ABSTRACT

The current study aims to overcome the devastating effect of the pesticide fenamiphos which is being used for agricultural pest control. The pesticide fenamiphos is neurotoxic organophosphorus and its harmful oxidation products have been found in both surface and groundwaters. To achieve eco-friendly hydrolysis of fenamiphos, an enolase enzyme from *Saccharomyces cerevisiae* FN6-01 was used. The highest enolase activity was obtained with 50 ml of yeast extract peptone dextrose (YEPD) medium, pH 5, 24 h of the incubation period, inoculum age of 24 h and with inoculum size of 2 ml. At the optimized conditions, the activity of enolase was further enhanced by its immobilization on citrate-stabilized and COOH-functionalized silver nanoparticles (AgNPs). The characterization of both free and immobilized types of nano particles was performed by using different techniques to find out the morphology, purity surface composition, and optical and dispersion properties of AgNPs. The UV-Vis absorption peak at 294 nm confirmed the AgNPs synthesis and XRD reveals the crystalline nature of NPs, showing the highest peak at 200 miller indices. The FTIR spectrum bands were observed due to the stretching vibration of the different bonds. The Scanning electron microscopy showed that free and immobilized citr-Ag-COOH-NPs were 96.7-120 nm and 122-152 nm, respectively. Maximum activity of immobilized enolase observed by varying enzyme concentration (0.25-2 ml), $AgNO_3$ concentration (0.5-3 mg/ml) and procurement period (1-6 min) was 1407 mU/ml, 2271 mU/ml and 3660 mU/ml. Different characterization techniques for the analysis of free AgNPs as well as enolase immobilized AgNPs were performed. The effect of free and immobilized enolase was studied on fenamiphos hydrolysis. A 8.1% enhanced specific activity of enolase was achieved after its immobilization on citr-Ag-COOH-NPs. At 30°C, the highest thermostability of immobilized enolase was observed. The results are highly significant ($\rho \leq 0.05$) and indicate that immobilized enolase has significant potential in the detoxification of fenamiphos.