ABSTRACT

The present study deals with the production of lipase from *Rhizopus oligosporus* IIB-08 under solid-state fermentation and its immobilization on Al_2O_3 nanoparticles for improved resolution of 2-octanol. The best lipase activity (10.44±0.36 U/g) was observed by using almond meal as a substrate and improving different growth conditions. The optimized parameters for better lipase production were the level of substrate (15 g), moisture content (DW), time of incubation (72 h) and size of inoculum (5 ml). The lipase activity was enhanced by immobilizing it on Al-NPs which were synthesized biogenically using *Mentha spicata* leaves extract. Superior quality leaf extracts were prepared under optimized conditions i.e. level of powder (1.5 g), level of solvent (15 ml) and extraction temperature (45°C). Two types of Al-NPs e.g. aqueous (Aq.) and ethanolic (Eth.) were selected out of the potential extracts. The characterization of both types of NPs was performed by using different techniques to find out the morphology, purity, surface composition, optical and dispersion properties of Al-NPs. The UV-Vis absorption peak at 250 nm confirmed the synthesis of Al-NPs and XRD analysis revealed that these NPs were of crystalline nature. The FTIR spectrum bands observed at 653.8/cm and 661.2/cm were due to the stretching vibration of Al–O bond. The Scanning electron microscopy showed that Aq.Al-NPs were of 130-135 nm. The lipase was adsorbed on these well characterized NPs and used for the resolution of 2-octanol. More than 9.3% catalytic efficiency was observed with immobilized enzyme. Finally, lipase catalyzed fatty acids viz. linolenic acid (C18:3), linoleic acid (C18:2), palmitic acid and oleic acid (C18:1) were confirmed in the fungal culture broth via GC/MS. Palmitic acid exhibited the highest concentration (142 µg/ml) at a retention time of 23.2 min. It was concluded that lipases immobilized on NPs have remarkable potential to be used in the resolution of pharmaceutically important organic chemicals.