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**GH10 AND GH11 XYLANASES PRODUCED  
FROM THERMOTOLERANT *Streptomyces* sp. SWU10  
WITH HIGH pH AND THERMAL STABILITY**

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**Abstract**

Thermotolerant *Streptomyces* sp. SWU10 isolated from rice straw produced four endo- $\beta$ -1,4-xylanases. Three enzymes, XynSW1, XynSW2A, and XynSW2B were purified and characterized. Their apparent molecular masses were 25 kDa, 31 kDa, and 44 kDa, respectively. Optimal pH and temperature of XynSW1 were pH 5.0 and 40°C, whereas 60°C and 6.0 were for XynSW2A and XynSW2B, respectively. The enzymes were stable in a wide pH ranges, more than 80% of initial activity remained at pH 2-11 (XynSW1), pH 3-9 (XynSW2A) and pH 2-9 (XynSW2B) at 4°C for 16 h, and stable up to 50°C, 80°C and 60°C for 1 h, respectively. The *xynSW1*, *xynSW2B* and *xynSW3* genes were isolated by *in vitro* cloning. The *xynSW1* contains 1,011 bp in length and encodes a mature enzyme of 295 amino acids and 41 amino acids of signal peptide. The coding sequence of *xynSW2B* gene was 1,434 bp and encodes a polypeptide of 477 amino acids included 41 amino acids of signal peptide. XynSW2A seem to be the proteolytic degradation product of XynSW2B which might be cleaved at Lys-Lys at positions 330 and 331. The *xynSW3* gene contains 726 bp and encodes a polypeptide of 241 amino acids. After cleavage of signal peptide, the calculated molecular mass was 20,872 Da. The amino acid sequence analysis revealed that the XynSW1 and XynSW3 belongs to glycoside hydrolase family 11 (GH11) whereas the XynSW2A and XynSW2B belongs to GH10. The *xynSW1* gene was further over-expressed in *Pichia pastoris* using pPICZ $\alpha$ A vector. The recombinant XynSW1 exhibited some physicochemical properties that better than those of the native enzyme including higher optimal temperature (60°C), and higher specific activity, but lower optimal pH (4.0). Because of their stability in a wide pH ranges, and high temperature, these xylanases from thermotolerant *Streptomyces* sp. SWU10 may have potential application in several industries including food, textile, biofuel and also waste treatment.

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