The search for better methods of biomass conversion to fuels and feedstocks has reawakened interest in the enzymology of plant cell wall degradation. This has brought impetus to xyloglucanases as an important player in this process as well as in various other industrial processes. The present study describes work on xyloglucanases produced from fungi using tamarind kernel polysaccharide as substrate.

This study led to isolation of many strains of fungi capable of producing XG from soil, that have not been reported so far. Strains of Alternaria, Aspergillus, Cephalosporium, Cladosporium, Fusarium and Penicillium were isolated. The semi-quantitative method of enzymatic index helped to short list the 174 isolates that were isolated to six promising ones.

All the chosen isolates were capable of producing xyloglucanase. Except Fusarium sp., all isolates produced the enzyme both in acidic and alkaline medium. Aspergillus terreus was found to be the best producer and produced XG preferentially at alkaline pH. Fermentation studies showed that Czapek Dox broth supplemented with TKP was a better medium for XG production and optimum fermentation time was found to be four days. Further, the enzyme from A. terreus was found to be membrane bound and diffusible.

Medium optimization using Plackett – Burman design and ridge analysis proved very efficient and resulted in 2.1, 9.6 and 2.8 fold increase in XG, β-glucosidase and β-galactosidase production. The final composition of the optimized medium for XG was (in g / L): NaNO₃–2.0; K₂HPO₄–1.0; MgSO₄.7H₂O–0.5; KCl–0.5; FeSO₄.7H₂O–0.05; yeast extract–0.2; TKP–10.0; maltose–3.28; cellobiose–0.85 and pH–8.3. For β-glucosidase the optimized medium consisted (in g / L): NaNO₃–2.0; K₂HPO₄–1.0; MgSO₄.7H₂O–0.5; KCl–0.5; FeSO₄.7H₂O–0.05; yeast extract–7.85; lactose–4.38; KH₂PO₄–4.23; TKP–2.06 and pH–4.5. Optimized medium for β-galactosidase was (in g / L): K₂HPO₄–1.0; MgSO₄.7H₂O–2.67; KCl–0.5; FeSO₄.7H₂O–0.05; TKP–10.0; lactose–2.88; NH₄(SO₄)₂–2.97 and pH–4.5. Optimization also reduced the fermentation time for XG production from 96 to 24 hrs.

Cation exchange chromatography using CM – Sepharose and gel filtration using Sephadex – G 100 resulted in purification of XG to homogeneity. Purification
resulted in 17 – fold purification with a yield of 3.4%. The purified XG from *A. terreus* consisted of a single polypeptide chain with a molecular weight of 79 KDa (as determined by SDS – PAGE and gel filtration).

Determination of biochemical and kinetic properties of XG yielded promising results. Km was found to be 1.25 mg% and Vmax 0.026 µmoles / min. Though the enzyme was optimally active at acidic pH, it was highly stable at alkaline pH also. The enzyme was thermophilic with optimum temperature of 60°C and stable between 20 to 90º C. Half – life of *A. terreus* XG was 63 min⁻¹, kₐ 0.011 ± 0.003 and Dₜ 209 min. at 90º C while Eₐ was calculated to be 6.31 kJ mol⁻¹.

The enzyme was activated by most divalent metal ions including Mg, Ba, Ca, Mn, Co and Zn at 25 mM. However, HgCl₂ and Pb(CH₃COO)₂ completely inhibited activity and EDTA and SDS caused 80% and 70% inhibition, respectively. The enzyme was endo – acting and had highest specificity towards XG.

In conclusion, TKP was found to be a suitable substrate for production of xyloglucanase by *Aspergillus terreus* NFCCI 1890. Use of low cost TKP as substrate, doubling of activity in the optimized medium and decreased production time can be very useful strategies for economizing XG production. XG activity could also be markedly enhanced in the presence of Mg / Mn. The robust properties of XG from *A. terreus*, i.e., alkalotolerance, thermophilicity and thermostability are indicative of its suitability for various industrial processes.