M.Phil. in Biochemistry

Changes in macromolecules during malting of rice ("Mottaikaruppan" variety)

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Abstract

Cereal malts are rich in enzymes and soluble materials, which could be used in food industry. Malting of different cereals like rice, in food and brewing industries is in practice. A local variety of rice called "Mottaikaruppan", which has not been studied before was selected. When dehusked unpolished rice grains and paddy were steeped in distilled water and germinated in a moistened bag germination of dehusked unpolished rice (77.7%) was better than paddy (59.6%) at 5^{th} day. Addition of $0.1gl^{-1}$ gibberellic acid improved the malting of dehusked unpolished rice while Tween-80 (1.0 ml/l) with gibberellic acid decreased the malting. Appreciable drop in starch (7.2%) and total protein (16.5%) contents while increase in reducing sugar, total sugar and soluble protein contents and increase in malt amylase and malt protease activities were observed from the 2^{nd} day of germination. Germination of the dehusked unpolished rice grains was arrested on the 4^{th} day and malt powder was prepared. Soluble protein was best extracted with 0.01M phosphate buffer (pH 7.0) - $10gl^{-1}$ NaCl, and this was not better than distilled water for sugar extraction. Extraction of sugars with 0.01M phosphate buffer (pH7.0) - $10gl^{-1}$ NaCl improved with increasing temperature, but the soluble protein extraction was affected above $80^{o}C$ due to thermal denaturation of proteins. Hot centrifugation ($50\text{-}70^{0}C$) of the extract showed positive effect on the extraction of soluble proteins while no influence on sugar extraction. The rice supernatant contained one type of glucose polymer and four types of soluble proteins, while the supernatant of rice malted for 4 days contained two additional glucose polymers and one additional soluble protein or peptone or combination of both. Among the extractants used to extract amylases and proteases from malted rice powder, $10gl^{-1}$ NaCl and 0.03M phosphate buffer (pH 7.5)were the best for the extraction of malt amylase and protease respectively. The kinetic properties of malt amylase and protease were determined. Optimum pH and temperature for simultaneous extraction of malt amylase and protease were pH 7.4 and $50^{0}C$ respectively. Incorporation of Triton X-100 (0.1%, v/v) improved extraction of amylase and protease by 11.5 and 1.8% respectively. The malted rice supernatant contained α-amylase and amyloglucosidase and showed no naringinase like activity. Presence of enzymes and increased amount of low molecular weight soluble substances of cereal malts are the important indicators for their nutritional value and utilization in the food and brewing industries.