ABSTRACT

Immobilization of enzyme on magnetic nanoparticles is a promising strategy to enhance enzyme's activity, stability and reusability. Magnetic nanoparticles offer advantages of easy recovery of enzyme from the reaction mixture using permanent magnet. Endo-1,4-β-glucanase immobilization on silica coated magnetic nanoparticles was carried out by covalent linkage. Reduction precipitation method was used to produce iron oxide (Fe_3O_4) magnetic nanoparticles which were further modified by a layer of silica (Fe_3O_4@SiO_2) using tetraethylorthosilicate (TEOS) as a silica precursor. Characterization of synthesized nanoparticles was done by Fourier-transformed infrared spectroscopic analysis (FTIR), scanning electron microscopic analysis (SEM) and X-ray diffraction (XRD). Different parameters of immobilized enzyme were studied including determination of optimum pH, thermal stability, temperature, effect of different metal ions (1 mM Mg^{2+}, Ca^{2+}, Co^{2+}, Fe^{2+} and K^{+}), effect of surfactants and inhibiting agent (0.25% Tween-80, Triton-X-100, SDS and EDTA), determination of storage stability at 4°C and reusability assay. The results suggest that immobilized endoglucanase had better thermal stability, improved performance in the presence of surfactants, relatively good reusability and storage stability at 4°C and can be used in numerous applications. The immobilization of endoglucanase on magnetic nanoparticles has a potential to improve reusability of enzyme which can lower the cost of industrial process.