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YIELD IMPROVEMENT AND PILOT SCALE CULTIVATION OF *PLEUROTUS EOUS* BY UTILIZING REEDS AS THE SUBSTRATE AND NUTRITIONAL ANALYSIS OF ITS HARVESTED FRUIT BODIES

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ABSTRACT

This research work concentrated on yield improvement of *P. eous* on unexplored locally available lignocellulosic materials such as paddy straw, reeds, banana stem, sugar cane bagasse, sugar cane leaves, coir pith, sorghum husk and sunflower stem. The maximum bioefficiency of *P. eous* was obtained from paddy straw (121.97%) followed by reeds (112.98%). Among eight substrates, pilot scale production was carried out in reeds and totally 103.05kg of fresh fruit bodies were harvested from 105 kg of dry substrate with bioefficiency of 98.14%.The nutritional parameters of harvested fruit bodies were analysed viz., carbohydrate (47.27g/100g), protein (28.35g/100g), fat (0.37g/100g), crude fiber (42.46g/100g), energy (305.89 kcal/100g) and moisture (10.19%/100g). Hence the present shows a positive path that *P. eous* can be cultivated using alternative substrate and its efficacy was tested at pilot scale. As this mushroom known to several medicinal properties this study will be further focused towards pharmaceutical applications.

Key words: *Pleurotus eous cultivation*, reeds, bioefficiency, nutritional parameters.

INTRODUCTION

Enormous amount of crop residues and other organic wastes are generated annually through the activities of agricultural, forest and food processing industries. About 385 million tones of agricultural wastes are available annually in India about half of this residue remains burned and neglected. If even one percentage of these crop residues used for mushrooms production,

India will become a major mushroom producing country in the world. [1] *Pleurotus* spp. is the valuable edible as well as medicinal mushrooms. It occupies the third place in the world's production of edible mushrooms. [2] The *Pleurotus eous*, popularly known as the oyster mushroom or pink color mushroom, is a commercially important edible mushroom, with high nutritive value, medicinal properties high yield and short crop cycle.

The present study focused on cultivation of *P. eous* by utilizing eight different locally available agricultural wastes and pilot scale production was carried out in reeds as an alternative substrate and estimated to nutritional parameters.

MATERIALS AND METHODS

Spawn preparation

Half cooked sorghum grains were mixed with calcium carbonate at the rate of 2 per cent (20 g/kg of seed) and filled in poly propylene bag (300g) and were autoclaved. The sterilized bags were aseptically inoculated with pure mycelium of *P. eous*, maintained on potato dextrose agar (PDA) slopes and incubated at room temperature (28±2 ℃). The spawn growth was completed in 12 to 14 days.

Mushroom bed preparation

The locally available lignocellulosic substrates such as paddy straw (PS), reeds (RD), banana stem (BS), sugar cane bagasse (SCB), sugar cane leaves (SCL), coir pith (CP), sorghum husk (SH) and sun flower stem (SFS) were utilized for mushroom bed production. Mushroom beds were prepared in polypropylene bags of size (30 × 60 cm). The substrates were sterilized at 121℃ for 90 minutes and shadow dried up to 60% moisture. The cylindrical polypropylene bags were filled up to 7 - 8 cm layer height with the processed substrates and 10 g of bed spawn was inoculated on the substrate along the circumference of the bags. The substrate was again layered to 5 cm height and spawn was inoculated along the corners of the mushroom beds with gentle pressing of the substrate in each layer for tight packing. The process was repeated until eight layers of spawn and substrate (90 cm) were packed. The inoculated bag was perforated (12 no's) with sterilized teasing needles.

Yield and bioefficiency

Total weight of all the fresh fruiting bodies harvested from all the four pickings were measured as total yield of mushroom. The bioefficiency (yield of mushroom per kg substrate on dry wt. basis) was calculated by the following formula. [3]

$$\text{B.E. (\%)} = \frac{\text{Fresh weight of mushroom}}{\text{Dry weight of substrate}} \times 100$$

Analysis of nutritional parameters

The fruit bodies of harvested *P. eous* mushrooms were dried in an oven at 40°C for 48 hours. The dried *P. eous* powder nutritional parameters (protein, carbohydrate, fat and crude fiber) estimated by following methods. [4-8]

RESULTS AND DISCUSSION

***P. eous* cultivation different lignocellulosic substrate**

Among eight lignocellulosic substrates, paddy straw recorded for the maximum production of fruit bodies 1097.75 g harvested in 4 intervals with a bioefficiency of 121.97% were recorded. However next to the paddy straw, reeds influenced for the production of fruit bodies 1016.9 g with bioefficiency of 112.98% (Table 1).

Table 1. Cultivation of *P. eous* using locally available lignocellulosic substrates

Substrates	SW* (g)	DFSR*	DPHF*	FH* (g)	SH* (g)	TH* (g)	FH* (g)	TMH* (g)	BE* (%)
PS	900	8	13-14	450	325	227.5	95.25	1097.75	121.97
RD	900	8	13-14	435.5	305.5	195.15	80.75	1016.9	112.98
BS	1000	8	13-14	303.15	278.15	138.36	91.75	811.41	81.14
SCB	950	8	13-14	365.20	219.10	119.25	100.5	804.05	84.63
SCL	850	9	14-15	265.27	220.16	110.17	56.19	651.79	76.68
CP	1000	9	14-15	170.35	110.56	105.23	100.30	486.44	48.64
SH	1000	8	13-14	375.24	286.56	178.25	85.75	925.8	92.58
SFS	750	9	14-15	195.75	176.40	150.55	56.30	579	77.20

Key: SW - Substrate weight in grams, DFSR - Days for spawn run, DPHF - Days for pinhead formation, G - Gram, FH - First harvest, SH - Second harvest, TH - Third harvest, FH - Fourth harvest, TMH - Total mushroom harvest, BE – Bioefficiency, PS- Paddy straw, RD- Reeds, BS – Banana Stem, SCB - Sugar cane bagasse, SCL – Sugar cane leaves, CP – Coir Pith, SH -Sorghum husk, SFS - Sun flower stem.

Pilot scale cultivation of *P. eous*

In pilot scale cultivation of *P. eous* fruit bodies, the complete colonization of mycelium in mushroom bed was recorded on day 8-9, and the pinhead primordial was appeared on day 12-13. The overall yield of 103.05 kg from 105 kg dried substrate and bioefficiency (98.14 %)

of fresh *P. eous* fruit bodies were recorded within 37 days in reeds as an alternative cellulosic substrate under pilot scale cultivation (Table 2). Several reports similarly supported that *P. eous* cultivated on locally available substrates such as wheat (62.5%), soybean (75%), paddy (60%- 135%), chick ling vetch (70%), gram (58.5%), pea (55%), maize (50%), coffee pulp (82.92%) and sorghum (53%) and recorded the maximum bioefficiency. [9-12]

Table 2. Cultivation of fruit bodies of *P. eous* on reeds as an alternative cellulosic Substrate at pilot scale

Key:

Growth parameters	**Crop cycle**
Spawn run (Days)	8-9
Pin head formation (Days)	12-13
First harvest (kg)	44.15
Second harvest (kg)	31.25
Third harvest (kg)	17.37
Fourth harvest (kg)	10.28
Total fresh mushroom produced per bag (kg)	103.05
Total dried substrates (kg)	105
Bioefficiency (%)	**98.14**

Bioefficiency calculated on basis of n=100

Nutritional properties

The fruit bodies of *P. eous* (/100g) contains carbohydrate (47.29 g), protein (28.35 g), fat (0.37 g), crude fiber (42.46g), moisture (10.19%) and energy values (305.89 kcal) (Table 3). Similarly reported that the in the fruit bodies of *P. eous* contain protein (46 %), carbohydrate (24%), fat (1.2 %), crude fiber (12 %). [13-16]

Table 3. Analysis of nutrient contents from *P. eous* mushroom powder

Parameters	***P. eous***
Carbohydrate (g/100g)	47.29
Protein (g/100g)	28.35
Fat (g/100g)	0.37
Crude fiber (g/100g)	42.46
Energy (kcal/100g)	305.89
Moisture(%/100g)	10.19

CONCLUSION

The present study concluded that *P. eous* can be cultivated by different lignocellulosic substrate and among those reeds recorded to be the best alternative and replacement of traditional substrates. Hence the present shows a positive path that *P. eous* can be cultivated using alternative substrates and its efficacy was tested at pilot scale. *P. eous* was recorded high nutritional contents and this mushroom has several medicinal properties. This study will be further focused towards pharmaceutical applications.

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