Preliminary studies on the selection of thermostable alkaline xylanase producing bacteria

Kapilan, R. and Vasanthy Arasaratnam

This study was aimed at selecting a thermostable alkaline xylanase producing bacterial strain. Among the bacterial strains available in the laboratory, isolated from cow dung, hot rice water, water used in autoclave, opened xylan agar plate and beet root peel, the strains, which were expected to produce alkaline xylanase, isolated from opened xylan agar plate medium (GS_7, GS_{15} GS_{17}, GS_{20} & GS*) were selected. The activated bacterial strains (18h old, 20% v/v) were transferred into fermentation medium containing (gl^{-1}) xylan, 20.0; peptone, 2.0; yeast extract, 2.5; $CaCl_2.2H_2O$, 0.005; $MgCl_2.6H_2O$, 0.005; $FeCl_3$, 0.005; K_2HPO_4, 2.5; KH_2PO_4, 1.0; NaCl, 0.1 and $(NH_4)_2SO_4$, 2.0 at pH 7.0 and incubated at 40°C and 100 rpm. The strains were grown in the fermentation medium at different pH values (7.5, 8.0, 8.5, 9.0 & 10.0) at 40°C and 100 rpm. Highest growth (600nm) obtained for GS_7, GS_{15}, GS_{17}, GS_{20} and GS* were 2.27 (16h), 2.375 (16h),2.35 (17h), 1.85 (11h) and 2.14 (16h) respectively at pH 8.0 and for GS_7, GS_{15}, GS_{17}, GS_{20} and GS*were 2.04 (15h), 2.26(16h), 2.02 (16h), 2.22(16h) and 2.25 (12h) respectively at pH 8.5. Alkaline xylanase activity measured at pH 8.5, produced by GS_7, GS_{15}, GS_{17}, GS_{20} and GS* at pH 8.5 were 16.5, 18.9, 25.6, 18.6 and 23.5 Uml^{-1} (30h) respectively and at pH 9 were 13.6, 9.6, 20.38, 10.4 and 14.73 Uml^{-1} (30h) respectively. Xylanase production by GS_{17} and GS* was less affected than GS_7, GS_{15} and GS_{20} when the pH of the medium was changed from 8.5 to 9.0. Further, xylanase production by GS_{17} and GS* was better than by GS_7, GS_{15} and GS_{20} when the pH of the medium was maintained at 8.0, 8.5 and 9.0, during fermentation. Therefore GS_{17} and GS* were selected as the best alkaline xylanase producers among the strains. Then the bacterial strains were activated at pH 9 and inoculated into the fermentation medium (20%, v/v) at pH 9 and incubated at different temperatures (35, 40, 45, 50, 55 & 60°C) and 100 rpm. Though both GS_{17} and GS* produced xylanase at higher temperatures, the xylanase production by GS_{17} after 39 hours of fermentation was 1.217 times more at 40°C, 1.311 times more at 45°C, 1.165 times more at 50°C and 3.204 times more at 55°C, than GS* . GS* did not produce xylanase at 60°C while GS_{17} produced 4.25 Uml^{-1} (30h) of xylanase activity. GS_{17} was selected as the best thermostable alkaline xylanase producer for further studies because it gave higher xylanase enzyme activity in alkaline pH and at high temperatures. Further studies are underway to improve the strain and to optimize the fermentation medium and culture conditions to increase the xylanase production.

Department of Biochemistry, Faculty of Medicine, University of Jaffna, SriLanka