Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online)
An Online International Journal Available at http://www.cibtech.org/jls.htm
2011 Vol. 1 (3) July-September, pp.56-59/ Shah et al.
Research Article

Cultivation of *Pleurotus Sajor – Cajo* on Wheat Straw, Water Hyacinth and Their Combinations

***Fatema Shah, SS Khan, Mahnaaz Khan and Arshiya Tanveer**
Department of Microbiology, Saifia Science College, Bhopal – 462001, India
**Author for Correspondence*

ABSTRACT
The present investigation was carried out to study the cultivation of *Pleurotus sajor – cajo* on Wheat straw, Water hyacinth and their combinations. The results obtained revealed that the best response in the form of pin head appearance and productivity of mushroom came from the bags containing Wheat straw only (3.1 kg), followed by the3:1 combination of Wheat straw + Water hyacinth (2.6 kg), 1:1 combination of Wheat straw + Water hyacinth (1.9 kg), 1:3 combinations of Wheat straw + Water hyacinth (1.5 kg) and only Water hyacinth (0.77 kg), where respectively it took 16, 20, 25, 30 and 40 days for the appearance of pin heads.
Keyword: Water hyacinth, *Pleurotus sajor-cajo*, pin head, productivity and mushroom.

INTRODUCTION

Water hyacinth known as "Jalkumbhi" is a common aquatic weed, found in almost all water habitats and reservoirs in and around Bhopal city. In America it is known as "Dollar weed". Water hyacinth (*Eichhornia crassipes*) is an aquatic plant which can live and reproduce: inches to a metre in height. Water hyacinth was introduced into India as an ornamental plant nearly half a century ago (Oommachan, 1971)**.** It spreads rapidly and is found practically all over the country. It is serious pest in West Bengal, covering by its dense growth vast surface of rivers, lakes and ponds. It is estimated that about 30,000 acres of once clear water surface in West Bengal is infested with this noxious weed, the infested area being much larger during the monsoon months. Water hyacinth has invaded paddy fields in some areas and rendered them unproductive (Zadrazil, 1980). It has displaced many aquatic fodder grasses.

The weed obstructs wave action in the water and interferes with the activities of birds; it hinders the use of larvicides and other anti –mosquito measures. Navigation is hazardous in Water hyacinth infested waters. Decaying plant parts pollutes the atmosphere and the sources of drinking and bathing water.

The fresh plant contains approximately*:* moisture, 95.5; organic matter, 3.5; nitrogen, 0.04; ash, 1.1; P2O5, 0.06; and K2O, 0.2%. The dried plant contains: organic matter, 75.8; nitrogen, and ash, 24.2% (Sotulu, 2010). Although Water hyacinth is seen in many countries as a weed and is responsible for many of the problems outlined earlier in this fact sheet, many individual groups and institutes have been able to turn the problem around and find useful application for the plant. The plant though containing more than 95% water, has a fibrous tissue and high energy and protein content, and can be used for the variety of useful applications such as leaf protein and for the production of biogas (Mishra and Mishra, 2001).

Oyakava *et al*., (1968) utilised Water hyacinth as a substrate for the production of yeast, feeds and forages. Zadrazil (1977) reported the conversion of straw into feed by the members of *Basidiomycetes.* Nutritional evaluations of Water hyacinth (*Eichhornia crassipes*) was carried out by Alcantara *et al.,*(1981). Nageshwaran and his co-workers (2003) evaluated Water hyacinth and Wheat straw waste for the culture of oyster mushrooms.

A mushroom is fleshy, spore- bearing fruiting body of a fungus. It is rich in protein constituting a valuable source of supplementary food. Use of mushrooms can contribute positively in facing the challenge of world-wide food shortage, originating with rapidly expanding human population at the rate of more than 2 lakhs per day. The great value in promoting the cultivation of mushroom lies in their ability to grow on cheap carbohydrate materials and to transform various waste materials. The utilization of Basidiomycetes for the bioconversion of different plant waste to make feed for animals is reported by Zadrazil (1980).

Various varieties of edible mushrooms are used extensively in cooking, especially in Chinese, European and Japanese cuisines. Mushrooms are commonly rich in fibre and provide vitamins such as thiamine, riboflavin, niacin, biotin, cobalamine and ascorbic acid but not a significant source of vitamin D. However, there are some varieties of mushroom such as white button mushrooms which can become significant source of vitamin D after exposure to ultraviolet light (Bowerman, 2008). Mushroom are also a good source of some minerals including selenium, potassium and phosphorous. The species which we used in our study

was *Pleurotus sajor-cajo***.** *Pleurotus* is one of the important edible mushrooms gaining popularity in recent years. It is found growing naturally on dead organic materials rich in cellulose. It is very versatile in nature as far as substrate preference and growth are concerned. However, it can be grown on paddy straw, gunny bags, rice husk, chopped *Parthenium* stem, etc. (Dubey, 2007). In the present investigation, we have cultivated mushroom, using novel combinations of Water hyacinth and Wheat straw as a substrate. Eradication of Water hyacinth is a global problem and by using it as a substrate for the growth of edible mushroom shall help in its removal on one hand and food production on the other and that too at affordable cost.

MATERIALS AND METHODS

Water hyacinth (*Eichhornia crassipes*) was collected from lower lake of Bhopal city. They were brought to home and after removal of roots were cut into pieces having size of around 2 cm. Pieces were soaked into clean, clear water for approximately 6-8 hrs. The excess water was drained by spreading the weed on clear floor. The chopped pieces of Water hyacinth were then given heat treatment for destruction of their waxy layer by immersing into boiling water for 30 min. After which they were dried in shade until the required 65-70% moisture content was achieved. Prepared mushroom spawn of *Pleurotus* species (*sajor-cajo*) available locally was used for mushroom cultivation.

Ten polythene bags of 60cm x 30cm having perforation of 1cm on each side for gaseous exchange were now filled with alternate layer of raw material and oyster mushroom spawn (*Pleurotus sajor-cajo*) which helps to increase utilization of nutrient from raw material and help for uniform fructifications of mushrooms. The same method was used for preparation of Wheat straw substrate material which serves as control for monitoring mushroom growth and yield. The bags were kept in clean, dark room in ideal temperature condition of 20-25˚C with relative humidity levels of 70-80%. The conditions were maintained & proper ventilation was provided. The bags were left undisturbed until pinhead mushroom developed. Time taken for pinhead appearance and quantity of mushroom produced in each flush were recorded accordingly in the table below.

OBSERVATION

The appearance of pin head in all these bags took different time periods. It was 16 days for the bag containing Wheat straw only, 20 days for 3:1 combination of Wheat straw and Water hyacinth, 25 days for 1:1 combination of Wheat straw+ Water hyacinth, 30 days for the combination of 1:3 of Wheat straw and Water hyacinth and 40 days for the bag containing Water hyacinth only (Table 1). It is observed that Wheat straw served as the best substrate for the production of *P. sajor – cajo* and resulted on the production of 1.6 kg of mushroom in 16 days, followed by 3:1 combination of Wheat straw and Water hyacinth producing 1.2 kg in 20 days. Water hyacinth alone was not found conducive for mushroom growth as it took 40 days for first flush as produced only 0. 50 kg.

.

Table 1: Showing appearance of pinhead & final harvest of the mushroom *P. sajur-cajo* under various combinations of Wheat straw and Water hyacinth (*Eichhornia crassipes*).

S.No.	Substrate	Time taken for pin head appearance	Production of mushroom in kgs I flush	Production of mushroom in kgs II flush	Total kgs
1.	Wheat straw only	16 days	1.6 kg	1.5 kg	3.1 kg
2.	Wheat straw + Water hyacinth (3: 1)	20 days	1.4 kg	1.2 kg	2.6 kg
3.	Wheat straw + Water hyacinth (1: 1)	25 days	1.2 kg	0.75 kg	1.9 kg
4.	Wheat straw + Water hyacinth (1: 3)	30 days	0.80 kg	0.70 kg	1.5 kg
5.	Water hyacinth only	40 days	0.50 kg	0.27 kg	0.77 kg

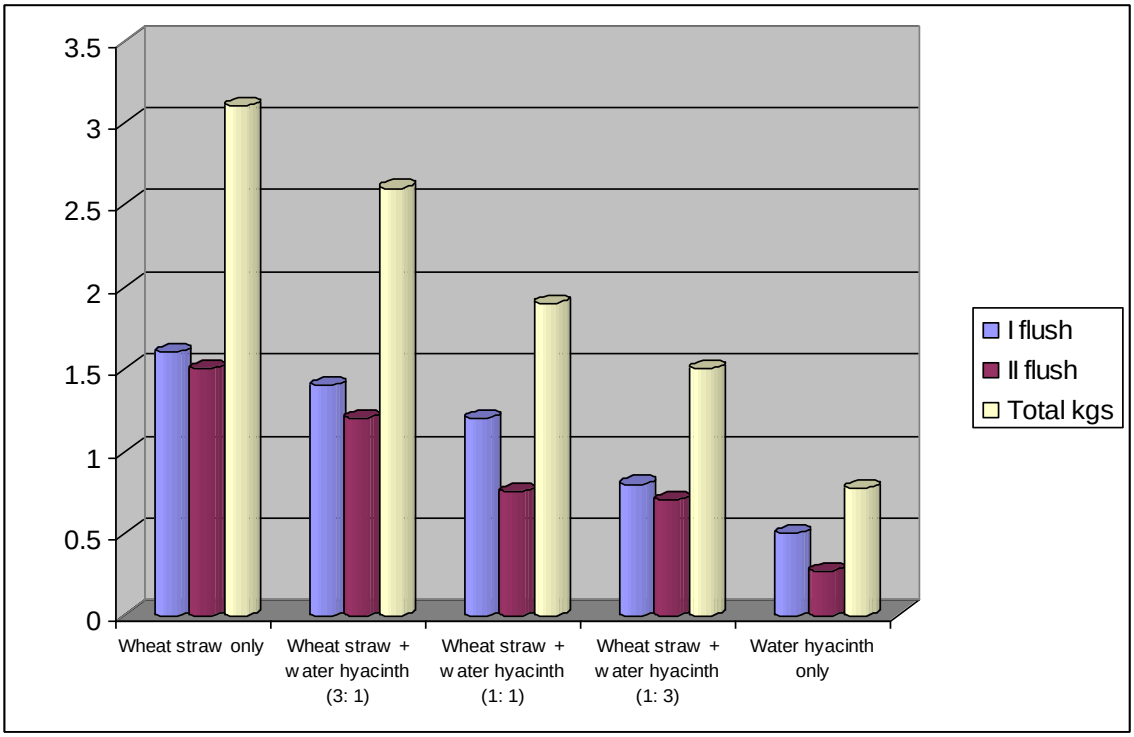

Figure1: Histogram showing productivity of *P. sajor-cajo* on Wheat straw, Water hyacinth and their combinations

RESULTS AND DISCUSSION

It is evident from table 1 that the productivity of *P.sajor cajo* differed under various substrates maintaining uniform conditions of temperature and humidity. Best response in the form of pin head appearance came from the bags containing Wheat straw only, followed by the3:1 combination of Wheat straw + Water hyacinth, 1:1 combination of Wheat straw + Water hyacinth, 1:3 combinations of Wheat straw + Water hyacinth and only Water hyacinth. It took 16, 20, 25, 30 and 40 days respectively for the appearance of pin heads. It means that with the increase in the amount of Water hyacinth, there was increase in the time period for the first appearance of pin heads and vice versa. This affected the final yield also, with the production of 3.1 kg of mushroom from the bag containing Wheat straw only, followed by 2.6 kg from the bag containing Wheat straw and Water hyacinth in 3:1 ratio. The yield was 1.9 kg in the bag containing 1:1 combinations of Wheat straw + Water hyacinth whereas it was 1.5 kg in the bag containing 1:3 combinations of Wheat straw and Water hyacinth. The yield was only 0.77 kg in the bag containing Water hyacinth only.

It is therefore concluded on the basis of the present investigation that, Water hyacinth, a troublesome aquatic weed cannot be exploited as a sole substrate for the production of mushroom and also its combination with Wheat straw did not support higher production of mushroom. However, Mishra and Mishra (2001) presented a paper at the proceedings of International Congress of Chemistry Environment held at Indore on the utilization of Water hyacinth as an alternate substrate for mushroom cultivation of Wheat straw. They emphasised on the use of Water hyacinth on a large scale for mushroom cultivation on one hand and utilization of this weed for beneficial purposes, which shall also be useful in removing the weed from water bodies.

The results of the present investigation however, are not in conformity with the findings of Mishra and Mishra (2001) who have reported a yield of mushroom which is almost 1.5 times in case of Water hyacinth used as the sole substrate compared to the production on rice straw only. However, the present study indicates that increased ratio of Water hyacinth almost linearly decreased the productivity of the mushroom *P. sajor-cajo* and this may be attributed to a very high moisture content of *E. crassipes* (upto 95%) and a low nutritive value which did not support high production of mushroom

under study. Moreover, with increased ratio of Water hyacinth in the substrate, it took more time for the appearance of the pinheads and subsequently the harvest period was also delayed. Therefore, the use of Water hyacinth as a substrate for mushroom cultivation for better productivity is totally uncalled for

REFERENCES

Alcantara PF and Loobs AD (1981). Nutritional evolution of Water hyacinth (*Eichhornia crassipes*). *National Science Development Board and Technology Journal**6*** 15.

Bowerman, S (2008). If mushroom see the light Los Angeles Times, March 31, 2008.

Dubey RC (2007). Text of Biotechnology., S.Chand & Company Ltd; Ram Nagar, New Delhi, P:440.

Mishra V and Mishra A (2001). Water hyacinth and its utilization for mushroom cultivation. Published in the Proceedings of International Congress of Chemistry and environment (ICCE-2001)16th-18th Dec., Indore, India. Editor – Dr. S.l.Gargh.187-188.

Nageshwaran, MA, Krishnan G, Ganeshan M, Vedhamurthy, AA, and Selvaganapathy E(2003). Evaluation of Water hyacinth and Wheat straw waste for oyster mushrooms. *Journal of Aquatic Plant Management*., **41** 122-123.

Oommachan, M. (1971). The Flora of Bhopal. J. K. Jain Brothers, Motia park, Bhopal.

Oyakawa N,Orlandi W and Valente, EOL (1968). The use of *Eichhornia crassipes* in the production of yeast, feeds and forages quoted from E.C.S. Little Handbook of Utilization of Aquatic plants, FAO, Rome.**11** 318-327.

Sotulu, AO (2010). Digestibility value and nutrient utilization of Water hyacinth (*Eichhornia crassipes)* meal as plant protein supplement in the diet of *Clarias gariepinus* (Burchell, 1822) Juveniles. *American Eurasian Journal of Agricultural and Environmental Sciences **9*** (5) 539- 544.

Zadrazil F (1977). The conversion of straw into feed by Basidiomycetes. *European Journal of Applied Microbiology* **4** 273-281

Zadrazil F (1980). Conversion of different plant wastes into feed by Basidiomycetes. *European Journal of Applied Microbiology* **9** 243-248.

.