FERMENTATION OF SWEET SORGHUM JUICE BY SACCHAROMYCES CEREVISIAE FOR OBTAINING AND ANALYSIS OF BIOFUEL VOLATILE COMPOUNDS

O. I. Volodko, G. V. Lantukh, K. M. Lukashevych, A. G. Novak, S. P. Tsygankov

Abstract. *Modern world tendency in energetics of developed countries are focused on comprehensive employment of renewable energy sources because of negative ecologic impact of industry and transport that use fossil energy sources. Ukraine is having one of the highest agricultural potential in Europe however doesn't apply renewable energy of raw materials from phytomass to the full extent. One of the most profitable and simple way to obtain environmentally friendly liquid fuel is bioethanol production.*

Sweet sorghum for bioethanol production can complement sugar beet molasses which is a traditional raw material in Ukraine but has limited reserves.

The current work is aimed in implementation of sorghum sugars processing in ethanol through molasses fermentation technology adaptation to sweet sorghum juice and syrup. The fermentation of sweet sorghum juice from functioning plant in Sumy region was performed, kinetic parameters of fermentation were determined, and volatile substances were obtained and analyzed as components of gasoline mix.

The chemical composition of sweet sorghum juice (variety "Mammoth") is carried out. Thus, juice contains heterogeneous composition of sugars: sucrose 68% and 32% of invert sugar, which may affect the kinetics of fermentation.

The anaerobic fermentation of sweet sorghum crude juice was performed using commercial strain Saccharomyces cerevisiae M5. The dynamics of ethanol concentration in fermented cultured broth was investigated with full evaporation headspace gas chromatography method. The maximal ethanol concentration (5 % v/v) was obtained in 15–16 hours after inoculation, ethanol productivity was 2.63 g l^{-1} h^{-1}.

The content of volatile metabolites in the cultured broth before and after distillation was analyzed by headspace gas chromatography method. It was established that such components of fermented cultured broth as acetaldehyde, acetone, isobutanol, and 1-propanol can be distilled only 40–60 %.

The results demonstrated the possibility of sorghum sugars fermentation by strain of S. cerevisiae M5 with high ethanol productivity.

Key words: ***fermentation, sweet sorghum juice, ethanol, headspace gas chromatographic***