TESTING NEW GRANULAR YEAST STRAINS IN SECONDARY FERMENTATION BOTTLES FOR OBTAINING SPARKLING WINES

TESTAREA UNOR SUŞE NOI DE LEVURI GRANULARE ÎN FERMENTAŢIA ADOUA ÎN BUTELII PENTRU OBŢINEREA VINURILOR SPUMANTE

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Abstract. *During the secondary fermentation in bottles six granular yeast strains were tested which were isolated from Iaşi vineyard –Copou wine center. The aim of the study was to select the yeast strains with most suitable fermentation features for making high-quality wines. To achieve this objective, the same dosage was used in the trial, the variable parameter being only the biological agent, respectively leavens obtained from the tested yeast strains. After mixing the dosage (raw wine, yeasts, liqueur de tirage) we carried out physical-chemical tests and the information obtained was used for the dynamic survey of changes occurring in the secondary fermentation in bottles. Based on the dynamic results of some physical – chemical parameters and of the organoleptic features of sparkling wines made, we drew the conclusion that from the six tested yeasts, four may be considered suitable for making sparkling wines.*

Key words: sparkling wine, secundary fermentation, yeasts

Rezumat. *În fermentaţia a doua în butelii au fost testate şase suşe de levuri granulare noi izolate din podgoria Iaşi – centrul viticol Copou. Scopul lucrării a fost de a selecta din acest lot suşele de levuri cu proprietăţi fermentative optime în procesul de obţinere a vinurilor spumante de calitate. Pentru realizarea acestui obiectiv, în experiment s-a folosit acelaşi amestec de tiraj, parametrul variabil fiind doar agentul biologic, respectiv maielele obţinute din suşele de levuri testate. După omogenizarea amestecului de tiraj (vin materie primă, levuri, licoarea de tiraj) s-au efectuat analizele fizico – chimice, datele obţinute fiind utilizate pentru urmărirea în dinamică a modificărilor survenite în timpul celei de a doua fermentaţii în butelii. Pe baza rezultatelor în dinamică a unor parametri fizico-chimice şi a caracterizării organoleptice a vinurilor spumante obţinute, s-a constatat că din cele şase suşe de levuri testate, patru pot fi considerate performante în tehnologia de obţinere a vinurilor spumante.*

Cuvinte cheie: vin spumant, fermentatia a doua, suşe levuri

INTRODUCTION

Two categories of yeasts are involved in the technology of making sparkling wines, namely yeast strains with fermentation features for making the

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basic wine and the yeasts triggering the second alcoholic fermentation in high pressure bottles and stainless steel bottles.

The significant role of yeasts used in the second alcoholic fermentation is highlighted in many papers which approached various study directions. Thus, Roşu Cornelia et.al. (1997) studied the influence of yeast strains on the volatile complex. The correlation between the autolytic capacity of yeast strains and the quality of sparkling wines has been studied by authors Todd B.E.N. et.al.(2000), Martinez-Rodrigue A. et al.(2002), Cebollero E. (2005, 2006). Information on the modality of using yeast strains (free cells or immobilized preparations) is found in the papers of Cotea V.V. (2005), Tiţa O.I. (2005) and Ţârdea C. (2010). In addition to these study directions it is necessary to pursue the activity of isolating new yeast strains for obtaining quality sparkling wines.

In this paper we studied, under the conditions of second fermentation in bottles, six new yeast strains isolated from the plantations of Copou Viticulture Center, Iaşi, which were given the following codes: MNF4, MNF8, MNF11, MNF9, MNC9 and MNC12

The objective of the study was the selection of yeast strains with the best fermentation characteristics for making high quality sparkling wines. After analyzing the results regarding the behavior of yeast strains in the second alcoholic fermentation at high pressure and high alcohol content, we selected from the entire lot of yeasts the strains MNF4, MNF8, MNF11 and MNF9, which determined the making of dry sparkling wines, appreciated from organoleptic point of view.

MATERIAL AND METHOD

In the trials conducted we created approximately identical conditions for testing the six yeast strains. Therefore, for the preparation of the blended wine we used the same wine as raw material and the same dosage of liqueur. The variable constituent of the blended wine was the yeast obtained from the tested strains. The blended wines were analyzed from physical-chemical point of view, determining by OIV methods the alcohol (vol %), sugars (g/L), total acidity (g sulfuric acid /L), volatile acidity (g acetic acid /L), SO_2 free (mg/L), SO_2 total (mg/L) and pH.

The blends were poured into 150 bottles grouped into six lots, with 25 bottles for each yeast strain tested. For practical reasons, a control aphrometer was attached to one bottle from each lot, to measure the inside pressure every three days. Moreover, at the same time interval, a bottle was taken out from the trial in order to make chemical determinations regarding sugar consumption. At the end of the trial the sparkling wines obtained were analyzed from organoleptic and physical-chemical point of view

RESULTS AND DISCUSSIONS

The selection of the best yeast strains for sparkling wine making is a difficult process which involves a progressive selection according to their fermentation features. After the preliminary tests which allowed the selection of yeasts which are non-foaming, alcoholigenic, nonadhesive to the walls of the

bottles and which make compact, stable or granular deposits, a new testing stage was necessary, in particular the assessment of their ability to trigger and finish alcoholic fermentation in the bottles, in conditions of pressure and high alcohol content.

For the trials we used a raw material wine whose physical-chemical features are shown in table 1.

Table 1

Physical –chemical features of the raw material wine

Variety	Alcohol (vol %)	Total acidity (g/L H2SO4)	Volatile acidity (g/L CH_3COOH)	SO_2 free (mg/L)	total SO_2 (mg/L)	pH
Fetească regală	10,6	4,5	0,32	26	78	3,41

The blends which were obtained from the same amount of wine – raw material, liqueur and yeasts had a slightly different chemical composition. This aspect is suggested by the data shown in table 2.

Table 2

Physical –chemical features of blends

No.	Yeast strain	Alcohol (vol %)	Sugars (g/L)	Total acidity (g/L H_2SO4)	Volatile acidity (g/L CH_3COOH)	SO_2 free (mg/L)	SO_2 total (mg/L)	pH
1	MNF4	10,4	24	5,2	0,30	25	76	3,30
2	MNF8	10,3	24	5,1	0,29	24	73	3,22
3	MNF11	10,4	24	5,2	0,30	25	75	3,35
4	MNF9	10,4	24	5,2	0,30	23	72	3,30
5	MNC9	10,3	24	5,2	0,30	24	74	3,30
6	MNC12	10,4	24	5,1	0,30	23	75	3,32

After the distribution of blended mixes and the performance of corking and capping, the bottles were stored in a special room at 16-18 °C.

Since the third day of the trial we monitored the accumulation of carbon dioxide in bottles, tracking the pressure by means of aphrometers, and sugar consumption was determined through chemical analysis.

In the graphical representation of data, in figures 1 - 6, we noticed that four yeast strains tested, namely MNF4, MNF8, MNF11 and MNF9, had a similar behavior in the second fermentation in bottles.

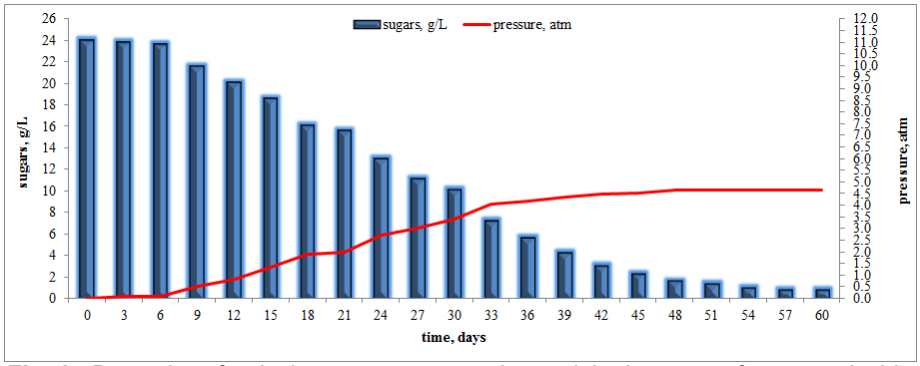

Fig. 1 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF4 yeast strain

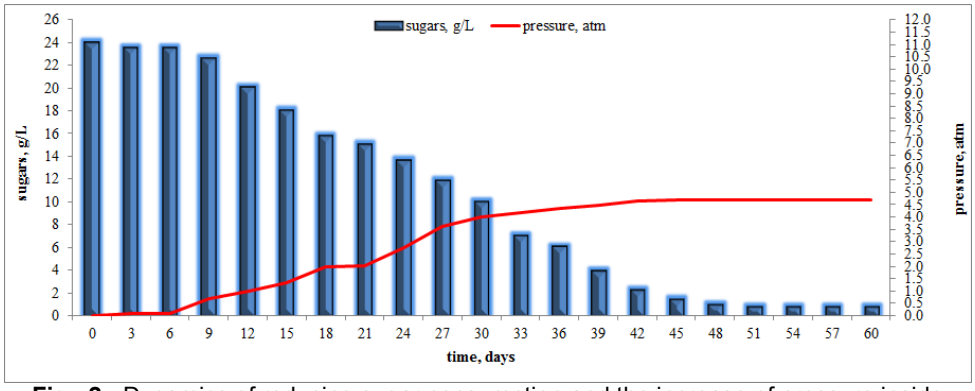

Fig. 2 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF8 yeast strain

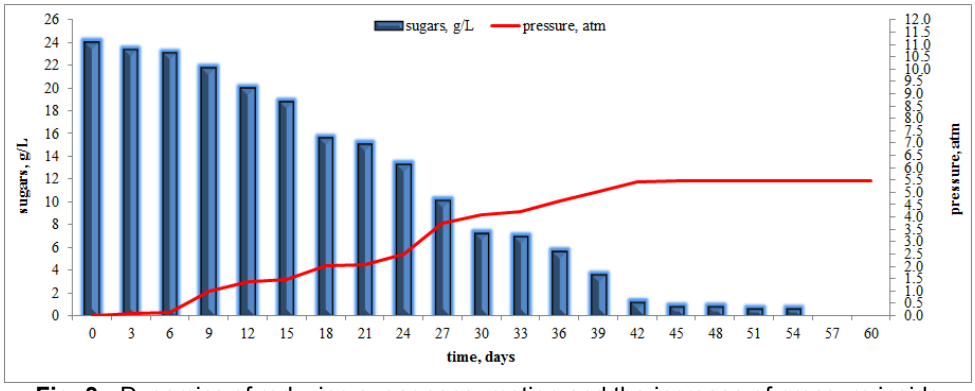

Fig. 3 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF11 yeast strain

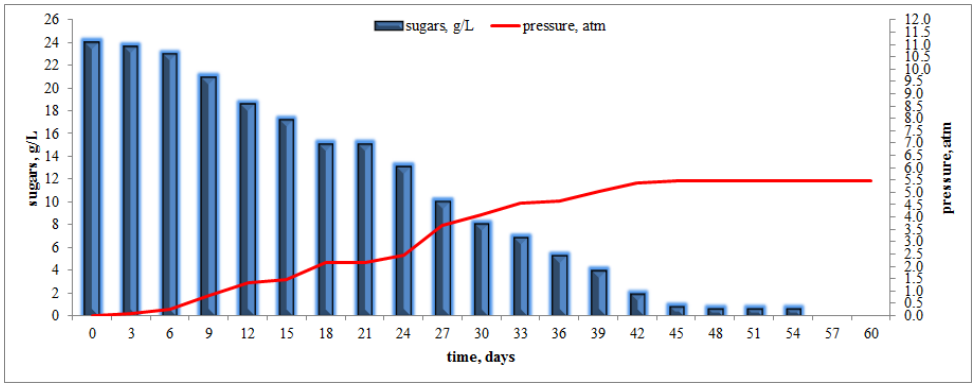

Fig. 4 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF9 yeast strain

Pressure growth was noticeable after 6 days, the maximum pressure inside bottles varying according to the yeast strain. Therefore, values of 4.65 bar and 4.70 bar were recorded after 45 and respectively 48 days in the case of MNF4, MNF8 strains and 5.45 bar after 42 and respectively 45 days, for MNF11 and MNF9 strains. Knowing maximum pressure inside bottles and the number of days

to reach that level, we were able to calculate the average value of daily pressure increase inside bottles for each yeast strain tested. Thus, the highest daily average values of the pressure were recorded during the second fermentation of MNF11 and MNF9 yeast strain, in particular 0.151 bar respectively 0.139 bar. These values corresponded to the values of the average daily consumption of reducing sugars namely of 0.63 and 0.59 g/L. MNF4 and MNF8 yeast strains had a lower value of the average daily pressure growth inside bottles that is 0.110 bar and 0. 120 bar, also in accordance with the average daily consumption of reducing sugars namely of 0.53 and 0.55 g/L.

At the end of the alcoholic fermentation, the four yeast strains made dry sparkling wines whose volatile acidity did not grow according to the blended wine, the alcohol content ranging between 11.5 and 11.6% vol. Moreover, the lees resulted after the alcoholic fermentation in bottles had a granular aspect being extremely stable during bottle transportation in the pre-disgorging stage or during their handling for disgorging. For these reasons we selected these yeast strains for making sparkling wines.

MNC9 and MNC12 yeast strains, figures 5 and 6, triggered second fermentation in bottles after 15 days.

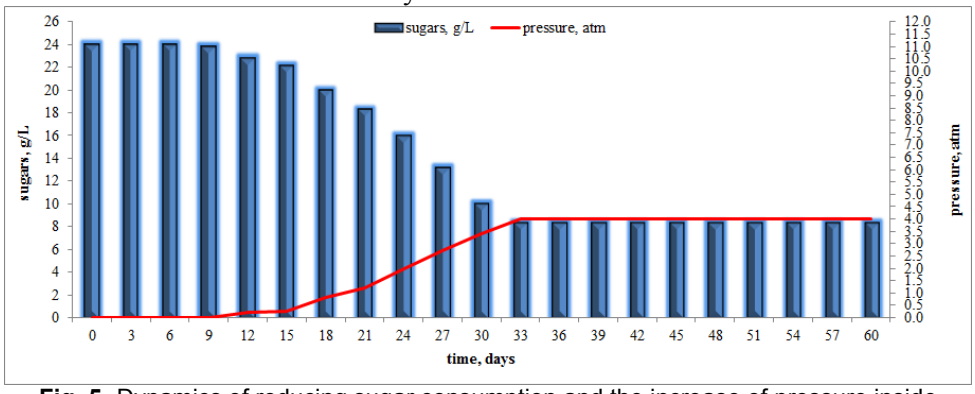

Fig. 5 -Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNC9 yeast strain

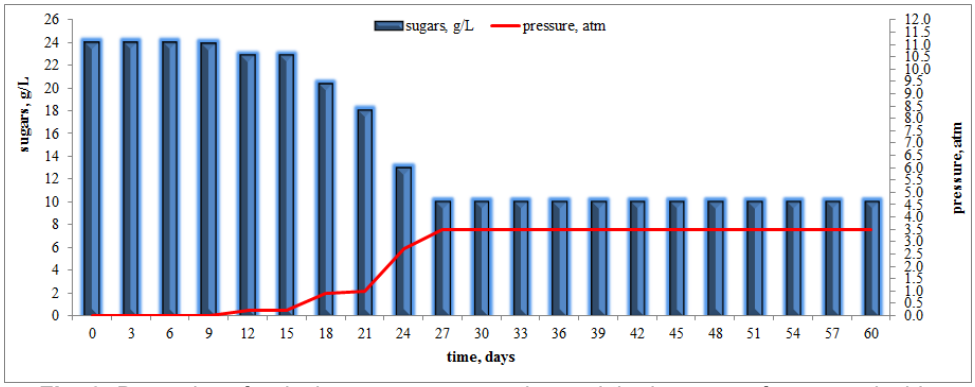

Fig. 6 -Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNC12 yeast strain

Pressure was determined since the 18th days of the alcoholic fermentation start. Both yeast strains did reach the end of second fermentation in bottles, coming to a halt when they reached pressures of 4.0 bar and 3.5 bar respectively.

The four strains selected namely MNF4, MNF8, MNF11 and MNF9 shall be studied in trials on variants of blended wines using different wines as raw material. We shall also test the capacity of these strains to trigger and finish the second fermentation in bottles at a temperature of 10-12°C.

The further study of the four selected strains is justified by the organoleptic features of sparkling wines obtained as well as by the fineness of bubbles accompanied by a longer length of the perlage.

The results obtained after these trials shall finally allow us to name new high quality yeast strains for the technology of sparkling wine making.

CONCLUSIONS

1. The data presented point out the fact that MNF4, MNF8, MNF11 and MNF9 yeast strains are able to make alcoholic fermentation at high pressure and with high alcohol content, making in the end dry sparkling wine.

2. MNC9 and MNC12 strains proved not to be able to finish alcoholic fermentation at high pressure, even though in the preliminary selection test they showed fermentative features favoring second fermentation in bottles.

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