1. INTRODUCTION

Vast quantities of renewable ligno-cellulosic agro-industrial wastes are generated every year in developing countries like India which depend totally on agricultural economy (Bisaria et al., 1987a). Ligno-cellulosic substances are the most abundant naturally-occurring polymers in the biosphere (Allosopp and Seal, 1986).

The molecular structure of ligno-cellulose presents a barrier for bio-degradation. As natural polymer, the ligno-cellulosics invite the evaluation of biological methods for their exploitation, and in recent years considerable research efforts have been invested to understand the mechanism played by various micro-organisms (Harvey, 1986). For a long-range solution to our resources, problems of energy and food, cellulose is the only renewable carbon source that is available in large quantities. Efficient and controlled bio-degradation of ligno-cellulosic materials by fungi or bacteria would lead to a number of products of great
economic importance. Hence, global efforts are being initiated for proper utilization of these abundant wastes.

Mushroom cultivation is one of the economically feasible and eco-friendly processes for bio-conversion of different ligno-cellulosic residues. Most of the mushroom species in general represent efficient and effective examples of the microbial world gifted with the unique ability of lignolytic activity to degrade lignin besides cellulose and hemicellulose. Mushrooms have a tendency to concentrate nitrogen in their growth substrate consequent to their mycelial ramification. The existing mycelial cells start utilising the soluble sugars/nitrogenous compounds available in the growth substrate, multiply their cell number, which consequently switch over to the secretion of degradatory enzymes to release the desired sugars/nitrogenous substances (Harper and Lynch, 1985). Besides, they produce fruiting bodies with high protein, most of the essential aminoacids, valuable vitamins, minerals, low fat and carbohydrates (Hayes and Haddad, 1976; Bano, 1976; Haque and Chakvabarti, 1982).

Species of oyster mushroom in the genus *Pleurotus* are commonly available as wood decomposers in forests throughout the world. They are the well-known white rot edible Basidiomycetes normally cultivated on
cereal straws, and they produce a wide range of extra-cellular enzymes to degrade complex ligno-cellulosic substrates into soluble products. The ability of *Pleurotus* spp. to excrete hydrolysing enzymes enables them to flourish over a wide range of ligno-cellulosic substrates. A greater understanding of enzymatic process during the growth and development of *Pleurotus* spp., would help in optimising the conversion of the ligno-celluloses into food, feed and organic manure (Gupta and Langa, 1988; Wood and Smith, 1988; Scaria *et al.*, 2000).

Species of *Pleurotus* are noted for their culinary properties and broad adaptability under varied agro-climatic conditions. The genus *Pleurotus*, though relatively new to the mushroom industry, has gained much popularity the world over and is presently believed to be the potential competitor to the commonly cultivated temperate mushroom (*Agaricus bisporus*) which is the leader in total production. In many countries, edible *Pleurotus* species are collected and cultivated as choice edibles and have been the subject of many taxonomic and genetic studies (Ghose and Gosh, 1978; Sivaprakasam *et al.*, 1986; Zadrazil and Dube, 1992).

In Tamil Nadu, every year about 20 million tonnes of crop residues are available. If one fourth of this quantity is used for mushroom
production, around 1.97 million tons of oyster mushroom containing 0.05 million tons of quality protein could be made available to the consumers (Krishnamoorthy and Marimuthu, 1991).

A lot of work has been done on the suitability of various substrates for Pleurotus production. *P. sajor-caju* and *P. flabellatus* are found to grow on various substrates, namely, paddy straw, wheat straw, ragi straw, hulled maize cob, waste cotton, banana pseudo-stem and waste paper (Agarwala, 1973; Jandaik, 1976; Bano and Rajarathnam, 1982; Bahrain, 1989; Kalavalli and Xavier, 2000).

Mushrooms are identified as food contributing to the protein of countries depending largely on cereals (Bahl, 1987). The food value of oyster mushroom on the basis of their nutrients has been studied by various scientists (Rai and Saxena, 1990; Pandey, 1991; Bajaj *et al.*, 1996 and Xavier and Kalavalli, 2000). To those suffering from diabetics and hypertension mushrooms are considered an ideal diet because of their low fat and carbohydrate contents (Bahl, 1987; Marimuthu *et al.*, 1991; Pandey, 1991). They are considered a delicacy not only for their nutritive value but also for their flavour, taste and texture (Bano *et al.*, 1987; Marimuthu *et al.*, 1991; Khandar *et al.*, 1991).
A large number of fungal competitors like *Trichoderma* sp., *Pencillium* sp., *Chaetomium* sp., *G/iocladium* sp., *Aspergillus* sp., etc. were reported from oyster mushroom beds affecting the growth and yield of mushrooms (Sharma and Jandaik, 1980; Marimuthu *et al.*, 1989).

It is well known that the incorporation of organic compost increases the rhizosphere beneficial microflora and makes the soil suppressive to soil borne pathogens (Papavizas and Lewis, 1985). Coirpith is a highly ligno-cellulosic waste dumped on roadsides in large quantities, and it creates environmental pollution problem. As it is a recalcitrant agro-waste, the total destruction of ligno-cellulosic compounds is not possible. But the organisms that produce cellulolytic and lignolytic enzymes are capable of degrading coirpith (Nagarajan *et al.*, 1985; Mani and Marimuthu, 1992).

Spent substrate of mushrooms can act as organic manure and thus help in substituting chemical fertilizer. The natural ligno-cellulosic wastes degraded by *Pleurotus* mushroom could be used as garden manure as they enrich the nitrogen content of the soil (Wang *et al.*, 1984; Rajarathnam and Bano, 1987; Nallathambi and Marimuthu, 1993; Mani *et al.*, 1991). The composted coirpith can be used as organic manure without any adverse effect on crop growth and it also acts as a carrier of
bio-control agents *viz.*, *Trichoderma* spp. and *Chaetomium* spp. (Savithri and Khan, 1994; Ramamoorthy *et al.*, 1999). Keeping in view the aforesaid aspects, the present study has been taken up with the following objectives:

- Analysis of the utilisation of selected plant residues by different *Pleurotus* spp. for biomass production;
- Evaluation of competitor moulds of *Pleurotus* spp. as antagonistic fungi against root rot pathogen; and
- Utilization of fungal inoculants for decomposition of coirpith, and performance analysis of coirpith compost as organic manure and for biological control of plant pathogen.