J. Mountain Res. Vol 2 pp.13-18, 2007

INFLUENCE OF TEMERATURE AND pH DURING RADIAL GOWTH OF *PLEUROTUS* SPECIES ON DIFFERENT LIGNOCELLULOSIC WASTES

M.P. Singh*, Abhishek Kr. Srivastava, Sanjay Kr. Vishwakarma Vivek Kr. Pandey Ashwini Kr. Pandey and Devinderjit Singh Sidhu**

Department of Biotechnology, V.B.S. Purvanchal University, Jaunpur-222001 (India)

*** Department of Botany, S.C.D. Government College, Ludhiana (Punjab)*

**e-mail:mohanbio_62@yahoo.co.in; mpsingh_07@yahoo.com*

ABSTRACT

The three species of *Pleurotus* i.e. *P. sapidus, P. roseus* and *P. fossulatus* grown on three lignocellulosic wastes viz. sugarcane bagasse, brassica haulms, cauliflower wastes and radish leaves showed maximum radial growth at 30°C at both the pH 5.5 and 6.0. Radish leaves supported better and cottony growth of *Pleurotus species* than other two substrates. However, *P. fossulatus* grown on sugarcane bagasse at pH 5.5 and 30°C showed better growth than radish leaves. From the pH studies it was observed that pH 6.0 supported maximum radial growth on all the substrates except on sugarcane bagasse by *P. fossulatus*.

Key words: Radial growth, pH, temperature, *Pleurotus* species.

INTRODUCTION

Huge quantities of lignocellulosic wastes are generated through the activities of agriculture, horticulture, forests, food and wood processing industries. The total world production of agricultural wastes alone is 4664.63 million tones of crop residues (Tiwari and Ahlawat, 2007). The major part of these agrowastes is used either as fodder or dumped *in situ* in the fields or burnt without considering the repercussions of environmental pollution. Lignocellulosic wastes can be used for the maximization of mushroom production per unit area at minimum cost which in turn can provide even cheaper source of food protein.

Pleurotus is commonly known as oyster mushroom which grows naturally in the temperate or tropical forest on dead and decaying wooden logs or some times on the outer bark of living trees (Singh *et al*, 2006). Most of the known species of *Pleurotus* are edible and several have been successfully brought under artificial culture, which can effectively degrade lignocellulosic wastes and provide nutritious food (Singh, 2000; Singh

and Kaushal, 2001;Singh and Sharma, 2002 and Singh and Gautam, 2004).

Several factors influence the mycelial growth and fruit bodies development along with the yield performance of *Pleurotus* species. Temperature is one of the most important physical factors affecting the growth and development of *Pleurotus* species. The temperature extreme (maximum and minimum) determines the mycelial growth as well as fruit bodies production. The optimum temperature for growth and production are more frequently of interest of experimental investigators. Like temperature pH is important to the growth and development. Keeping these objectives in view present investigation was taken up.

MATERIALS AND METHODS

Four lignocellulosic wastes viz. sugarcane bagasse (*Saccharum officinarum*), brassica haulms (*Brassica campestris*), cauliflower leaves and wastes (*Brassica capitatum*), radish leaves (*Raphanus sativus*) along with three species of *Pleurotus* i.e. *P. sapidus, P. roseus,* and *P. fossulatus* were selected in the present investigation. Experiment was conducted on solid media to study the influence of temperature and pH during radial growth of *Pleurotus* species. The mushrooms were grown on these lignocellulosic wastes at temperature 25°C and 30°C and pH 5.5 and 6.0 in solid medium.

Solid medium was prepared using 2% agar and 3% lignocellulosic wastes in distilled water. The medium was warmed till the agar was dissolved in the distilled water and then autoclaved at 121°C and 15 psi pressure for 20 minutes. The pH of the medium was adjusted at 5.5 and 6.0 and 10 ml medium was poured in each petriplate (9 cm diameter) under *in vitro* condition. The medium was allowed to solidify in petriplate. After solidification 5mm plug of 10 days old culture was inoculated. The inoculum was cut out with the help of cork borer, which was fully sterilized. The growth of *Pleurotus* species mycelium was measured in term of radial distance at three days interval till the petriplate were completely covered. The experiments were conducted at the temperature 25°C and 30°C and pH 5.5 and 6.0. Throughout the experiment three replicate of each condition was used and their average was taken as quantitative measure for determining radial growth of *Pleurotus* mycelium.

RESULTS AND DISCUSSION

The influence of temperature on the radial growth of *Pleurotus* species at pH 5.5 is presented in table1. At 25°C all the three species i.e. *P. sapidus, P. roseus* and

P. fossulatus showed relatively slow mycelial growth on sugarcane bagasse, brassica haulms, cauliflower leaves and radish leaves agar media. However, at this temperature brassica haulms agar medium supported faster growth than other two substrates. All the three species of *Pleurotus* took 12 days on all the solid media to fill the petriplate at this temperature except *P. sapidus*, which took only 9 days to cover the petri plate on brassica haulms agar media. However, at 30°C *P. fossulatus* showed rapid growth and took only 6 days to fill the plate on sugarcane bagasse. In other cases *Pleurotus* species took generally 9 days to fill the petri plates. The radial growth of *Pleurotus* species at pH 6.0 is shown in table 2. All the *Pleurotus* species performed well in terms of radial growth on all the substrates. There was no appreciable difference in the mycelial growth of different species of *Pleurotus*.

The desired temperature for the vegetative growth of *Pleurotus* species was reported as 20-30°C in large geographical area (Sohi and Upadhyay, 1989). They observed maximum growth of large number of *Pleurotus* species at 30°C. Singh (1997) and Singh et al (2006) found maximum mycelial growth at temperature 30°C. The present observations are also in conformity with the findings of Zadrazil (1976, 1978), Quimio (1977) in case of *P. ostreatus*. They reported maximum mycelial growth at 30°C. However, Rangad and Jandaik (1977) reported 25 °C optimum temperature for maximum mycelial growth of *P. ostreatus*(Grey).

Hashimoto and Takahashi (1976) and Zadrazil (1976) recorded pH 5-6.5 optimum range for the growth of different species of *Pleurotus*.Singh (1997) and Singh *et al.* (2006) reported maximum mycelial growth at pH 6. They observed that *Pleurotus* species failed to grow at pH 4.0 and 8.0. In the present investigation pH 6 was found to be optimum pH for vegetative growth of *Pleurotus* species.

REFERENCES

Hashimoto, K. and Takahashi, Z. 1976. Studies on growth of *Pleurotus ostreatus*. *Mush. Sci.*, 9:585-593.

Quimio, T. H. 1977. Indoor cultivation of *Pleurotus ostreatus*. *Philippine Agriculturist*, 61:253-262.

Rangad, C. O. and Jandaik, C.L. 1977. Cultural studies on some *Pleurotus* species. *Ind. J. Mush.*, 3:13-17.

Singh, M. P. 1997. Studies on Biodegradation of compost and growth behaviour of oyster mushroom. *Ph. D. Thesis,* Panjab University Chandigarh, India.

Singh, M. P. 2000. Biodegradation of lignocellulose waste through cultivation of *Pleurotus sajor-caju*. In; *Science and cultivation of edible fungi,* Van Griensven (ed.): Balkema, Rotterdam, pp. 517-521.

Singh, M.P. and Kaushal, S.C. 2001. Common grass: a potent substrate for cultivation of oyster mushroom. *Mush. Res.* 10: 43-45.

Singh M.P. and Sharma, R. 2002. *Pleurotus florida* Eger – an effective biodegrader of steam sterilized lignocellulosic wastes. *Pollution Res.* 21: 63-67.

Singh, M.P. and Gautam, N.C. 2004. An overview of lignocellulose Biotechnology. In: *Recent Advances in Biotechnology*, N.C. Gautam and M.P. Singh (eds.): Indica Publishers and distributors, New Delhi, pp. 1- 20.

Singh, M. P., Pandey, V.K., Pandey, A.K. and Singh, S.K. 2006. Effect of temperature and pH on mycelial growth of oyster mushroom (*Pleurotus* species). *J. Mountain Res.*, 1:15-20.

Sohi, H. S. and Upadhyay, R.C., 1989. Effect of temperature on mycelial growth of *Pleurotus* spp. and their yield performance on selected substrates. *Mush. Sci.* 12: 49-56.

Tiwari, R. P. and Ahlawat, O.P. 2007. Recycling of agro-wastes for microbial protein production through mushroom production. In: *International Conference on Mushroom Biology and Biotechnology*, NRCM, Solan (abstract), pp 85-86.

Zadrazil, F. 1976. The ecology and industrial production of *Pleurotus ostreatus, Pleurotus florida, Pleurotus cornucopiae* and *Pleurotus eryngii. Mush Sci.*, 9:621-652.

Zadrazil, F. 1978. Cultivation of *Pleurotus*. In: *The Biology and Cultivation of Edible Mushrooms*. S.T. Chang and W.A. Hayes (eds.): Academic Press, New York, Pp. 521-527.