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THE INFLUENCE OF TEMPERATURE ON THE FERMENTATIVE INTENSITY OF MUST OF GRAPES BY THE UTILIZATION OF SOME YEAST STRAINS ISOLATED FROM THE "DEALURILE BUJORULUI" VINEYARD

A. CIUBUCĂ*, OCTĂVIŢA AILIESEI**

Key words: yeasts, temperature, fermentation

Abstract: The study discusses the behaviour of some yeast strains, isolated from the "Dealurile Bujorului" vineyard, in processes of alcoholic fermentation, at various temperatures.

Introduction

As generally known, temperature represents, one of the physical factors essential for the organisms' existence, being manifested within two limits - a maximum and a minimum one - between which the optimum is situated.

Studies on the thermoresistance of microorganisms, in general, and of yeasts, especially, have been performed by Meyer (1979), Barillave (1982) and Borek (1959).

The must of grapes' fermentation temperature is of special importance in assuring wine's fineness, freshness and quality as, according to Bisson (1980), Butănescu (1968) and Liaguno (1979); lowering of this parameter limits drawing away of the aromatic substances.

Starting from these observations, the authors of the present study followed the behaviour of some yeast strains - isolated from the "Dealurile Bujorului" vineyard, in the process of alcoholic fermentation at various temperature values.

Material and method

The fermentative intensity of 5 species belonging to the ***Saccharomyces*** genus - containing 18 yeast strains - has been tested as a function of temperature.

The must of wines was distributed in low capacity fermentation vessels, equiped with rubber corks. The corks were pricked by syringe needles, thus substituting the fermentation valves. The must was then subjected to a new sterilization, for 20 minute, at 0,8 atm, being inoculated, after its cooling, with a drop of yeast inoculum from the

*The "Dealurile Bujorului" Wine Growing and Wine-Making Research Station
**The "Al.I. Cuza" University of Iassy - Laboratory of General Microbiology

strains considered for analysis. In the beginning, the vessels have been weighed on an analytical balance - for tare's determination, another weighing following after the must's and the inoculum's distribution, the amount of must the vials contained being thus established.

The inoculated vials were divided into 4 batches and thermostated at 4 different temperatures - i. e., 4°C, 13°C, 25°C and, respectively, 35°C - for two weeks.

Over this time interval, analytical weighings have been performed daily, for establishing the weight losses produced as a result of CO_2 releasing (a natural phenomenon in processes of fermentation).

Fermentative intensity was calculated as percents.

Results and discussion

A permanently-controlled following of the fermentative process evidenced the thermal threshold around which the fermentative optimum of the yeast strains utilized in the experiments was settled.

Development of the fermentative process-followed on the two strains of the ***Saccharomyces cerevisiae*** species (Fig. 1) - occurs within a progressive thermal evolution from 4°C to 25°C, an appreciable decrease of temperature being recorded at 35°C. Comparatively, the ***Saccharomyces cerevisiae*** strain 174 is seen as more active - comparatively with strain 326 - in all temperature steps.

If the fermentation curves of the two strains were situated at quite close parameters - at temperatures of 4°C, 25°, 35°C - but at 13°C strain 174 evidenced significant differences, which placed it - in the end of determinations - almost to the maximum level attained at 25°C. This demonstrates that the fermentative optimum of strain 174 is slightly over 13°C and below 25°C, which recommends it for further tests - applied for the obtention of high-quality wines.

The temperature of 35°C was found as very active in the first 5 days of fermentation, the maximum threshold of 7,5-8% released CO_2 being attained, and remaining at the same constant value along the following 10 days. The logarithmic increase of the CO_2 released over a very short time interval probably induces an energetic elimination - manifested in a caloric form - which, correlated with the high threshold of the environmental's temperature, may repress certain enzymatic systems responsible for the processes of alcoholic fermentation.

Strains of the ***Saccharomyces ellipsoideus*** species (Fig. 2) manifest a weak fermentative intensity at 4°C, strain 181 excepted; it shows an appreciable fermentative activity starting with the 5th day, in the end of the 2 week period exceeding the same strain at 35°C, the value recorded being of 5,5% released CO_2. This demonstrates that the optimum temperature is higher than 4°C and much lower than 35°C. The optimum

fermentation temperature was slightly over 13°C, a value of 9,5% released CO_2 being attained the curve's slope being progressive, however without a logarithmic aspect.

There results that strain 181, ***Saccharomyces ellipsoideus***, was situated at an optimum fermentative level, at a temperature threshold over 13°C, being thus included in the group of colder yeasts.

At a temperature of 13°C, all strains of the ***Saccharomyces ellipsoideus*** species attain a fermentative threshold higher than that attained at 35°C, however below that recorded at 25°C. At 25°C, strain 220 of ***Saccharomyces ellipsoideus*** showed the highest fermentative level, of 12,5% released CO_2 while, at 35°C, the fermentative activity was the least inhi-bited, which may explain inclusion of this yeast strain in the class of more warm yeasts.

Out of the 5 yeast strains of the ***Saccharomyces oviformis*** species (Fig. 3), special mention should be made of strain 352 which, in the end of the 2 week-period of observations and determinations, evidenced the same value (11% released CO_2), both at 13°C and at 25°C, while the temperature of 35°C was seen as the most inhibiting one-comparatively with the other strains. This is indicative of the fact that the mentioned strain belongs to the colder yeasts.

Among the strains of the ***Saccharomyces bayanus*** species (Fig. 4), strain 332 showed a higher fermentative activity at the end of the 2 weeks, at a temperature of 13°C, and a lower one at temperatures of 25°C and, respectively 35°C. That is why, this strain may be included among the cold yeasts, manifesting a good fermentative activity at 13°C - namely, 11% released CO_2. A temperature of 4°C does not stimulate the fermentative enzymatic activity of all strains belonging to this species, while a value of temperature of 35°C represses the synthesis of enzymes involved in the fermentative process

Fig. 5 - plotting graphically the fermentative activity of the 4 strains belonging to the ***Saccharomyces rosei*** species - puts into evidence strain 475, with a low fermentative activity at all values of temperature tested, only a maximum of 8,5% released CO_2 being recorded at 25°C - which in insufficient for a normal, fermentative strain. This strain is further tested for the obtention of nectar wines. Strain 466 was seen as the most active one of the whole species, as manifesting a fermentative activity of over 12,5% released CO_2, at a thermal threshold of 25°C.

At 13°C, the same strain manifests the highest fermentative activity (9,5% released CO_2), comparatively with the other ones, while the temperature of 35°C was seen as repressing the process.

Conclusions

1. The temperature found as most active towards fermentation was of 25°C for most of the yeasts; the temperature of 35°C repressed the enzymatic synthesis responsible for the alcoholic fermentation.

2. A temperature of 4°C is insufficient for initrating the enzymatic synthesis responsible for the fermentative process.

3. An appreciable fermentative activity was manifested, at 13°C, by a series of strains, such as : 352 *Saccharomyces oviformis* and 332 *Saccharomyces bayanus* with 11% released CO_2.

4. The fermentative activity varies with the thermal threshold at which the process occurs while manifestation of the fermentative activity is not determined by the yeast strain employed and not by the species to which it belongs.

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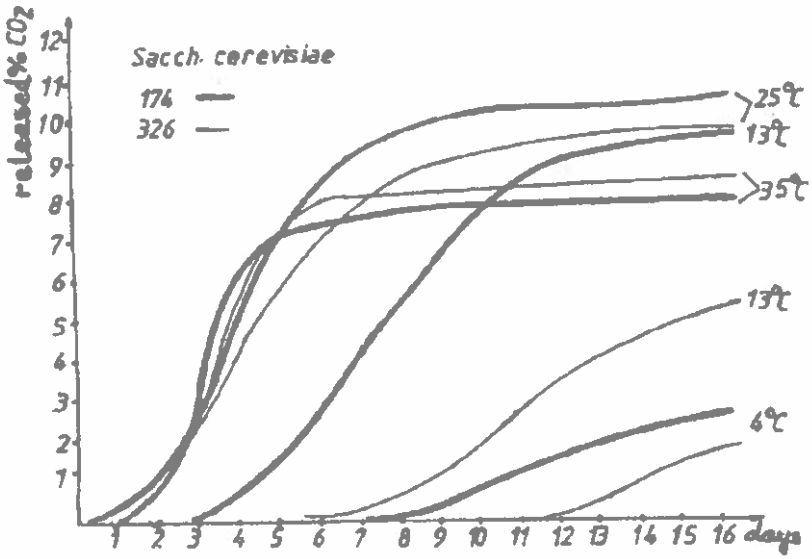

Fig.1 - Curve of the fermentative activity of the *Saccharomyces cerevisiae* species - strains 174, 326

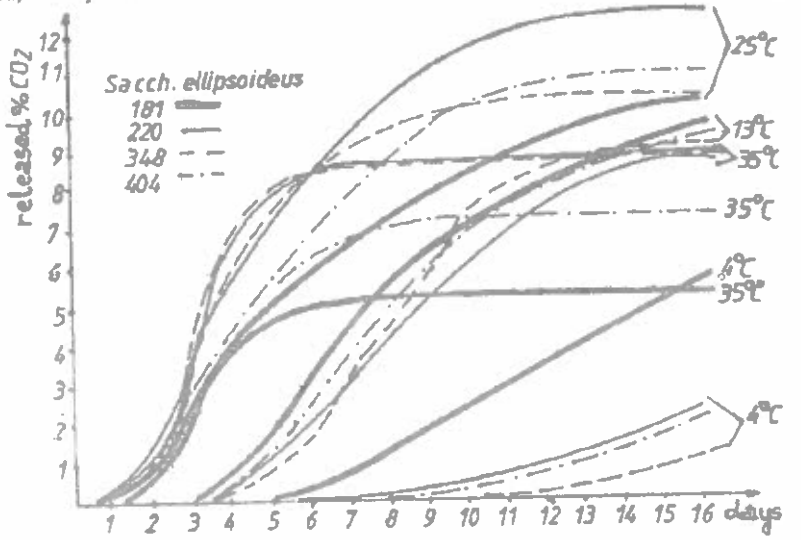

Fig. 2 - Curve of the fermentative activity of the *Saccharomyces ellipsoideus* species - strains 181, 220, 348, 404

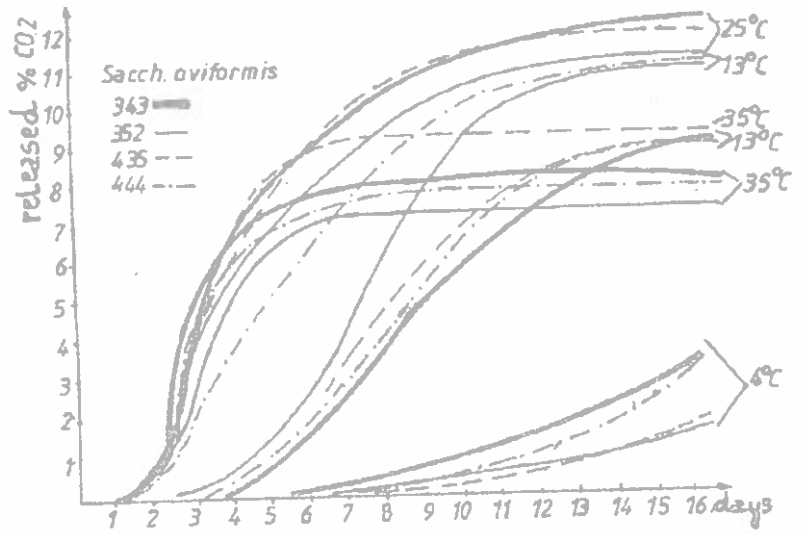

Fig. 3 - Curve of the fermentative activity of the *Saccharomyces oviformis* species - strains 343, 352, 435, 444

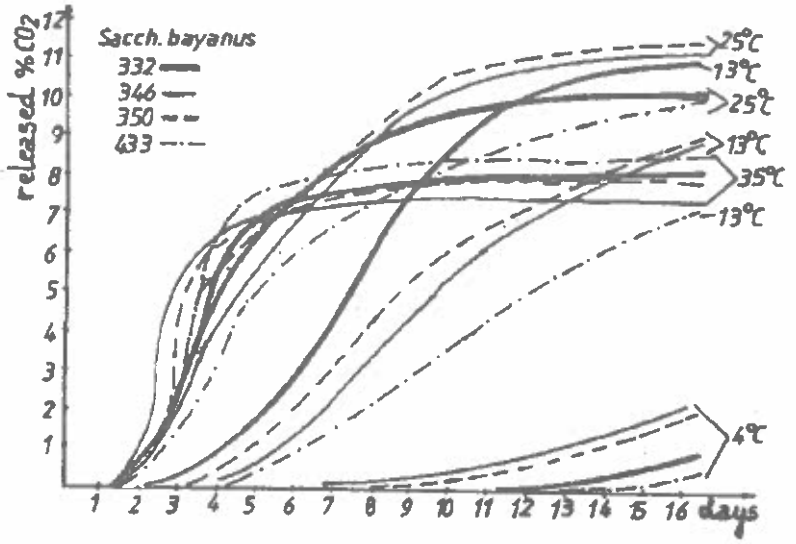

Fig. 4 - Curve of the fermentative activity of the *Saccharomyces bayanus* species - strains 332, 346, 350, 433

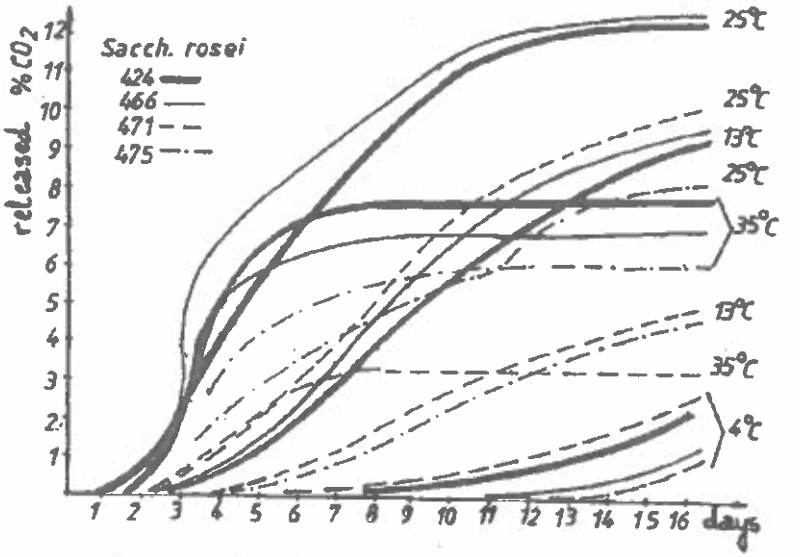

Fig. 5 Curve of the fermentative of the *Saccharomyces rosei* species - strains 424, 466, 471, 475