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ENZYME PREPARATION IN SECONDARY FERMENTATION AND MATURATION PROCESS IN BREWING INDUSTRY

Felicia Stoica, Camelia Muntean, L. Giurgiulescu, A. Buică, Andreea Moreanu, Denisa Popa
University of Craiova, Faculty of Horticulture, A.I. Cuza Street, no. 13, Craiova, Dolj; E-mail: feliciastoica@yahoo.com

Abstract

For a better quality it must continues the fermentation of fermentated sugar, synthesis of a new secondary compounds increase the superior alcohols and ester contents. It must be assurance the CO_2 saturation and totally increase of oxygen content. And finally, the limpidity and brightness must be characterized of finite produce. In this purpose, the young beer is subdued at the secondary fermentation and maturation process. The reducing at the diacetil and acetoina is the limitative phase in beer maturation. The taste defect which is produce by diacetil and acetoina constitute a big problem for the all making brewer.
***Keywords**: enzymatic preparation, secondary fermentation, maturation, Maturex L*

Introduction

The primary fermentation beer – young beer – is characterized through some sensorial aspects like: a pronounced taste of yeast, unspecific bitterness with a pungent taste, smell of green with mercaptans muddy appearance, a small microbiological and colloidal stability (Stoica, 2006).

For a better quality it must continues the fermentation of fermentated sugar, synthesis of a new secondary compounds increase the superior alcohols and ester contents. It must be assurance the CO_2 saturation and totally increase of oxygen content. And finally, the limpidity and brightness must be characterized of finite produce (Banu, 2000). In this purpose, the young beer is subdued at the secondary fermentation and maturation process (Kunze, 1996).

The traditional secondary fermentation processes proceed under yeasts influence. This one must be cooling at 5°C, in the cooler tank

where take place the secondary fermentation under yeasts influence that are in suspension. The yeasts must not be flocculent because it is possible to deposit while the temperature of beer in tank will increase and the secondary fermentation will stop (Banu, 2000).

The secondary fermentation may be realized by addition beer in phase fermentation "high edge", which cooling at 6-9°C, in proportion 10-20%. This procedure is prescript when the yeast is flocculent and it is not capable to produce an adequately secondary fermentation ant to increase the young beer flavor (Banu, 2000). This procedure conducing at a higher acetaldehyde proportion comparatively with the traditional process, but during the maturation process (4 weeks) the acetaldehyde content is reduced at the acceptable proportion.

The reducing at the diacetil and acetoine is the limitative phase in beer maturation (figure 1). The taste defect which is produce by diacetil and acetoine constitute a big problem for the all making brewer.

The diacetil and acetoine give to the beer an unacceptable taste of butter. The proportion of the diacetil which is perceptible by the consumer is 0.02-0.08 mg/l. The diacetil concentration at the final of maturation process must be smaller than 0.1 mg/l.

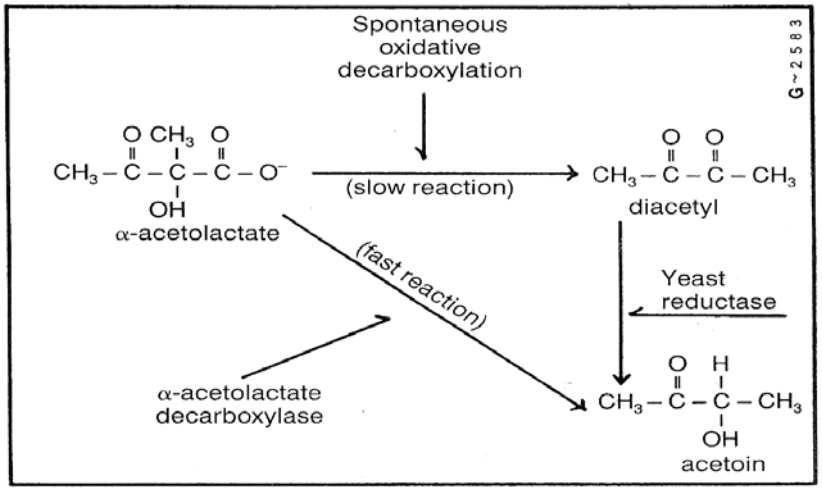


Figure 1. Removal of α-acetolactate during fermentation

Experimental

The experiment was placed at the brewing and malting factory, Brau Union Romania. The study was effectuated for 2 weeks on the Golden Brau beer. The fermentation process had place in cylinder-conical tank CCT, with cooler equipment which is capable to maintain the must temperature during the secondary fermentation/maturation process.

For fast reduction of diacetil during the beer maturation process it was used the enzymatic preparation. Some of this, Maturex L is α-acetolactate. This preparation is add to the cold must in dose 1-2 ml/hl must (Theiss, 1992). Using Maturex L, the diacetil concentration is at law level and the fabrication period is shorter with 5-6 days.

Results and Discussions

The results about the evolution of apparent extract, pH and temperature in cylinder-conical tank CCT are presented in table 1 date which are also in fermentation diagram from Brau Union Craiova factory.

Table 1. The evolution of apparent extract, pH and temperature in cylinder-conical tank

Day	Apparent extract (%)	pH	Temperature (°C)
1	11.3	4.68	10.1
2	8.7	4.43	10.0
3	5.7	4.36	11.7
4	2.7	4.20	13.0
5	2.4	4.19	12.9
6	2.3	4.17	12.7
7	2.3	4.17	12.5
8	2.3	4.18	12.4
9	2.3	4.80	12.1
10	2.3	4.18	11.8
11	2.3	4.19	11.6
12	2.3	4.19	11.4
13	2.3	4.19	10.2
14	2.3	4.20	9.0

The characteristics of the young beer which must be subdued of the secondary fermentation/maturation process are: consistency = 62%, yeasts volume = 1130 l, yeasts quantity = 700 kg, dose of yeasts = 392g/hl, Maturex quantity = 750ml and dose of Maturex = 0.50g/hl.

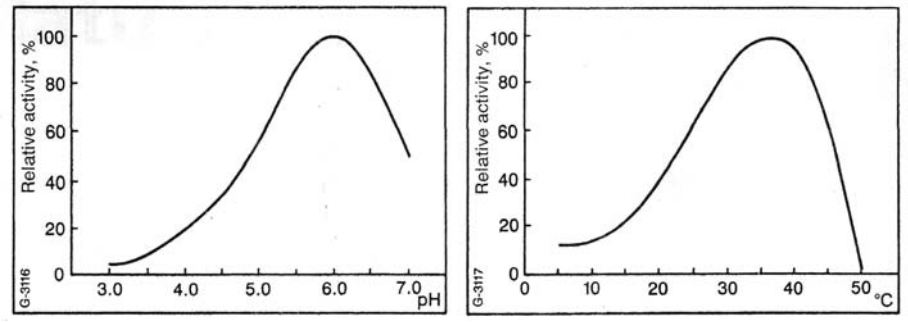
It can see that during the secondary fermentation the apparent extract present a rapid decrease from 11.3% come up to 2.3% at the final of process. The temperature and pH have also an unlinear evolution.

The temperature presents a light increase in the 4th day of fermentation process. After that temperature presents a continuing decrease come up to 9°C.

pH presents a linear evolution, decreasing continuously from 4.68 at 4.17 in the 6th and 7th day of the secondary fermentation. After that, pH remains practically constant to the end of process.

The enzymatic preparation using for increase the maturation rate is Maturex L in dose of 0.5g/hl.

In figure 2 is presented the influence of pH (figure 2a) and of temperature (figure 2b) on α-acetolactate activity. The date which are in this figures are also from the fermentation diagram by Braun Union factory. It can be observed that the maximum activity of Maturex is at the pH = 6, and a temperature of about the 35°C



a b

Figure 2. Influence of pH, and respectively of temperature on the activity of Maturex

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As regards the influence of pH and of temperature on enzymatic preparation stability, the relevant dates in figures 3a, and respectively 3b, are convincing.

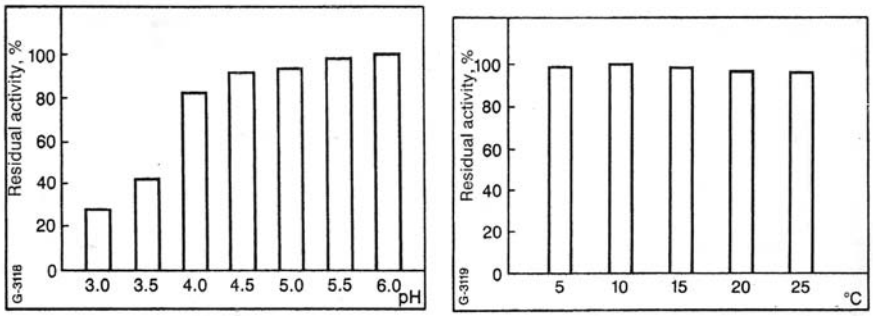

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Figure 3. The influence of pH (a) and of temperature (b) on the stability of Maturex

The stability of enzymatic preparation increases continuously during the increasing of pH value increase. The better residual activity, over 90%, are at pH = 5.5 – 6.0. However, the action of temperature on Maturex stability, it could be observed that the residual activity is maxim at temperature values from 5°C to 15°C. At higher temperature values, 20°C - 25°C, the enzymatic preparation stability presents an insignificant decrease

Conclusions

For improvement the qualitative and sensorial parameters at beer it is imperious necessarily inhibition or removal of the secondary products with high sensibility (diacetil and acetoine). The decrease of diacetil and acetoine represent the limitative phase during the maturation process. The best procedure for achievement this desire is using the enzymatic preparation α-acetolactate, known like Maturex L. Using Maturex L for acceleration of maturation process at beer the diacetil concentration remains at low level and the maturation period decrease with 5-6 days.

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