Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 25, No. (3) : 2023 : 418-421
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ISSN-0972-3005

DOI No.: http://doi.org/10.53550/AJMBES.2023.v25i03.005

EFFECT OF WHEAT BRAN AND GRAM FLOUR ON YIELD AND BIOLOGICAL EFFICIENCY OF WHITE OYSTER MUSHROOM [*PLEUROTUS FLORIDA* (MONT.) SINGER]

RUCHI KUMARI, SHIV KUMAR YADAV AND ABHILASHA A. LAL

Department of Plant Pathology, Naini Agriculture Institute, Faculty of Agriculture,
Sam Higginbottom University of Agriculture, Technology, and Sciences, Prayagraj, U.P., India

(Received 22 January, 2023; Accepted 20 March, 2023)

Key words: *Biological efficiency, Cost-benefit ratio, Pleurotus florida, Supplementation, Yield.*

Abstract– Mushrooms are magic living organisms that need very few things to grow. They are low in calories but rich in protein and are nutritionally placed between meat and vegetables and hence may be called vegetable meat. The addition of supplements with substrate has been a common practice for enhancing mushroom yield and nutritional value. The present experiment was carried out to find a suitable supplement combination for the cultivation of *Pleurotus florida*. Two supplements, namely wheat bran and gram flour, were mixed with wheat straw in different concentrations to enhance mushroom growth. The result of the present experiment revealed that supplementation with 20% wheat bran+5%gram flour (T1) enhanced yield significantly in all three flushes (176.27g) and biological efficiency (188.24 %) as compared to control and other treatments. The cost-benefit ratio was also superior in the case of 20% wheat bran + 5%gram flour (T1) (6.86:1).

INTRODUCTION

Most of the cultivated species of mushrooms belong to the phylum Basidiomycota, although some Ascomycota such as members from the genera *Morchella* or Tuber has also been successfully cultivated. Mushrooms are fleshy, spore-bearing reproductive structures of fungi grown on organic substrates. They have played an important role as human food for a long time due to their nutritional and medicinal properties (Etich *et al.*, 2013). Cultivated and wild mushrooms are a good source of protein, vitamins, minerals, carbohydrates, and fibers and are known to have a broad range of uses both as food and medicine. Mushroom cultivation is one of the most profitable and environmentally friendly enterprises, among various crops in India. Mushrooms are low in calories but rich in protein, and are nutritionally placed between meat and vegetable hence mushrooms may be called vegetable meat. Mushrooms being low-calorie food with very little fat are highly suitable for obese persons. With no starch and very low sugars, they are the "delight of the diabetic". In India, owing to varied agro-climate and abundance of farm waste, different types of temperate, tropical, and sub-tropical mushrooms are cultivated throughout the country (Pathania *et al.*, 2017). Oyster mushrooms are the easiest and least expensive commercial mushrooms to grow because they are well known for the conversion of crop residues to a food protein. The Oyster mushroom is an edible mushroom having excellent fragrance and taste and its cultivation on crop residues is considered a potential source of income, alternative food production, provision of employment, and recycling of agricultural wastes. *Pleurotus* species (*P. florida, P. ostreatus, P. sajor-caju, P. pulmonarius, P. eryngii, P. cornucopiae, P. citrinopileatus,* and *P. flabellatus*) are commercially very important edible mushrooms found all over the world. *Pleurotus* spp. can be grown using various agricultural waste materials. The different species of *Pleurotus* grow within a temperature range of 20 to 300 °C hence is becoming increasingly popular in both tropical and sub-tropical countries. In India, the cultivation of this mushroom is picking up at an alarmingly high rate due to the ease of its cultivation. *Pleurotus florida* is

characterized by a white spore print attached to decurrent gills, often with an eccentric (off center) stipe, or no stipe at all. Stanley *et al.* (2011) reported high nutritional values of *P. florida* with protein (25 - 50%), fat (2 - 5%), sugars (17 - 47%), mycocellulose (7 - 38%), and minerals (potassium, phosphorus, calcium, and sodium) of about 8 - 12%. They also possess a number of medicinal properties, such as antitumor, immunomodulatory, anti-genotoxic, antioxidant, anti-inflammatory, hypo cholesterolaemic, anti-hypertensive, antiplatelet-aggregating, anti-hyperglycaemic, antimicrobial, and antiviral activities (Gregori *et al.,* 2007). A significant number of agro-industrial lignocellulosic materials are used as substrates for the production of *Pleurotus* spp., like corn cobs, various grasses and leaves, red stems, maize, and sorghum stover, rice and wheat straw, vine shoots, cardboard and paper, wood, sawdust and chips, coffee pulp, cotton seed hulls, peanut shells, sunflower seed hulls, sugarcane, and tequila bagasse, etc**.** Mushroom supplementation is understood as a farming method based on the physical addition of nutritional amendments to compost, during the process of composting, the mixture of raw materials, at spawning, or during casing. Supplements are commonly manufactured products containing defatted vegetable meal, such as soybean meal and other organic protein sources, among them cereal bran, enriched with minerals or vitamins, which are frequently used for the cultivation of *Agaricus* and *Pleurotus* species. Nutritional supplementation of cultivation substrate is an important cultural practice of mushroom cultivation. Substrate supplementation with protein-rich materials was proved to enhance the yield of *Agaricus*, *Pleurotus,* and *Lentinula* strains (Naraian *et al.,* 2008). Yoshida *et al.* (1993) reported the highest yield with substrates (chopped straw or sawdust) mixed with wheat bran, rice bran, and bean curd refuse at 45%.

MATERIALS AND METHODS

The experiment was carried out in the Mushroom Crop Room and Research Laboratory, Department of Plant Pathology, SHUATS, Prayagraj, 211007 (U.P.), India during the period from January 2021 to April 2021. the base substrate of locally available wheat straw was supplemented with wheat bran and gram flour that were collected from the local area. Spawn of *Pleurotus florida* was procured from the Department of Plant Pathology, SHUATS, Praygaraj.

Experimental Design

In this experiment, the base substrate wheat straw was supplemented at different rates i.e., 0% (control), 20% wheat bran + 5%gram flour in T1, 20% wheat bran + 2% gram flour in T2, 10% wheat bran + 5% gram flour in T3 and 10% wheat bran +2% gram flour in T4. Each treatment was replicated six times. The effects of supplements were evaluated for days total yield (g/kg), biological efficiency (%), and cost-benefit ratio.

Substrate preparation

Wheat straw was used as the common substrate for all the treatments. The stubbles and hard sticks were removed which can damage the polythene bags. A hundred liter of water was filled in a clean drum of 500 liters capacity**.** In a drum of 500-liter capacity, 5-6 g of carbendazim and 120 ml of formaldehyde were added after which substrate *i.e.*, wheat straw was soaked for 15 - 17 hours. After 15 – 17 hours decanting was done and when the moisture of the substrate was about 55- 60%, then the substrate was ready for bagging.

Cropping and harvesting

Spawning was done at the rate of 20g per 1kg of wet substrate (Jarial *et al.,* 2020). The spawn was mixed with the wet substrate using a thorough method (Siddhant *et al.,* 2013).

The substrate along with the spawn was kept inside the polythene bag and the bags were closed tightly with a rubber band. The bags were kept in the sterilized crop room. 15 to 20 holes were made in the polythene bags using a sterilized needle for facilitating the aeration. All the spawned bags were kept at a distance of 20-25 cm apart from each other. When the mycelium covered the substrate entirely, the polythene bags were removed carefully with a sterilized needle without damaging the mushroom substrate. After 3-5 days of the removal of polythene bags, smaller pinheads appeared on the sides of the

blocks. To regulate the oxygen and carbon dioxide levels inside the mushroom crop room, windows were kept open for 1-2 hrs every day. After the maturation of fruiting bodies, handpicking was done.

Statistical analysis

In the present study, a completely randomized design (CRD) was applied for the analysis of the recorded data. The conclusions were drawn on the basis of analysis of variance (ANOVA). The calculated F was compared with the tabulated 5% level of probability at the appropriate degree of freedom.

RESULTS AND DISCUSSION

Effect of supplements on different parameters

The study was conducted to evaluate the best combination of supplements in stimulating the growth of *Pleurotus florida* so that productivity improved. The findings reveal that supplemented bags at different concentrations have better results in terms of biological efficiency, yield, and cost-benefit ratio than the ones without supplementation (Table 1 and Figure 1).

The result obtained was maximum biological efficiency was obtained in T1(83.6), average yield (176.27g) was also recorded in T1 - Wheat straw + Wheat bran (20%) + gram flour (5%).Treatment T1 was also found superior in terms of cost-benefit ratio with a C:B ratio of 6.86:1.

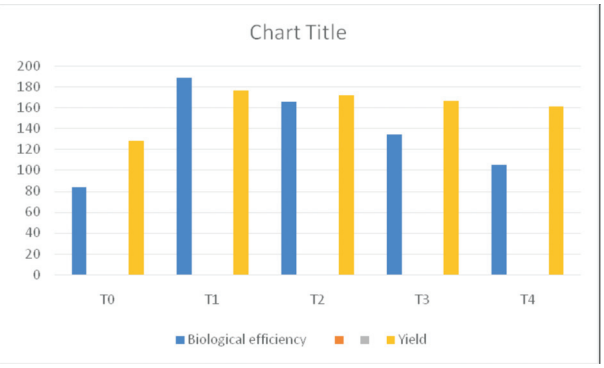

Fig. 1. Effect of supplements on different parameters of *Pleurotus florida*

CONCLUSION

As per the result obtained from this study, wheat straw supplemented with wheat bran (20%) and gram flour (5%) (T1) was proved to be best in terms of increasing mushroom yield along with biological efficiency and cost-benefit ratio. The probable reason for this is the presence of carbohydrates, amino acids, vitamins,vand minerals in wheat bran and the nitrogen content of gram flour. The results are of one cropping season (2020-2021) under Prayagraj agro-climatic conditions, as such to validate the findings more such trials should be taken up inthe future.

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Table 1. Effect of supplements on different parameters of *Pleurotusflorida*

Treatments	Biological efficiency (%)	Yield (g/kg)	Cost-benefit ratio
T0 Wheat straw	83.68	127.88	1.79:1
T1 Wheat bran (20%)+ gram flour (5%)	188.24	176.27	6.86:1
T2 Wheat bran (20%) + gram flour (2%)	165.15	171.90	5.86:1
T3 Wheat bran (10%) + gram flour (5%)	134.4	166.60	5.11:1
T4 Wheat bran (10%) + gram flour (2%)	104.91	160.77	4.43:1
CD (5%)	8.325	3.010	

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