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A novel approach toward the biodegradation of xenobiotic polymer

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Polymeric compounds become challenging due to their persistent nature when released into the environment as a waste. Peroxidase enzymes play significant role in biodegradation of polymeric materials. Oxidative enzymes play significant role in biodegradation of recalcitrant materials. Fungi are important among microorganisms for production of extracellular enzymes. Peroxidase enzyme play significant role in biodegradation of polymeric materials. The present study aimed for production, molecular characterization and application of peroxidase for polymers degradation. Maximum enzyme production was observed in the presence of vertyl alcohol (8.76 µl/100 ml), urea (1.7 IU/ml). Statistical analysis indicate the significance of model for the optimization of the enzyme production on the basis of F value and P value<0.05. Purification of enzymes was done by column chromatography. The molecular weight estimation was carried out by SDS PAGE. A band of 46 kDa was observed for lignin peroxidase. Rate of biodegradation is 25% of polymer. The Fourier transform infrared (FTIR) spectroscopy of enzyme treated polymer revealed the structural changes as compared to control (without enzyme treatment. The significant change was observed in peak at wavelength 7866.09 cm-1 which attributes to C-H bonding. Degradation end product has no toxicity confirmed by phytotoxic and cytotoxic analysis. Application of enzyme on different substrate (polystyrene, polypropylene, polyvinyl chloride) indicates the different level of degradation. It can be concluded that biosynthesis of lignin peroxidase enzymes have the potential for biodegradability of recalcitrant plastic waste and can be used for plastic waste treatment at large scale.

Biography

Nazia Khatoon is currently a PhD student working on the biodegradation project with Marc Deshusses at Duke University Department of Civil and Environmental Engineering. She has published 4 papers in reputed journals.

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