Use of Bacillus subtilis var. natto, Saccharomyces cerevisae, and Aspergillus oryzae in fermentation of brown rice

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ABSTRACT

Brown rice is a nutritious food, capable of enhancing metabolism and preventing arterial sclerosis, cancer, cardiovascular's disease and anaemia. However, its nutritious ingredients are mostly bound by peripheral tissues and thus not be easily digested or have a lower bioavailability. If it is overly cooked, its nutritious components may disapeear due to overheating. But if use of the ability of secreting various hydrolytic enzymes by Bacillus nato (BN) and Aspergillus oryzae (AO) with that of forming varied flavors by Saccharomyces cerevisiae (SC), the indigestibility of brown rice may be solved and its nutrition may well be preserved. In the mean time, its digestibility will be significantly strengthened and various flavors and healthy components are additionally formed in it. Therefore, the purpose of this study is to develop a fermentation process for production of functional fermented food from brown rice by mixed-culture fermentation. The functional components of fermented brown rice and its physiological function will be investigated too. These results can provide information for establishment of a fermentation process for production of functional fermented brown rice. Study on the effect of starter preparation method and inoculum size on brown rice fermentation shows that use of YMB (yeast and malt extract broth) as starter cultivation broth and 10% of inoculum size resulted in the highest BN spore and SC cell numbers with a substantial amount of glucosamine in fermented brown rice. A 1:0.9 of brown rice to water ratio led to the best formation of BN spores. No matter what single culture, double culture or mixed culture was used in fermentations, the final numbers of BN spores and SC cells could all reach 108 CFU/g. When both SC and AO were simultaneously used in fermentations, the final number of SC cells even reach 109 CFU/g. Only when both BN and AO were simultaneously used in fermentations, glucosamine content in harvested brown rice reached the least. And for other cases, glucosamine content in harvested brown rice could all reach 3mg/g. The SOD (superoxide dismutase) activity reached the highest value of 33U/g when both AO and SC were used in fermentation. The DPPH free radical scavenging ability could exceed 30% when single AO or both AO and SC or triple culture was inoculated. When three starters were simultaneously used, the highest protease activity could be obtained with 13.42U/g. Supplementation of glucose or yeast powder in brown rice could not help production of functional ingredients.

Keywords : brown rice, Bacillus natto, Saccharomyces cerevisae, Aspergillus oryzae, SOD, DPPH, protease, glucosamine.

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