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РОЗДІЛ 1

АКТУАЛЬНІ ПИТАННЯ ЗБЕРІГАННЯ ТА ТЕХНОЛОГІЇ ПЕРЕРОБКИ ЗЕРНА, ОВОЧІВ ТА ФРУКТІВ

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INFLUENCE OF TECHNOLOGICAL REGIMES ON CONTENT OF FERMENTATION BY-PRODUCTS FROM HIGH-GRAVITY BEER WORT

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For the production of beer high consumption are observed for heat, refrigerants and energy, particularly in the stages of mash preparation and its fermentation. Nowadays, more than ever, it is important to introduce energy-saving technologies that can reduce energy costs. These technologies include high-gravity brewing (HGB). When implementing HGB technology increased osmotic pressure of medium and greater concentration of alcohol cause a decreasing in the activity of yeast and their early sedimentation.

The consequence of these processes may be a change of organoleptic properties of the drink. The process intensification can be particularly made by temperature increasing, that, in turn, has a significant impact on the composition of the fermentation by-products which form the flavor profile of the final beer. Therefore, there are scientific and practical interests for the study of the effect of temperature regimes of high-gravity wort fermentation on formation of fermentation by-products in beer.

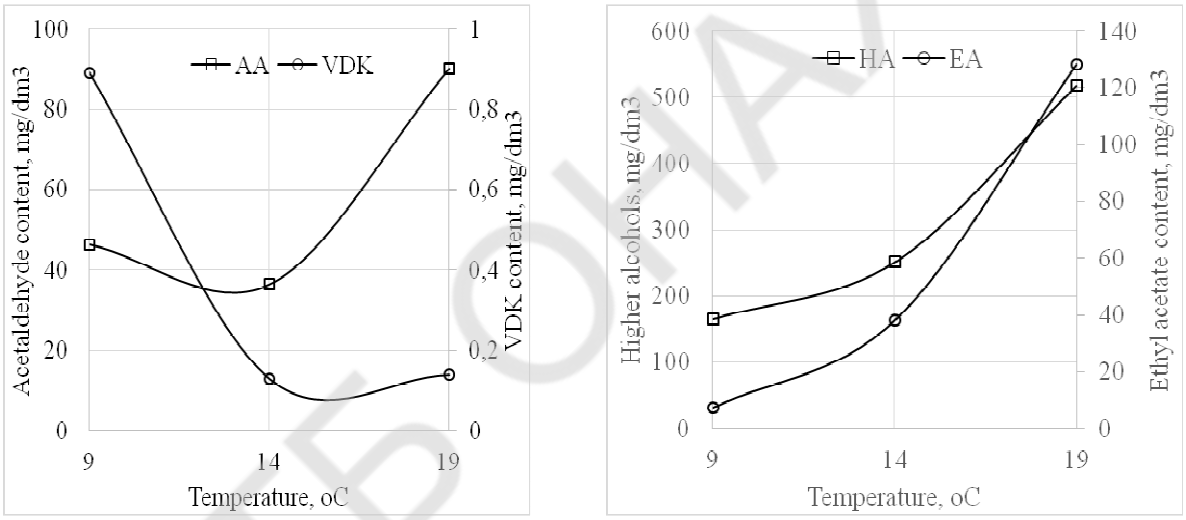
Research objects were brewing yeast Saflager W-34/70. The yeast was cultivated in wort with concentration 12 % of dry matter at the temperature 25 °C in three stages, 24 hours duration of each. Yeast biomass was separated by centrifugation at 4000 rpm for 10 minutes, then it was washed by sterile water and used for fermentation of 200 cm^3 hopped wort with concentration of 16 % of dry matter for 7 days at temperatures 9, 14 and 19 °C. Fermentation by-products content was determined in distillates of young beer. Vicinal diketones (VDK) were determined by spectrophotometric method after interaction with ortho-phenylenediamine.

Chromatographic studies were performed using chromatograph of model Kristall-4000 M-LUX. To calibrate the chromatograph calibration water-ethanol solutions were used: such as types GWER-6.1 (ester) and GWER-6.2 (alcohol) according to TU U 18.426-99. Chromatography conditions were as follow: capillary chromatographic column HP-FFAP (Agilent); stationary liquid phase – nitro-monoester of terephthalic acid and polyethylene glycol (molar ratio 2:1) with a film thickness of 0,5 microns; column length – 50 meters; internal diameter – 0,32 mm; column temperature program was as: isotherm at 40 °C for 5 min., then heating from 40 °C to 160 °C with speed of 4 °C per one minute, and at the end it was isotherm at 160 °C (10 min.); injector temperature – 250 °C; detector temperature – 200 °C; carrier gas –

argon with flow rate of 1 cm^3/min.; for operation of flame ionization detector next flows were used: air – 250 cm^3/min.; hydrogen – 30 cm^3/min. The chromatography system dead time was 2.66 minutes and was used to calculate the retention indexies. The sample injection was made using microsyringe of model ML-1 with nominal volume 1 mm^3. To manage the chromatograph the program NetChrom (version 2.1 for Windows) was used.

There are substances that form a bouquet of young beer (diacetyl, aldehydes), and substances that form the bouquet of the final beer (higher alcohols, esters). First of these substances give unclean, green, immature taste and smell for beer and negatively affect on the quality of beer when they are at higher concentrations. During fermentation and maturation they can be removed from the beer by biochemical way, what is the purpose of beer maturation. Higher alcohols and esters determine the flavor of beer. Their presence at certain concentration is a prerequisite for obtaining high-quality beer. Unlike the first group these substances can not be removed from the beer by technological ways.

The results showed that the increasing of fermentation temperature leads to a decreasing of the VDK content to the level that is typical for mature beer (0.1 mg/dm^3). At the main fermentation stage VDK content was observed at maximum value in young beer that was obtained at 9 °C (Fig. 1a).



a) b)

Fig. 1 – Dependence for content by-products of fermentation on temperature: AA – acetaldehyde; VDK – vicinal diketones, HA – higher alcohols, EA – ethyl acetate

In the study of the experimental samples of young beer it has been found that higher temperature (19 °C) promotes acetaldehyde formation at main fermentation (Fig. 1a). Acetaldehyde content from 20 to 40 mg/dm^3 is normal for the young beer and that was obtained by fermentation of wort at temperature of 14 °C. At all other conditions the acetaldehyde content exceeds the high concentration threshold of normal content range, but acetaldehyde content is decreased by biochemical way during maturation .

The esters formation is increasesed with raising of the fermentation temperature (Fig. 1b). It is important that beer gets an unpleasant chemical taste when the ethyl acetate con entration is over 30 mg/dm^3. Previous studies have found that to achieve the standard beer parameters such as the foam height and the foam stability after beer conditioning using HGB-technology the degree of beer dilution should not exceed 15-20 %. Thus limiting value for

ethyl acetate content is 35-37.5 mg/dm^3 in young beer. For this purpose fermentation temperature should not exceed 14 °C as the Fig. 1b shows.

Fermentation temperature raising intensifies the formation of higher alcohols (see Fig. 1b). It should be noted that the higher alcohols concentration above 100 mg/dm^3 impairs taste and useful properties of beer. In process of wort fermentation at dry matter concentration of 16 % in the studied temperature range it wasn't possible to reach the normal content of higher alcohols in beer, that may be due to the negative impact on yeast cells from increased osmotic pressure of medium.

Thus, at dry matter concentration of 16 % of high gravity beer wort the main fermentation should be carried out in a temperature range of 9-14 °C. It should be continued to search for ways that would reduce the formation of higher alcohol at fermentation of high-gravity wort.

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BAKING MIXES –THE NEW WAY TO WIDEN THE RANGE OF FINISHED PRODUCTS AT THE FLOUR MILLS

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The grain handling industry in Ukraine remains high and still has a promising potential due to a good crop capacity, which is enough for internal needs and a grain export as well. We can take pride that Ukraine is one of the leader on a worlds in quality and blackearth areas under crop and our wheat is in good demand within food market world-wide. However, this facts on firms our retard comparing to the progress of the world trends. The growth of the economy which is based upon the planet natural recourses exploitation and harmful industry for the environment nowadays moves away to the past. The oil and the gas, the coal and the ore are not getting as a gold vein today for the country-exporter.

Today, the leader is somebody who owns a new knowledge, scientific innovations: How to produce a new, saving time, resources and energy? Instead of selling relatively cheap basic materials and purchasing expensive high-technology, the country should produce that hi-tech itself. Speaking to the point regarding the milling industry in Ukraine, we might say that this trade provides our manufacture and population needs by the volume of produced goods but not by assortment.

Traditionally the wheat and the rye flour are in use for the bread and bakery production in Ukraine and neighboring states. Permanently growing up marketable competition requires maximum effectiveness and the opportune actions from every enterprise. Any businessman is stimulated and forced to look for his own way of progress under the current market conditions.

Here are the main points of effectual strategy: the growth of productiveness; the diminution of loss; the widening of the range of finished products; the introduction of new technologies; the improvement of working conditions.

In our time the major part of Ukrainians prefers having the baked goods which are made with one’s own hand or by special devices. Therefore the particular bakery mixtures are applied and just some quantity of water and other ingredients need to be added. So that, the

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