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Growth and Yield of *Hypsozygous ulmarius* on Paddy Straw, Coir Pith and Jatropha Husk

P.A. Gowda, S. P. Shivakumar, B.G. Krishnappa, B.C. Mallesha, Aparna Radhakrishnan and Punith Raj, T. S.

Department of Agricultural Microbiology, College of Agriculture, UAS, GKVK, Bengaluru - 560 065, India.

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The substrates *viz*., Paddy straw, coir pith and jatropha husk alone and mixtures of these were used for the cultivation of *Hypsozygous ulmarius* mushroom. The maximum *Hypsozygous ulmarius* mushroom yield (558 g/bag) with bio-efficiency of (115.09%) was recorded with the substrate combination of paddy straw + jatropha husk, followed by paddy straw (541.67g/bag yield and bio-efficiency of 111.66%) alone, which is on par to each other. Significantly least yield (237g/bag) and bio-efficiency (48.83%) was recorded in coir pith alone compared to paddy straw and paddy straw in combination of jatropha husk.

Key words: *Hypsozygous ulmarius*, Mushroom substrates, Paddy straw, Coir pith and Jatropha husk.

Mushrooms are fruiting bodies of basidomycetes and some ascomycetes fungi, which are edible. Fleshy nature of mushroom and their nutritional value is responsible for its main attraction to human being as a source of food. Mushrooms and their products are used as delicacy and its consumption is rapidly increased as they have good taste, flavour and nutritive value. Its products can serve to improve the nutritional status and helps in alleviating protein deficiency. (Suresh Chandra *et al*, 2006). The mushroom production and productivity is gradually increasing every year. Presently Indian mushroom production is 2,50,000 tonnes per year and world mushroom production is 15 million tonnes per year, with 7% of growth rate per year (Anonymous, 2010).

* To whom all correspondence should be addressed.
Tel.: 09164517721;
E-mail: lolagowda007@gmail.com

Hypsozygous species are efficient lignin degrading mushrooms, which belonging to Hymenomycetes of Basidiomycotina. *Hypsozygous ulmarius* commonly called as elm mushroom or Blue/black oyster mushroom. Cellulose rich organic substrates are found to be good for the cultivation of these mushrooms. Therefore the cellulose rich agricultural wastes or byproducts of agro industry like paddy straw, coir pith, sugarcane bagasse, wheat straw, banana leaves, hulled maize cobs etc., can be used as substrates for cultivation of *Hypsozygous species.*

Jatropha has a great potential and value to be exploited in its natural environment of semiarid and arid conditions in the tropics. The traditional and successful application of this crop includes soil water conservation, soil reclamation, erosion control, living fences, fire wood, organic fertilizer and local use in soap production, insecticide and medicinal application at modest scale. Now grown for biofuel in barren land.

MATERIALS AND METHODS

The laboratory experiment of mushroom cultivation was carried out in the Department of Agricultural Microbiology, University of Agricultural Sciences, GKVK, Bengaluru-65.

Selection of different substrates and mushroom culture

Coir pith

Coconut coir pith obtained from a coconut coir industry, Rajanakunte, Chikkaballapura (Karnataka) was used for various experiments in this study. Air dried samples devoid of bigger coconut husk pieces, clods and other foreign objects was used.

Jatropha husk

The jatropha husk obtained from the Germ plasm collection plot of the Department of Genetics and Plant breeding, University of Agricultural Sciences, GKVK, Bengaluru-65.

Paddy straw

Paddy straw was obtained from farmers of Mandya and stored in the Mushroom Laboratory, of the Department of Agricultural Microbiology, UAS, GKVK, Bengaluru-65.

Mushroom cultures

The pure culture of *Hypsozygous ulmarius* was used from the mushroom laboratory, Department of Agricultural Microbiology, UAS, GKVK, Bengaluru-65.

Development of spawn

Spawn for mushroom cultivation was prepared by following the standard procedure (Krishnamoorthy, 1981). For this purpose, uninfected, clean sorghum grains were washed in clean water three times and cooked, until the seed coat was just opened. The moisture content of half boiled grains was adjusted by air drying, to obtain around 50 to 55 %. This was followed by mixing with 2 % of calcium carbonate and 2 % of calcium sulphate. This admixture was filled into polypropylene bags of 15 x 20 cm of 250 gauge. It was filled to 2/3 capacity to have proper aeration and enable easy handling. Mouth of the poly propylene bag was closed with rubber band so as to avoid entry of moisture upon sterilization. The bags were sterilized in an autoclave at 121^0C and 15 psi for 45 minutes. After sterilization the bags were cooled and inoculated with mushroom mother culture of *Hypsozygous ulmarius* and incubated at room temperature. Mushroom mycelium (cottony growth) covered the entire sorghum in the bag in about 10-12 days. After complete growth on substrate, spawn packets were used for further studies.

Cultivation of Oyster mushroom

Substrate selection

Paddy straw, coir pith and jatropha husk were used as a substrate for *Hypsozygous ulmarius* mushroom cultivation (Plate 1).

Preparation of substrate

Cultivation was carried out by following the method of Desai and Shetty (1982). Jatropha husk, coir pith in combination with paddy straw was used for the cultivation of *Hypsozygous ulmarius* mushroom. The substrates were soaked in fresh water for 10 hrs in a container. The excess water was allowed to drain off and the substrate was pasteurized using steam for 30 minutes at 85^0C in a closed chamber. The pasteurized substrate was spread on a clear cement floor inside the room and allowed to cool to room temperature.

Spawing and spawn running

In this study, substrates were filled to polythene bag of size 30 cm x 45 cm of 150 gauge thickness. Hundred gram spawn of *Hypsozygous ulmarius* was used for filling of each bag or 5 % of spawn on wet weight basis of substrate for layer spawning, leaving 5 to 7 cm gap at the top and the mouth of the polythene bag was closed tightly with a rubber band. Three small holes were made at the bottom of the bag and 5 to 6 holes all over the bag for drainage and air exchange respectively. These bags were kept on racks in mushroom growing rooms. During spawn running humidity of 70-80 % was maintained in cropping room.

Table 1. Growth and yield of *Hypsozygous ulmarius* on different substrates

Substrates	Yield (g/bag)	Bioefficiency (%)
Paddy straw (Control)	541.67^{ab}	111.66^{ab}
Coir pith	237.00^{e}	48.83^{d}
Jatropha husk	521.67^{b}	107.54^{ab}
Paddy straw + coir pith	488.00^{c}	100.60^{b}
Paddy straw + jatropha husk	558.33^{a}	115.09^{a}
Coir pith + jatropha husk	397.33^{d}	81.90^{c}
SEm±	4.71	2.99
C. D. at 5%	14.51	9.23

Cropping

After complete growth of mycelium on the substrate, the polythene bags were cut open using scissors. These opened bags were kept 15 cm apart on racks. Relative humidity was maintained at 80-85 % by spraying water in the rooms. Watering of the opened bags was done at regular interval to maintain moisture. Buds developed into fruiting body. Finally, the fruiting bodies, before they shed the basidiospores, were harvested and the fresh weight was recorded and the yield and bio efficiency of *Hypsozygous ulmarius* mushroom was calculated.

Estimation of Bio - efficiency

Fully matured fruiting bodies of oyster mushrooms were harvested prior to curling up at margin. Harvesting was done prior to watering and fresh weight was recorded soon after the harvest of mushroom. Further, each bag was allowed to stand for 3 croppings

Bio-efficiency of *Hypsozygous ulmarius* mushroom was calculated by using the formula given by Chang and Miles (1989).

$$\text{Bio efficiency} = \frac{\text{Fresh weight of mushrooms}}{\text{Dry weight of substrate}} \times 100$$

RESULTS AND DISCUSSION

Mushrooms yield on different substrates

Experiments were carried out to know the effect of different substrates on *Hypsozygous ulmarius* mushroom yield and bio-efficiency. The maximum *Hypsozygous ulmarius* mushroom yield (558 g/bag) with bio-efficiency of (115.09%) was recorded with the substrate combination of paddy straw + jatropha husk, followed by paddy straw (541.67g/bag yield and bio-efficiency of 111.66%) alone, which is on par to each other. Significantly least yield (237g/bag) and bio-efficiency (48.83%) was recorded in coir pith alone compared to paddy straw and paddy straw in combination of jatropha husk (Table1). The highest and lowest mushroom yield and bio-efficiency could be due to the nature and nutrient content of the substrate.

In different substrates the mushroom yield varies. This could be due to the nature and nutrient content of the substrate (Desai, 1982). The low yield and bio-efficiency in coir pith may be due to its nutrient content. Similar results were also noticed by Owseph (1999) with coir pith substrate.

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