Abstract No: BO-05

Production of microbial lipase under solid-state fermentation and its application in the detergent industry

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Lipases are the enzymes of choice for laundry detergent industries owing to their triglyceride removing ability from soiled fabrics, which eventually reduces the usage of phosphate-based chemical cleansers in the detergent formulation. In this study, a partially purified extracellular alkaline lipase from *Fusarium oxysporum* was extracted by solid substrate fermentation using avocado seed powder as the solid substrate. The triglyceride removing ability of the lipase was assessed through a titrimetric assay to use this lipase as an additive in laundry detergents. Optimum growth conditions for maximum alkaline lipase productions on avocado seed powder as solid substrate (particle size 300 microns) was achieved when incubated for 120 hours at initial pH 8, where moisture level (40% w/w) in the presence of Yeast extract or Ammonium Chloride (8% w/w) as nitrogen source, Sucrose (8% w/w) as carbon source enhancer, Castor oil as oil enhancer and Sodium Chloride (4% w/w) as osmoregulator. The effects of selected surfactants, commercial detergents, and oxidizing agents on lipase stability were studied in a preliminary evaluation for its further usage in the industrial environment. Partially purified lipase has shown significant stability in the presence of surfactants, components in commercial detergents, and oxidizing agents (1.0 x 10^{-3} µmol min^{-1} lipase activity in the presence of H_2O_2 (2% w/v) / SDS (4% w/v) / Triton x-100 (10% w/v) / Ca^{2+} concentration (1000 ppm) and more than 50% residual activity after the incubation of an hour at 30 °C with common household detergents; namely Sunlight powder, Diva, Rin and Vim). Hence, the outcome of the present study opens an avenue for enzyme-based detergent sector for formulation of chemical-free or less chemical detergents with enhanced activity using alkaline microbial lipase.

Key Words: Solid state fermentation, Microbial lipase, Detergent, *Fusarium oxysporum*, Avocado seed powder