THE PRESENT STUDY
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Mushroom cultivation is a potential biotech process for converting cellulotic waste materials into valuable food. Protein conversion efficiency and yield are more in mushrooms when compared to plant and animal sources. Mushrooms have been recognized by Food and Agricultural Organisation (FAO) as food contributing to ameliorate the protein malnutrition of the countries, which are largely depending on cereals. The mushroom industry is a global expanding industry with world production greater than two million tons annually. Cultivation of mushrooms represents a major industry in the countries of South East Asia (Chang and Miles, 1991). International demand for oyster mushrooms has remained steady (at about 900,000 tone annually) over the last decade. Production of *Pleurotus* spp. accounted for 14.2% of the total world out put of edible mushrooms (Kues and Liu, 2000). In India, prevalence of varied climatic conditions and availability of vast quantities of lignocellulosic raw materials have stimulated the cultivation of *Pleurotus* spp. (Royse et al., 2004).

Total world production of agro-residues is 2,070 million tons, with 925 million tons (46%) being produced in Asia. India alone produces 321.4 million metric tons. These lignocellulosic wastes are the most difficult to be degraded and are partially burnt or disposed on land and then decomposed. Degradation by physical and chemical methods are not generally acceptable because of high cost and low degradability. The degradation of lignocellulosic wastes is achieved appreciably only by the white-rot fungi (Tuor et al., 1995). Among the white rot fungi, *Pleurotus* spp., belong to the group of white – rot fungi, which are capable of extensive lignin degradation (Couto et al., 2003). Because of this property, the various lignocellulosic wastes are used as substrates for the cultivation of *Pleurotus* spp. in solid state fermentation techniques. After the solid state fermentation, the degraded agro wastes are not properly used and are burnt down or discarded as waste materials. But these degraded waste materials could be the best source for various industrially important enzymes which could be
utilized for pulp and paper making process, tea fermentation, xenobiotics degradation, including azo dyes and waste water treatment processes.

Pulp and paper industry requires huge quantities of lignocellulosic biomass for paper production. For making paper, the lignocellulosic materials are subjected to various bleaching processes. Present day bleaching of kraft pulp uses large amounts of chlorine, the by products of which are toxic, mutagenic, persistent and bioaccumulating and cause numerous harmful disturbances in biological system. Biological alternatives to traditional pulp and paper industry processes have been the focus of extensive research in recent years. Use of laccase mediated (LME) system for effective delignification of kraft pulp is one such process. Enzymes also offer a simple approach that allows for a higher brightness ceiling. The LME systems have been also used for delignification of pulp and paper industrial effluents.

Dyes and pigments are extensively used for several industrial applications such as textiles, printing and manufacture of pharmaceuticals, foods and toys. Azo dyes, the most widely used chemical class in the textile and food industries, are xenobiotic compounds characterized by the presence of one or more azo linkages (\(-N = N-\)) and aromatic rings. It is estimated that 10 to 15 % of total dyes used in the dyeing process may be found in wastewater. Most of these dyes are carcinogenic and they pose serious environmental problem.

In urban and rural areas, large amounts of lignocellulosic wastes (agro and agro industrial wastes) are produced due to various domestic and industrial processes. Generally, this energy rich biomass is not properly utilized and is disposed off as a waste. But, if this biomass is properly treated, it will be a good source of manure.

In the recent years, research on use of biological and their enzymatic systems, especially the ligninolytic systems, for pulp and bleaching, for treatment
of effluents and for degradation of dyes and other xenobiotic compounds is getting momentum. Hence, in the present study, two agro wastes (cotton stalk and sorghum stover) and one agro-industrial waste (coir fibre) were tried as substrates for the cultivation of *P. sajor-caju*, *P. platypus* and *P. citrinopileatus*. The yield of mushrooms, nutrient composition of the fruit bodies, biological efficiency, energy value of the substrates and energy recovery of the mushrooms were analysed. The ability of these strains to convert the plant polymeric substances, cellulose, hemicellulose and lignin into simple compounds and thereby to increase the nutrient content and digestibility of the substrates were also analysed.

*Pleurotus* spp. were grown in C-limited medium of Janshekar and Fiechter (1988) for ligninolytic enzymes (LiP, MnP and laccase) production. The optimum culture conditions for maximum ligninolytic enzymes production (incubation period, pH, temperature, carbon and nitrogen sources) were determined; the enzyme properties (optimum temperature, pH, *V*<sub>max</sub>, *K*<sub>m</sub>, molecular weight and pI) were elucidated. The possible application of these fungi and their enzymes in various biotechnological processes like biopulping and bleaching of *E. grandis* hard wood kraft pulp, deinking of waste papers, treatment of pulp and paper industry effluent, degradation of azo dyes, composting of agro residues and also in production of vermicompost were tried.