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Current Research Trends on Fermentation Microorganisms in Alcoholic Beverage Industry

Min Jae Seo

Liquor Technical Center, Liquor BG, Doosan Inc.

Various compounds of alcoholic beverage are changed by the fermentation conditions, raw materials, and microorganisms in the brewing process. Among them, aroma compound is one of the most important factors for the determination of the alcoholic beverage quality. Microorganisms like yeasts, fungi, and lactic acid bacteria lead a key role to produce aroma compounds. Microorganism for fermentation has been studied to obtain various flavors by industrial researches.

Yeast has been used in the process of wine making, beer brewing and traditional alcoholic beverages. Since yeasts have been differentiated in brewing according to a type of alcoholic beverage, classifying method of yeasts has been suggested in various ways. Recently, new method was developed to discern Cheongju yeast, distilled Soju yeast, and wine yeast using PCR with designed primers, FLO5 and YHR213W [1].

To increase flavor of alcoholic beverage, two main ideas have been studied for yeast. One is the selection of mutant which has ability to produce increased aromatic compounds in alcoholic liquor. The other is the selection of ethanol-tolerant mutant. High concentrations of ethanol may cause yeast cell lysis, which gives off-flavors to alcoholic beverages. A distinctive characteristic of ethanol-tolerant mutant was investigated. Watanabe *et al.* elucidated that Genes induced by stress are highly expressed in ethanol-tolerant mutant [2].

Screening of fungi for brewing has also been performed. Takahash *et al.* could select *Aspergillus oryzae* mutant strain with a high glucoamylase activity and a low tyrosinase activity by irradiation of ultraviolet light. The Cheongju brewed by using this strain had an excellent flavor and its fermented residue did not turn brown even one month after koji making and brewing [3]. In order to clarify the changes in the aroma of Cheongju in the process of koji-making, sensory analysis and quantitative analysis of aroma compounds of koji were studied [4].

Some researches on microorganism for brewing process have performed in Korea. Korean traditional "Nuruk" could be a source of microorganisms such as fungi, yeasts, lactic acid bacteria. Therefore, Nuruk

has been paid attention to among the brewing scientists. Kim *et al.* selected 10 wild type yeast strains from 300 different type of Nuruk [5] and investigated their characteristics for brewing.

In addition, some studies on fungal strains from Nuruk were performed. They isolated several fungal strains including *Absidia* sp., *Rhizopus*, and *Aspergillus* sp. and carried out research on enzymological characteristics [6, 7].

But, unfortunately, efforts for screening of new types of microorganisms for brewing were insufficient. Most of brewing companies in Korea are now using yeast and fungi strains imported from foreign countries. Even a few developed strains hardly put to practical use in the brewing industry.

Doosan have been much interested in screening brewing strains with good characteristics for making beer, wine, Cheongju products. Continuous efforts resulted in development of various yeasts which have a starch degrading enzyme activity, high ester compounds production, or tolerance to high concentration of ethanol. And one of these strains was used to develop a new premium Cheongju product with high flavor. A fungal strain, *Aspergillus usamii* mut. *shirousamii* has been used in brewing a Cheongju product. A high productivity of citric acid with high glucoamylase activity of this strain makes a Cheongju product with good drinkability and freshness. In the process of screening new types of yeasts and fungi, sensory evaluation technique was very useful and essential.

For further improvements of the quality of alcoholic beverages, both research and technical development were required in brewing microorganisms. The improvement of brewing strains for alcoholic beverages with sensory evaluation techniques will be a significant part of developing new products in brewing industry.

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