alcoholic fermentation after 18-20 hours from the introduction of the leavens in the must. In this stage the musts grew turbid, and at the microscope we can notice a great number of yeasts in an intense process of burgeoning, and the must temperature grew slowly with approximately 1°C. The relative small duration of the pre-fermentation period is an advantage of the alcoholic fermentation process, always being preferred the yeast strains that show this characteristic. In dynamic, the evolution of the alcoholic concentration curve emphasizes a more intense activity of sugar metabolisation in the tanks considered as witness, where a commercial compound was used as

a fermentation agent. For example, after 48 hours, the yeast strain *Saccharomyces ellipsoideus* S3(150) accomplished 3,1 % vol. alcohol and the witness yeasts 4,1 % vol. alcohol (figure 2);

- the tumultuous fermentation stage started after 48 hours and continued for 8-10 days, when the must temperature increased gradually, because of the increase of the metabolic activity concomitantly with the increase of the yeasts number. In this stage, the temperature was verified in the fermentation devices twice a day, intervening to maintain it between 16 - 18°C. In the case of the three tested yeast strains, we noticed an average metabolisation of sugars, which led to eventually obtaining some wines with special sensory characteristics;
- in the tanks with the new selected yeast strains, the clarifying process started quickly at the end of the tumultuous stage, obtaining after 10 days relatively clear or lightly opalescent wines and the yeast deposit formed after the first racking was compact, hardly removable.

At the end of fermentation, dry wines were obtained, with an alcoholic strength between 11,6 and 12,4 % vol. alcohol (table 2), depending on the initial concentration of sugars from the substratum, which proves that the new tested yeast strains are alcoligene, being capable to metabolise almost completely the sugars from the fermentation medium.

Another important oenological characteristic is the capacity of the tested yeast strains to ferment the musts sulphated with different concentrations of sulphur dioxide, of even 200 mg/L SO_2 (Vasile Ancuţa et al, 2009).

As a result of determining the main structure characteristics, it follows that the wines made by the new selected yeast strains from the indigenous flora of the Iassy vine-growing region show balanced concentration of the physicochemical characteristics (table 2).

Table 2

The main composition characteristics of the wines obtained by using new yeast strain testing in comparison with the control yeast

Physical parameters - chemical and organoleptic	Fetească albă		Sauvignon blanc		Chardonnay	
	control yeast	F1(200)	control yeast	S3(150)	control yeast	C4(100)
Alcohol, % vol.	11,0	11,6	11,7	11,9	12,3	12,4
Non-fermented sugars, g/L	3,4	0,2	1,7	0,9	1,8	-
Glycerol, g/L	5,1	7,4	5,0	7,4	5,1	7,3
Non-reducer extract, g/L	17,2	21, 4	17,8	22, 4	17,8	22, 6
Total acidity, g/L $C_4H_6O_6$	4,8	5,6	4,8	5,95	4,5	5,9
Volatile acidity, g/L CH_3COOH	0,71	0,28	0,8	0,20	0,78	0,29
Tartaric acid, g/L	2,0	2,1	2,1	2,1	2,1	2,1
Citric acid, g/L	0,31	0,34	0,30	0,31	0,34	0,38
Malic acid, g/L	5,8	6,0	6,0	5,5	5,9	6,1
Polyphenols, g/L	0,41	0,43	0,40	0,42	0,40	0,44
Organoleptic assessment, 0 - 20	17,8	19,8	17,9	19,7	18,0	20,0

The tested yeast strains are considered valuable for obtaining quality dry white wines, these ones satisfy more conditions, which are: superior alcohol level, low volatile acidity, superior sugars-alcohol efficiency etc.

The organoleptic appreciation of the analysed wines emphasized their very good quality, materialized in marks from 19.7 to 20. All the wines presented a discreet, fine, specific flavour, being fruitfully well harmonized with the other components.

All these data offer a complete image of the oenologic value of the new yeast strains, as well as their practical importance in the dry white wines production technology.

Taking into account the results, we recommend the carrying on of the research in order to go deeply into the aspects concerning the importance of the yeast strains origin, into defining the characteristics regarding the wines authenticity and specificity.

CONCLUSIONS

1. The verification at the industrial level, because of the fermentation and technological characteristics, allowed the appreciation of the new selected yeasts strains *Saccharomyces ellipsoideus* F1(200), *Saccharomyces ellipsoideus* S3(150) and *Saccharomyces ellipsoideus* C4(100) as valuable biologic material, recommendable for the vine-growing practice.

2. Using the new selected yeasts strains in the alcoholic fermentation process al the industrial level has the following advantages: increased efficiency of the process by using at full capacity the fermentation spaces, total transformation of sugars, rapid conditioning (clearing, separation from the deposit) and increasing the specificity degree of the Iassy vine-growing region wines, contributing to their fame on the domestic and external market.

3. The oenologic value of the new selected yeasts strains allows their recommendation in the white dry wines production technology in Iassy vine-growing region, these ones contributing to obtaining quality wines which reflect the personality and the potentiality of the varieties specific to the region.

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