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OENOLOGICAL CHARACTERISTICS OF SALTAÑA WINE YEASTS

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Abstract: The oenological study of indigenous wine yeasts is of importance for the selection of possible winemaking starters. It is necessary to identify enological characteristics useful at the industrial level in the winery, such as fermentation power, fermentation speed, killer activity, development at different temperatures, growth in increasing amounts of alcohol and sulfur dioxide. The selected yeasts were isolated from *Malbec* and *Cabernet Sauvignon* grapes from Cafayate, Salta; identified according to Yarrow's (1998) taxonomic techniques as *Sacharomyces cerevisiae* and confirmed by molecular taxonomy. The killer phenotype of the isolated strains was evaluated by the method of Sommers and Bevan (1969), measuring the inhibition and death halos of the sensitive strain NCYC 1006. The fermentative power of the killer strains was determined according to the Delfini-Ciolfi (1979) technique by the production of carbon dioxide by daily weighing, evaluating the % alcohol by volume and the fermentation speed, selecting the yeasts that have high ethanol yield and better fermentation speed. The results indicate that the strains isolated from *Malbec* and *Cabernet Sauvignon* grapes with the best killer characteristics, determined by the inhibition and death halos of the sensitive strain NCYC 1006 of 4.8 and 3.22 mm, respectively, registered the highest values of 86.8 and 84.4 g/L of carbon dioxide produced, with growth rates 1.5 times the total rate, adequate for a winemaking process.
Keywords: starter, vinification, yeasts.

INTRODUCTION

The oenological study of indigenous wine yeasts is of importance for the selection of possible winemaking starters. It is necessary to identify enological characteristics useful at the industrial level in the winery, such as fermentative power, fermentation speed, killer activity, development at different temperatures, growth in increasing amounts of alcohol and sulfur dioxide.

In this work, autochthonous yeasts isolated from *Malbec* and *Cabernet Sauvignon* grapes from Cafayate, Salta, are studied. They are identified by traditional taxonomic techniques and confirmed by molecular analysis, analyzing the killer characteristics, fermentative power and fermentation rate of the isolated yeasts.

MATERIALS AND METHODS

The yeasts isolated from *Malbec* and *Cabernet Sauvignon* grapes from the Cafayate area in Salta were identified according to Yarrow's (1998) taxonomic techniques as *Sacharomyces cerevisiae* and confirmed by molecular taxonomy.

The killer phenotype was evaluated by the method of Sommers and Bevan (1969) of the isolated strains by measuring the inhibition and death halos of the sensitive strain NCYC 1006.

The fermentative power of the killer strains was determined according to the Delfini--Ciolfi technique (1979) by the production of carbon dioxide by daily weighing, evaluating the % alcohol by volume and the fermentation rate.

RESULTS

The isolation of the yeast strains was carried out after activation to obtain biomass used in the seeding of the trials, obtaining 11 yeast strains in *Malbec* grapes and 37 strains in *Cabernet Sauvignon*, after which their morphological and culture characteristics were evaluated.

The isolated yeasts were identified as genus *Sacharomyces*, with characteristics of the species *cerevisiae*, since they presented globose or ellipsoid cells 3-10 µ wide and 4-21 µ long, the growth in malt extract sometimes forms pseudomycelium, the ascospores are smooth with 1-4 spores per ascus, nitrates were not assimilated, this taxonomic identification was confirmed by molecular techniques. The characteristics of fermentation and assimilation of carbon compounds are given in Table 1.

Sacharomyces cerevisiae	Fermentation						Assimilation of carbon sources														
	Glucose	Galactose	Saccharose	Maltose	Raffinose	Lactose	Galactose	Saccharose Sucrose	Maltose	Lactose	Raffinose	Celobiose	Trehalose	L-arabinose	D-ribose	L-rhamnose	Erythritol	D-mannitol	Succinic acid	Citric acid	Inositol
	+	v	v	v	v	-	v	v	v	-	v	-	v	-	-	-	-	v	-	-	-

Table 1. Fermentation and assimilation test of carbon sources
(+) positive, (-) negative, (v) variable

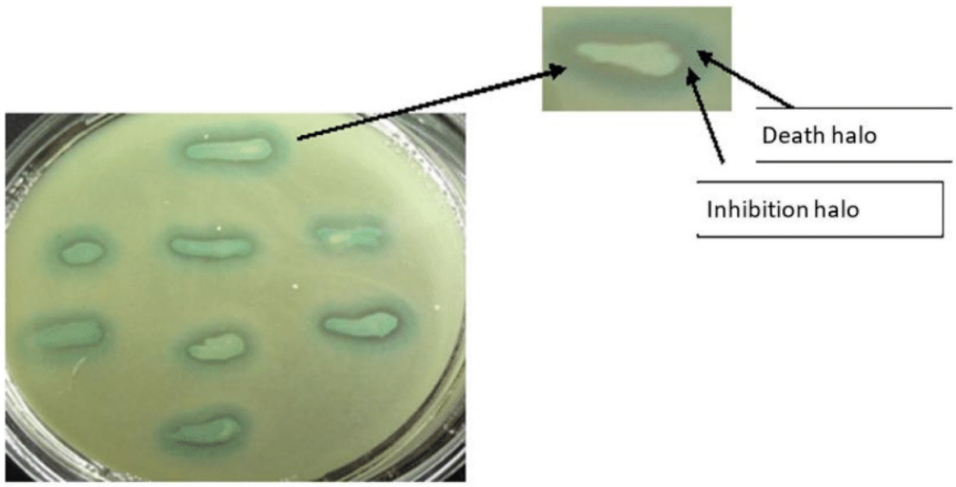

Fig. 1 Yeast strains with phenotype kyller

Yeasts	Killer phenotype (mm)	PF g/L	Ethanol % v/v	VF g/L/day	Remains sugar (g/L)
1	3,5±0,01 [a]	78,0±0,9 [a]	9,75±0,1 [a]	1,50±0,03 [a]	2,84±0,02 [a]
2	3,8±0,01 [b]	82,38±0,9 [b]	10,29±0,9 [b]	1,47±0,02 [a]	3,94±0,01 [b]
3	4,8±0,01 [d]	86,8±0,98 [c]	10,85±0,9 [c]	1,85±0,10 [b]	3,48±0,01 [c]
4	4,2±0,01 [c]	80,1±0,9 [a]	10,01±0,9 [a]	1,77±0,01 [c]	3,2±0,01 [c]
5	3,22±0,01 [a]	84,4±0,96 [b]	10,55±0,7 [a]	1,85±0,08 [b]	3,4±0,01 [c]
6	3,20±0,01 [a]	----------	----------	----------	-------
7	3,20±0,01 [a]	79,8±0,8 [a]	9,97±0,8 [a]	1,61±0,04 [d]	3,35±0,01 [c]

Table 3. Fermentative Power (PF), Fermentative velocity (VF), production ethanol and remains sugars of fermentation

Different letters per column indicate significant differences evaluated by Tukey's test ($p \leq 0.05$).

The killer factor was analyzed in the 48 yeast isolates from *Malbec* and *Cabernet Sauvignon* grapes, determining the development of the inhibition halo that ranged from 1.5 to 4.8 ± 0.05 mm; and cell death of the sensitive strain NCYC 1006, with a halo of 1 mm; by the action of the killer toxin of the isolated strains, after incubation at 25ºC for 72 hours, as shown in Figure 1.

The maximum inhibition halo values were 4.8, 3.9 and 3.8± 0.05 mm for yeasts isolated from *Malbec* grapes, higher than those of the killer control strain ATCC 36900 of 3.25 mm, as shown in Table 2. The remaining yeasts isolated from *Cabernet Sauvignon* recorded inhibition halos of less than 1.5 to 3.2 ± 0.05 mm, three strains being neutral and two sensitive to the control killer strain.

Malbec	*Cabernet Sauvignon* (city area)	*Cabernet Sauvignon* (field area)	
		Samples 1-11	Samples 12-22
2,8	2,7	1,75	1,9
23,5	2,8	3,2	2,5
2,0	2,7	3,2	2,1
1,8	2,7	3,1	2,0
3,8	2,8	3,1	1,5
1,9	2,9	3,2	2,8
3,1	2,9	3,1	2,9
4,8	2,5	1,8	1,5
3,1	2,9	1,5	1,8
3,25	2,4	3,1	1,8
3,9		2,9	1,8

Table 2. Inhibition halos of yeast strains with killer phenotype (± 0.05 mm)

The yeasts with maximum inhibition values greater than or equal to those of the 3.2 mm killer control strain ATCC 36900 were selected; four strains (1-4) isolated from *Malbec* grapes and three (5-7) strains from *Cabernet Sauvignon*, identified as *Saccharomyces cerevisiae*, were chosen according to the taxonomic characterization studies.

The fermentative power was evaluated in six of the seven yeast strains selected, since strain 6 did not ferment, registering values between 78 to 86.8 g/L of carbon dioxide with alcoholic production between 9.75 to 10.85 °v/v, as shown in Table 3.

The best enological parameters with 86.8 and 84.4 g/L of carbon dioxide and alcohol yields of 10.85 and 10.55 °v/v; These were recorded for the strains isolated from *Malbec* (strain 3) and *Cabernet Sauvignon* (strain 5) grapes, which presented inhibition and death halos of the sensitive strain NCYC 1006 of 4.8 and 3.22 mm, respectively, with higher ethanol production in the growth phase up to 10 days, and then remained constant at 20 days with fermentation rates of 1.85 g/L/day, adequate for a winemaking process.

CONCLUSIONS

Two strains isolated from *Malbec* and *Cabernet Sauvignon* grapes were found with better killer characteristics, determined by the inhibition and death halos of the sensitive strain NCYC 1006 of 4.8 and 3.22 mm, respectively, which recorded the highest values of 86.8 and 84.4 g/L of carbon dioxide produced, with growth rates 1.5 times the total rate, suitable for a winemaking process.

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