Tannin acyl hydrolase (E.C.3.1.1.20) is commonly referred as tannase. Tannase enzyme catalyzes the hydrolysis of ester bond and depside bond present in hydrolysable tannins to form glucose and gallic acid. The use of better carbon sources and efficient production strains were deemed as promising strategies to economize tannase production. A novel agro-residue, cashew testa, was tested for the production of tannase under solid-state fermentation (SSF) using *Aspergillus niger* CEPC 11. CEPC 11 was identified by 18S rDNA typing as *Aspergillus niger* and deposited in International depositing Authority under MTCC number 5898 and NCBI accession number KM516789. The enzyme was purified 11 fold to obtain tannase with a specific activity of 10.22 U/mg and final yield of 48%. SDS-PAGE analysis of purified enzyme gave a single band of 89.9KDa. The optimal temperature was found to be 40°C, with an active range of 25-60°C. The optimal pH was 5.5, and the enzyme was inactive at pH 8.0. The enzyme was identified through MALDI-TOF-MS tandem mass spectrometry as tannase. Km and Vmax were recorded at 0.1133M (substrate concentration) and 44.79 µmol/minute respectively.

Process parameters important in tannase production were identified by a Plackett and Burman design and the parameters with significant effects on enzyme production were optimized statistically employing Box-Behenken method. Higher temperature had a negative effect on production whereas the substrate cashew testa influenced tannase production positively in the tested range. The optimum values of parameters obtained through RSM were Cashew testa (23%), Di-KHPO₄
(3.40 mM), Sodium Chloride (0.47 mM) and temperature (32-35°C). Optimization of the levels of Cashew testa and incubation temperature content of the medium resulted in a 3.021 fold increase in production from 97.32 to 301.702 U/ml of tannase. Gallic acid is also determined as an inter-mediatory by-product of this technology. HPTLC method was used for the quantification of Gallic acid from cashew testa and analysed at 254 nm. Tannase activity was significantly enhanced by MgSO4, ZnSO4 and Na+, which correlates with factors influencing enzyme production significantly. The oxidizing agent, acetone enhanced the tannase activity enormously upto10 % (v/v) concentration. Significant inhibitory effect was recorded in the presence of β-mercaptoethanol and sodium cholate. The thermal stability of tannase was determined by Thermo Gravimetric analyser (TGA) analysis between 10-60°C for 24 h. The percentage of mass loss between the temperature of 29.47°C and the complete dissociation temperature at 60°C were 89.91 %, and the complete degradation was observed at 380-600°C. The gene encoding tannase, isolated from *A. niger*, was found to be 550 kb, and nucleic acid sequence analysis revealed an open reading frame consisting of 530 bp (147 amino acids) of one stretch in the +2 strand. The sequence has been deposited in the GenBank under accession number KM 110788. 3D model is generated by MUSTER. The structure predicted the -3.84 kcal/mol as free energy of binding which reveals the galloyl binding site and the interaction site are, SER 52, ASP53, ALA78, GLN84. Treatment with tannase enzyme improved the quality of fruit juices. 27.36% pomegranate juice was clarified when treated with the purified enzyme having 10.22u/mg activity. The partially purified 10.22U of enzyme could give 29.5% tea cream solubilisation with in 1h. Heavy metals (Cadmium, Nickel,
Lead, and Copper) in tannery effluent were analyzed before and after treatment with enzyme by AAS (Atomic Absorption spectroscopy) and could observe an interesting result of reduction of copper ions in the tannery effluent when treated with tannase. Hence the present study concluded that the fungus *Aspergillus niger* CEPC 11 has potential for industrial production of extracellular tannase. It may be noted that this is the first report on tannase as well as gallic acid production by *Aspergillus niger* under SSF from cashew industry by-product cashew testa as the substrate.

**Key words:** Cashew testa, Tannase, Gallic acid, Purification, RSM, *Aspergillus niger*. 