ABSTRACT

Matrices from bio-polymer's are an excellent option for embedding molecules at micro or nano level for various fields of research due to their nontoxic and biodegradable. The economics of the process also makes it attractive to study the system. *Tamarindus indica* is a tropical, fruit-bearing tree. Tamarind seed polysaccharide (TSP) is a galactoxyloglucan isolated from seed kernel of *Tamarindus indica*. When dissolved in water it exhibits properties like high viscosity, broad pH tolerance and adhesivity. In addition, it is non-carcinogenic, mucoadhesive, biocompatible, and high thermal stability.

The aim of our study was to increase the surface interaction between the matrix (TSP) and proteins especially enzymes which have both hydrophilic and hydrophobic regions. The enzyme lipase was chosen for our study due to its stability in organic solvents, stereo specificity and interfacial activity. The enzyme was immobilized by adsorption and the activity of immobilized enzyme in hydrolysis and esterification reactions were studied using 4-nitrophenyl stearate and ibuprofen respectively. Characterization of the matrix was carried out with Infrared, scanning electron microscope and X-ray diffraction techniques. The coupling yield of enzyme to the polymer was 27% for 30 mg/g of matrix and re-usability of the immobilized enzyme was found to be satisfactory for six repeated cycles with 63% of activity compared to the first cycle.
We have explored the possibility of developing a new assay system for hydrolases, mainly lipases using the macrocyclic molecule porphyrin known for its excellent photo physical properties. The high molar extinction coefficient of porphyrin is highly advantageous for using it as a photometric molecule.

The sodium salt of tetra sulfonato phenyl porphyrin (TSPP) was chosen as an indicator for the assay as it is highly water soluble. The assay was based on concomitant change of $\lambda_{\text{max}}$ from 413 nm to 434 nm due to the protonation of porphyrin (TSPP) molecule. The assay system gave an activity value of 280 U/mg ($CRL$), 8.5 U/mg ($PPL$) and 13.5 U/mg ($PAL$) and the short coming of the assay being limited to water soluble products i.e. only up to fatty acids with four carbon chain in length. This can be used for analysis of synthetic substrates which will have commercial importance.

The synthesis of particles in nano size plays an important role in research. Bio-polymers with reductive and free hydroxyl groups are exploited in the field of material science and nano-biotechnology. We have explored the possibility of using tamarind seed polysaccharide (TSP) as a template for the synthesis of nano particle. TSP was used as a soft sacrificial template, after forming a metal-polymer composite and the composite was further heated to a temperature of 600$^\circ$C. The metals used in the study were iron and copper in the form of nitrates, which on direct oxidation can form metal oxides and the as-synthesized particles were analyzed with Tunneling electron microscope, Scanning electron microscope, X-ray diffraction and Raman spectra.
The as-synthesized particles were found to be alpha-iron oxide and copper oxide, which were transparent and arranged in an array of 50-150 nm in size. The ratio of metal to polymer was similar to the previous reports, but the formed metal oxide morphology was found to be completely different.