Abstract No: BO-16 **Biological Sciences**

Production of extracellular amylase under solid state fermentation using ground nut shell as the substrate and its application in textile and baking industry

I. A. U. Apeksha and M. K. B. Weerasooriya*

Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka
Email: bandu@kln.ac.lk

Amylases find potential applications in a number of industrial processes such as food, detergent, textiles, brewing and paper industries. Though Amylase can be obtained from several sources, use of microorganisms meet the industrial requirements as it is economical and easy to manipulate microbes to obtain enzymes of desired characteristics. Several methods such as submerged fermentation and solid-state fermentation have been successfully used for amylase production. As the contents of synthetic medium used for amylase production are very expensive, replacing them with available agricultural and industrial wastes would be economically advantageous. Hence, in this study amylase was produced by *Aspergillus niger* (obtained from the culture collection of Department of Microbiology, University of Kelaniya) under solid state fermentation using dried ground nut shell powder as the carbon source and its potential for using in baking and textile industries were evaluated. Culture conditions were optimised to get maximum amylase production by varying parameters such as incubation period, pH and substrate: moisture ratio. Culture media was supplemented with additional nitrogen source such as Gelatine, $(NH_4)_2SO_4$, Urea and NH_4Cl and amylase production was monitored. Cultures were grown at large scale under optimised conditions. At day 6 mycelia were filtered and culture filtrate was fractionated with ammonium sulphate. Ammonium sulphate fraction (50-75%) which had the highest amylase activity was dialysed and its suitability to use in baking and textile industry was investigated. Bakery products were prepared using the wheat flour dough treated with different volumes of amylase (2.5, 3.00. 3.5, 4.00 and 4.5 ml) and quality of the products were evaluated. To test the possibility of the enzyme produced for use as a desizing agent, gray cotton fabric were immersed (1.5 x 1.5 inch fabric pieces) in pH 5.5 buffer solution supplemented with 500 µl (3.69 U ml^{-1}) and 300 µl (3.69 U ml^{-1}) enzyme respectively. Removal of starch from gray cotton fabric and concomitant release of glucose due to starch hydrolysis was monitored at different time intervals. The optimum incubation period, pH and substrate: moisture ratio for maximum enzyme production were found as day 6, 5.5 and 1:5 respectively. Gelatin and urea addition enhanced amylase production whereas $(NH_4)_2SO_4$ and NH_4Cl showed no significant contribution on the amylase production. Quality of the bakery products such as volume of the product, crust colour and crumb structure were improved with increasing amounts of amylase. Staling was retarded in the samples treated with 4.00 and 4.5 ml amylase with respect to the control. Gray cotton fabric treated with amylase revealed that removal of starch of the fabric and concomitant release of glucose due to starch hydrolysis increases linearly with the increasing time and reached the maximum by 2 hrs. Yield of the enzyme production was ~ 5740 units/g. All these findings suggested that amylase produced by solid state fermentation using ground nut shell as a substrate can be successfully used to improve the quality of bakery products and as an anti-staling agent in baking industry and as a desizing agent in textile industry.

Keywords: Amylase, Anti-staling agent, Desizing agent, Ground nut shell, Quality of bakery products