Wesleyan Journal of Research , Vol.14 No 01(May (2021) Research Article (Botany)

Cultivation of Pleurotus eous : A sustainable approach by using sugarcane bagasse with different supplements

Bharat Chavan, Prashant Pangrikar and Shrikant Mane*
Department of Botany, R. B. Attal Arts, Science and Commerce College, Georai (MS) India
*Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (MS) India
Email: ppangrikar@gmail.com

Abstract
During the study of Oyster mushroom was cultivation on sugarcane bagasse substrate, along with different supplement flour, using cylindrical block system to find out high yield. Supplementation of various flour, significantly affected the number of primordial, fruiting bodies and amount of fresh weight or yield of Oyster mushroom in cylindrical block system various treatments of flours obtained as follows: F0= SCB (100 %); F1= Millet flour (8.6 %), SCB (93.2%); F2= Gram flour (8.6 %), SCB (93.2%); F3= Wheat flour (8.6 %), SCB (93.2%); F4= Sorghum flour (8.6 %), SCB (93.2%); F5= Green Gram flour (8.6 %), SCB (93.2%). The experiment was repeated twice and statistical analysis was performed to compare the average growth of mushrooms and floor supplemented baggage.
. The highest yield of mushroom obtained from Millet flour supplemented sugarcane bagasse whereas, the lowest with control. There were some significance changes in the nutrient composition of *P. eous* harvested from the treatments.

Key words: Bagasse, Nutrition, Oyster mushroom, Production, Waste Flour supplement.

Article History
*Received 18/05/2021; Accepted 25/05/2021.

Introduction

Edible mushroom also called as white vegetables of boneless vegetarian meat, rich in nutrition and metabolites (Thakur & Singh 2013). The genus *Pleurotus* belonging to family Pleurotaceae is widely distributed throughout the Northern Hemisphere (Singer 1986). To date, about 70 species of *Pleurotus* have been recorded of which nearly 25 were reported from India (Sarbhoy *et al.* 1986).

In India sugarcane bagasse is co-product generated by sugar industries as waste product; if not disposed correctly, it may lead to irreparable adverse effect in surrounding environment as well as local flora and fauna. This residue may enable to develop sustainable application, like cultivation substrate for edible and commercial mushrooms (Wang *et al.* 2017). For commercialization aspect, cultivation of mushroom is not much expensive. Number of scientific attempts was made to improve the quality and quantity edible mushroom; we also predict that some agro-waste products can be used as supplementary for production of edible mushroom. This study focussed on utilization of various flours collected from local flourmills for cultivation and improves yield and quality of Oyster mushroom. The results of the study will be crucial to farmers and mushroom cultivators which utilizes flourmill waste for mushroom production for both food and income generation.

Material and Methods

Pure culture of edible mushroom *P. eous* spawn was received from Nutrimist Mushroom Farm, Research and Training center, Aurangabad (MS) India. The sugarcane bagasse (SCB) was obtained from sugar factory Chhatrapati Sahakari Sakhar Karkhana Ltd., Sawargaon and stored at room temperature. The flourmill waste-flour supplement viz. Millet flour, Gram flour, Wheat flour, Sorghum flour, Green gram flour etc. was obtained from various local

millers.

Cultivation and analysis were carried out in the culture room at Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The relative temperature, humidity and ventilation were controlled.

The freshly chopped substrate was soaked in fresh water for 12 h followed by chemical treatment of Crystal Bavistin Fungicide Carbendazim 50% WP for 24 hrs. Excess water was decanted and was shed dried till retain 65–70% of moisture in substrate. The flourmill waste-flour supplement viz. millet flour, gram flour, wheat flour, sorghum flour and green gram flour, each were mixed separately in 1 kg of substrate and placed in sterile container. Substrate filled in 14 × 22 cm polythene bag with multilayer scattered by thin layer of spawn after each 5 cm. Small pinholes were made on the bags with the help of sterilized needle in distance of 2–3 cm across the surface for ventilation. The experiment was repeated twice and statistical analysis was performed to compare the average growth of mushrooms and flour supplemented bagasse. The bags were inoculated at 27°C ± 1 in Cultivation room for several days.

This study uses a completely randomized design (CRD) with six various treatments of waste flours obtained as follows:; F1= Millet flour [*Cenchrus americanus* (L.) Morrone : Poaceae] (8.6 %), SCB (93.2%); F2= Gram flour [*Cicer arietinum* L. : Fabaceae] (8.6 %), SCB (93.2%); F3= Wheat flour [*Triticum aestivum* L. : Poaceae] (8.6 %), SCB (93.2%); F4= Sorghum flour [*Sorghum bicolor* (L.) Moench : Poaceae] (8.6 %), SCB (93.2%); F5= Green Gram flour [*Vigna radiata* (L.) R.Wilczek : Fabaceae] (8.6 %), SCB (93.2%) and F6= as control, SCB (100 %). The experiment was repeated twice and statistical analysis was performed to compare the average growth of mushrooms and floor supplemented baggage.

The bags were kept in a well-ventilated cropping room at 26–28 °C for about 15–17 days and polythene were tear-off from each bag promote development of fruiting body. The Formula by Chang *et al.* (1981) was followed to calculate biological efficiency (BE). Growth rate and yield weight of three harvestings were also observed (Fig 1, 3). Fig 3 is photo plate

The biochemical estimations were carried out on shade dried mushroom, harvested from different treatment used herein. The moisture content was determined by oven drying method (AOAC, 2005). The crude protein was analyzed by Lowry protein assay (Lowry *et al.* 1951), Crude fiber, fat and ash were determined by the procedure recommended by AOAC (2005). Total carbohydrate was determined by Anthrone method (Hedge and Hofreiter, 1962). The nutritive value was calculated with formula suggested by Indrayan *et al.* (2005).

Results and discussion

The results indicate that the maximum yield (712.86g/kg with 71.28% BE) was observed in millet flour supplement to sugarcane bagasse which was higher than all other treatments. It was followed by wheat flour (685.92gm/kg with 68.59% BE). The minimum yield was observed in control i.e., only sugarcane bagasse (469.86gm/kg with 46.98% BE) followed by Green gram flour (590.30/kg with 59.03% BE), which are significantly higher than control and lower than all other supplements (Table 1). The result shows sugarcane bagasse +sorghum, the earliest pin head in 17 days. After that wheat flour + green gram show the pin head at 18 days. The gram flour first pin head at 19 days. The control shows the highest duration for first pin head at 27 days. The maximum number of fruiting bodies (97) with average weight was 63.66 % and biological efficiency was 71.28 next to the gram and wheat flour shows the no of fruiting bodies was (96) while average weight changed i.e., gram as 54.33% and wheat shows 61.33. The green gram shows (93) fruiting bodies with 51.33% average weight and 59.03% biological efficiency. Sorghum shows (92) fruiting bodies with 56.66% average weight with 62.07% biological efficiency. Millet flour supplement which was higher than all other supplements. The minimum number of fruiting body (89) was

observed from control with 59.33 average weight and 46.98 % biological efficiency.

The growth rate and fresh weight of mushroom harvest. (Table 2) was also influenced due to flour supplement; it is observed that rather than control all supplemented blocks were show effective and rapid growth.

The present study further revealed that the biochemical characters like protein content at (26.08%), carbohydrate (46.56%) and nutritional value (324.58/100g) of mushroom were relatively more in F2 as compare to other treatments (Table 3, Fig 2). The content of fat (5.46%) and crude fiber (14.94%) was fluctuated in F3 and F4 respectively, which is highest than that of other treatments. In overall the F2 treatment is better among all the treatments used herein. The findings of this study were relatively agreed with results of Senthilraja (2014).

Table 1: Time duration for yield of *Pleurotus eous*

Sugarcane bagasse + Flour used	PHF	FH	NOFB	Average weight/FB	Biological Efficacy (%)
F1: Bagasse +Millet	14	18	97	63.66	71.28
F2: Bagasse +Gram	15	19	96	54. 33	60.97
F3: Bagasse +Wheat	15	18	96	61.33	68.59
F4: Bagasse + Sorghum	14	17	92	56.66	62.07
F5: Bagasse +Green gram	16	18	93	51.33	59.03
F6: Control	21	27	89	59.33	46.98

Average of three replicates

PHF= Pin head formation, FH= First harvesting, NOFB= Number of fruiting body.

Table 2: Production of *Pleurotus eous* on sugarcane bagasse with different flours.

Flour used	1st Harvest	2nd Harvest	3rd Harvest	Total Harvest
F1: Millet	285.52 g	234.13 g	193.21 g	712.86 g
F2: Gram	245.33 g	206.66 g	157.75 g	609.74 g
F3: Wheat	258.6 g	232.46 g	194.86 g	685.92 g
F4: Sorghum	239.5 g	224.7 g	156.5 g	620.7 g
F5: Green gram	231.9 g	193.33 g	165.2 g	590.43 g
F6: Control	160.66 g	172.15 g	137.05 g	469.86 g

Average of three replicates

Table 3: Effect of different supplemented substrate on biochemical composition of *Pleurotus eous*

Flour used	Moisture	Crude Protien	Carbohydrates	Fat	Ash	Crude fibre	Nutriational value cal /100 g
F1 : Millet	85.92	24.10	45.59	4.73	9.84	13.42	321.33
F2 : Gram	85.42	26.08	46.56	3.78	6.98	13.62	324.58
F3 : Wheat	84.90	25.09	42.78	5.46	6.90	14.87	320.62

F4 : Sorghum	86.02	22.87	43.98	4.08	7.06	14.94	304.12
F5 : Green gram	83.13	22.14	42.13	4.0	9.54	14.87	293.08
F6 : Control	84.60	21.54	41.01	4.58	10.12	13.02	291.42

Average of three replicates, values reflected in percentage.

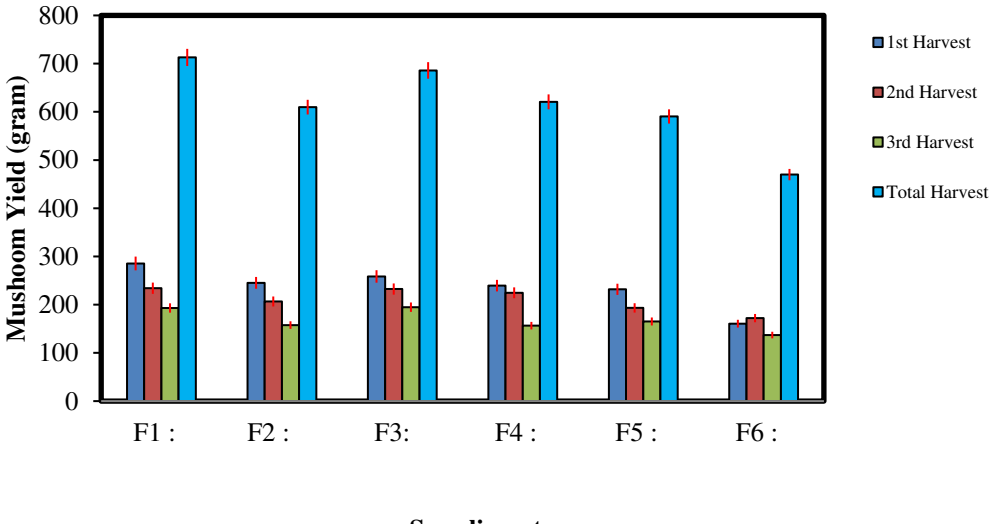

Figure 1. Average of harvested mushroom, Cultivated on sugarcane bagasse with supplement.

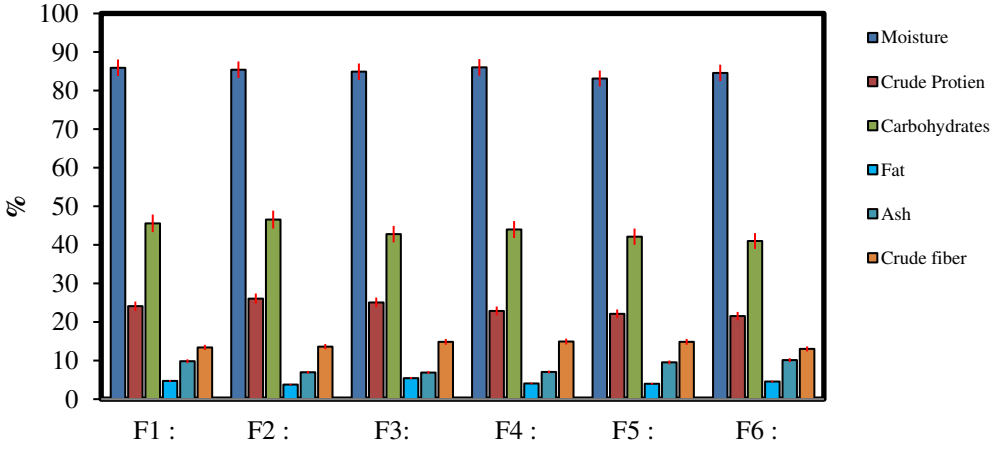

Figure 2. Biochemical composition of mushroom, grown on sugarcane bagasse with supplement.

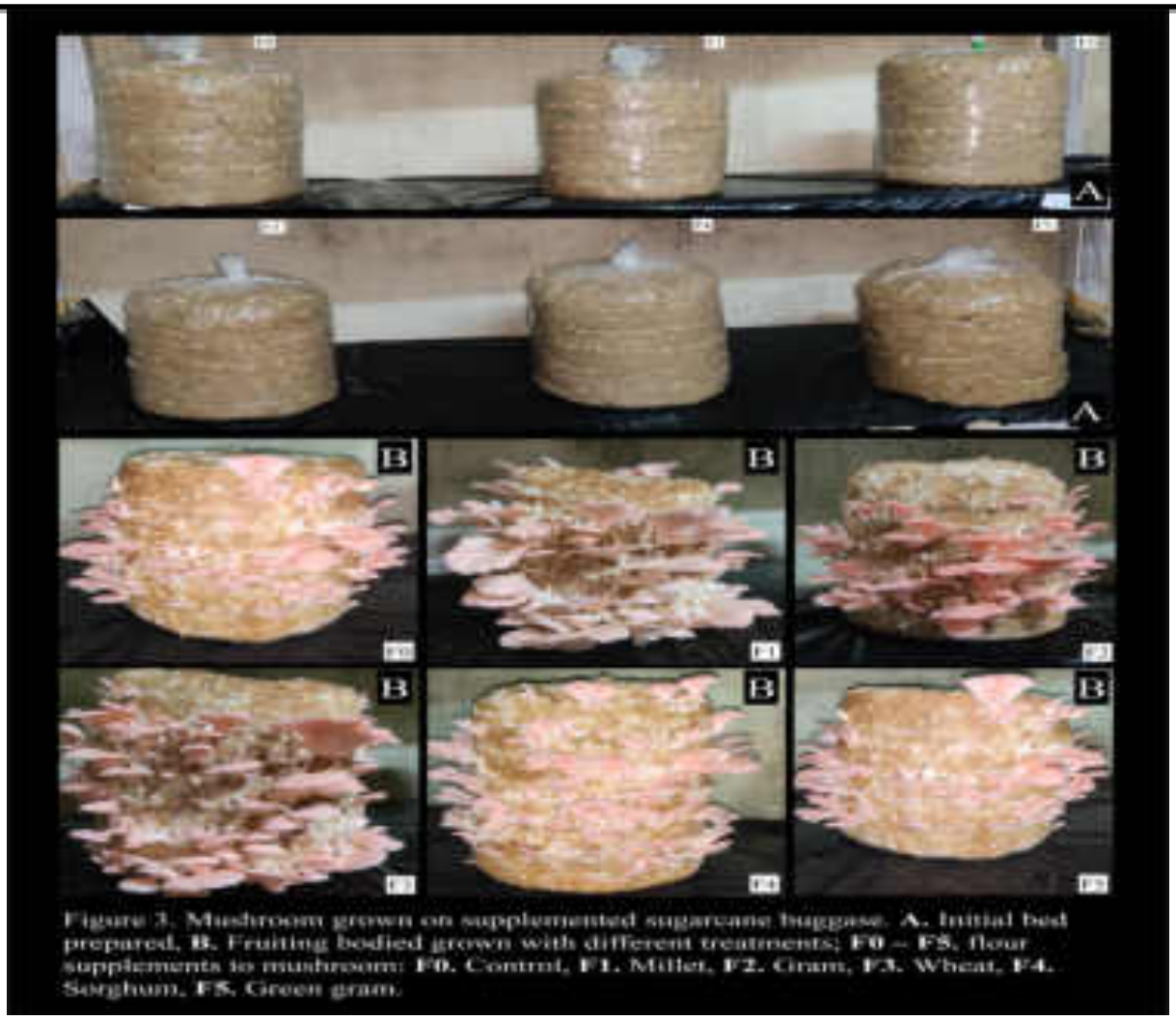

Figure 3. Mushroom grown on supplemented sugarcane baggase. **A.** Initial bed prepared, **B.** Fruiting bodied grown with different treatments; **F0 – F5.** flour supplements to mushroom: **F0.** Control, **F1.** Millet, **F2.** Gram, **F3.** Wheat, **F4.** Sorghum, **F5.** Green gram.

Figure 3. Mushroom grown on SCB with supplement.

Conclusions

The results of the study reveals that the growth of *Pleurotus eous* mushroom was highly affected by addition of supplements into the substrate. Though it can be concluded that organic supplement collected from flourmill waste is one of the best and recycled products to be recommended improved performance and of yield of *Pleurotus eous* mushroom along with its nutritional composition.

Acknowledgements

Authors are thankful to Head, Department of Botany, Dr.BAMU Aurangabad, for providing laboratory facilities. Authors are thankful to senior professor, Department of Botany, Dr. BAMU Aurangabad for providing laboratory facilities. Authors are also thankful to Principal, R. B. Attal Arts, Science and Commerce College, Georai for constant support.

References

AOAC (2005) "*Official methods of analysis"* (15th edition), Association of official analytical chemists, Washington, D.C.

Chang, S.T., Lau, O.W. and Cho, K.Y. (1981) *European Journal of Applied Microbiology and Biotechnology* 12: 58-62.

Hedge, J. E. and Hofreiter, B. T. (1962). In: *Carbohydrate Chemistry*, 17 (Eds. Whistler R.L. and Be Miller, J.N.), Academic Press, New York.

Indrayan, A. K., Sharma, S., Durgapal, D., Kumar, N. and Kumar, M. (2005) *Current Science* 89(7): 1252-255.

Lowry, O. H., Rosebrough , N. J., Farr, A. L. and Randall, R. J. (1951) *Journal of Biological Chemistry* 193(1): 265-275.
Sarbhoy, A. K., Agarwal, D. K. and Vershney, J. L. (1986) "*Fungi of India*", Associated Publishing Company, New Delhi, pp 274.
Senthilraja, K. (2014) *Research Journal of Agricultural Sciences* 5(1): 23-26.
Singer, R. (1986) "*The Agaricales in modern taxonomy"*, 4th Ed. Koeltz Scientific Books, Germany, pp 174-179.
Thakur, M. P. and Singh, H. K. (2013) *Medicinal Plants* 5(1):1-20.
Wang, M., Song, W., Wang, J., Wu, J., Ding, T. and Li, F (2017) *Asian Agricultural Research* 9(6): 92-95.