Plant Archives Vol. 25, Supplement 1, 2025 pp. 2006-2011 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.275

EFFECT OF DIFFERENT CASING THICKNESS AND CASING MATERIAL ON YIELD AND YIELD ATTRIBUTING CHARACTERISTICS OF WHITE BUTTON MUSHROOM (*A. BISPORUS*)

Bhagshali Patle*, H. K. Singh and Gopinath V.
Department of Plant Pathology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), India
*Corresponding author E-mail: bhagshali06041994@gmail.com
(Date of Receiving : 10-11-2024; Date of Acceptance : 11-01-2025)

ABSTRACT

The study evaluated the impact of varying casing material thickness on the yield and yield-attributing characteristics of white button mushroom (*Agaricus bisporus*). Two casing materials, cocopeat and vermicompost, were tested at five thickness levels (1", 2", 3", 4", and 5") using a Completely Randomized Design (CRD). The research was conducted at the Mushroom Research Laboratory, IGKV, Raipur. Spawn preparation and composting followed standard protocols, while the mushrooms were cultivated under controlled conditions. The results demonstrated that casing thickness significantly influenced mushroom growth and productivity. For cocopeat, 1" thickness yielded the highest sporophore weight (58.00 g) and biological efficiency (12.76%), with an overall yield of 638.00 g/bag. Vermicompost casing also showed maximum yield at 1" thickness (637.00 g/bag) with a biological efficiency of 12.74%. Thicker casings (4" and 5") consistently resulted in delayed pinhead initiation and harvest, reduced sporophore weight, and lower yields.

Keywords **:** *Agaricus bisporus,* cocopeat , vermicompost, thickness, sporophore weight.

Introduction

Fungi are the most diverse organisms on this universe and are defined as a eukaryotic, heterotrophic organism, devoid of chlorophyll and obtains its nourishments from living, non-living and dead organic matters (Taylor, 2015). There are 1.5 million species of fungi in nature, of which 2000 species of edible fungi are known to man out of 10,000 species of macro fungi (Hawksworth, 1991). Globally, an estimated 1,069 species of mushrooms have been reported to be used for food purposes (Boa, 2004). Milky mushroom bears a resemblance to button mushroom, which is robust, milky white in color, fleshy in nature and can be stored for a long duration (4-5 days) (Ragupathi *et al* 2016). Milky mushroom is otherwise known as "summer mushroom" because of it growing in high temperature and it also called "Dutt Chatta" for the reason that its attractive pure milky white in color. It contains high protein, lipid, fiber, polysaccharides, essential amino acid and low in fatty acids. Mostly it grows in the southern part of the Indian sub-continent such as Tamil Nadu, Andhra Pradesh, Karnataka and Kerala because of having high and moderate temperature throughout the year. The climatic condition of Orissa as well meant for growing milky mushroom except for November to February months. No commercialized cultivation of milky mushroom in Northeastern part of the country (Kumar *et al* 2014). The milky mushroom was first discovered by Purkayastha and Chandra in 1970s in the northeastern region of India (West Bengal). The same mushroom was rediscovered in Tamil Nadu by Krishnamoorthy in 1997. Up to 1998, the mushroom was not coming into commercial cultivation. In the 1998 Krishnamoorthy *et al* 1997 & 2002., cultivated commercially in first time in the world at Regional Research Station, Aruppukkottai and released new variety as *Calocybe indica* var. APK2. *Calocybe* the genus originated from India and presently has nearly 40 species and cultivated in tropical and sub-tropical plains and having required high temperature and relative humidity.

Materials and Methods

Source of material

The strains of button mushroom were obtained from Mushroom Research Laboratory, Department of Plant Pathology, College of Agriculture, IGKV Raipur.

Statistical analysis

All the experiments were laid down in Completely Randomised Design (CRD) with single factor and data were analysed for the experimental study by using OPSTAT software for all the experiments.

Preparation of Spawn for Cultivation

This spawn was most commonly prepared in heat resistant polypropylene bags (6 "X 11" -150 gauges) which have double sealing at the bottom. The ideal size of bags for half kg of spawn is 35 x 17.5 cm and for one kg of spawn is 40 x 20 cm. Step-wise procedures is mentioned below: The grains are filled in polypropylene bags. Polypropylene neck ring (height 2 cm and diameter 4 cm) was placed near the top by passing the upper open end of bag through this ring. Thereafter the bag was folded back and plugged with non-absorbent cotton. These bags were sterilized at 22 p.s.i. pressure for 1.5-2 hours. These bags when got cooled, were shaken well before inoculation so that the water droplets accumulated inside the bag are well absorbed by the grains. These bags were put under UV for 20-30 minutes in laminar air flow chamber before inoculation. Under aseptic conditions in the laminar airflow chamber 10-15 grams of mother spawn were inoculated per bag. (If the small scale cultivation has to be taken up, then the mycelium of mushroom growing on slants can also be directly inoculated in these autoclaved bags). The inoculated bags were shaken well and incubated in BOD incubator at 25-28° C for 15-20 days. The bags were regularly examined for contamination during the incubation. The contaminated bags once observed were immediately discarded. When the mycelial run was complete the bag became white. These bags were then stored at room temperature for future use.

Compost preparation

The compost was prepared by long method as described by Mantel *et al.* (1972) and following ingredients were used and are as follows, Wheat straw (1000 kg), Urea (18.0 kg), Gypsum & wheat bran (25 kg). Compost was prepared on a flat cemented floor which was pre-treated by 2 % formalin solution a day before. Chopped wheat straw was thoroughly spread on floor and wetted by sprinkling of water. So that water impregnated in straw and around 75% moisture was maintained then heap was prepared and kept for 48 hours. After 48 hrs all ingredients and straw except gypsum were thoroughly mixed and a stack (5' wide x 6'height) was made. Watering was done regularly on each day to prevent drying of stack. The first turning was given on 6th day of the stack preparation by breaking the heap in such a way that each component of the stack was mixed properly. Second turning was given on 10th day followed by 3rd turning on 13th day. 4 th Turning on 16 th day, 5 th turning on the 19th days, and 6 th turning on 22nd day was given and gypsum was added on 6th turning. On 25th day 7th turning and 24th day 8th turning was given on 28th day heap was broken, and ammonia smell was checked. There was no smell of ammonia the compost was ready for spawning.

Casing Soil

Casing soil was prepared by mixing well decomposed (2 yrs old) Vermicompost & Cocopeat with soil in 1:1 (v/v) ratio. Bags fully impregnated with mycelium were covered with the casing soil to make 4 cm thick uniform layer. The mushrooms were harvested by gentle twisting of the fruit body. A record of spawn run, pinhead initiation, size of fruiting bodies and total yield, number of fruiting bodies in each harvest and average fruit body weight was made to determine the best strain for yield potential of button mushroom.

Harvesting of the mushroom

Primordia were initiated in cased beds within 10-15 days; whereas matured sporophores come for 1st harvest after 10-13 days. Harvesting was done by hand picking with slight twisting and pulling of the matured fruiting body. From a single bed three, fleshes were harvested at 10-15 days interval. So, that cropping duration varied up to 50-60 days. The matured fruiting bodies were should harvest before pileus showing dry or yellowness.

Weighing of sporophores

Individual fruiting body weight was taken when freshly immediately after harvest to be of assistance of single pan weighing balance with a sensitivity of 1 g.

Yield of mushroom

The collective yield of mushroom in each replication was recorded by calculation of the fresh weight at the number of harvestings which was represented as weight (g) per unit of dry weight substrate.

$$\text{The average number of sporophore (g)} = \frac{\text{Weight of sporophore (g)}}{\text{Number of sporophore}}$$

Biological efficiency

Following formula was used for calculating biological efficiency,

$$\text{Biological efficiency (\%)} = \frac{\text{Weight of fresh mushroom (g)}}{\text{Weight of dry substrate (g)}} \times 100$$

Result and Discussion

Effect of cocopeat casing thickness on yield and yield attributing characteristics of white button mushroom (*A.bisporus*)

From the table it is clear that thickness of cocopeat greatly influenced the yield and yield attributing characters. The number of days required for pin head initiation greatly differ with respect to different thickness and it was considerably earlier found in 1" (16.20 days) thickness while slowest was observed at 5" (19.20 days). In other thickness it varied from 16.20-16.60 days. Similarly, days required for 1st harvest was also considerably differ with respect to thickness of casing and faster (19.00 days) noticed in 1,2 and 3" thickness and next was 4" (20.00 days) while it was considerably delayed in 5" (22.00 days) thickness. Considerably higher (58.00g) weight of sporophore was obtained at 1" and next was 2" (55.00g) whereas 4" (48.33g) and 5" (50.00g). gave least weight.

The pileus diameter of fruit bodies of *A. bisporus* greatly influenced by different thickness of casing materials. The highest (12.06cm) diameter of pileus was recorded at 5 " and 3" (3.84cm) thickness and lowest (3.14cm) was recorded at 1 " In other thickness 11.64 and 11.46 cm was observed at (1" 3" respectively) . The length of stipe was taken and it differ considerably with respect to thickness of cocopeat, and highest (8.14cm) length was recorded 2" which considerably less (5.20cm) found at 4 ". In other thickness it varied from (6.50-7.64cm). Similarly, stipe diameter was observed and it also considerably higher observed at 5" (10.94cm) while lower (8.02cm) recorded at 1" thickness. In other thickness it ranged between 9.38-9.96cm. The yield of *A. bisporus* significantly influenced by different thickness of cocopeat, significantly higher (638.00g/bag) yield was obtained at 1" and closely followed by 2" (634.00g/bag) and both were significantly at par with each other, However, 5" thickness gave significantly lower (355.00g/bag) yield and it was inferior with other thickness. At 3" and 4", yield was 504.00 and 397.00g/bag respectively and were differ significantly with other thickness. The biological efficiency in according with that of yield and it varied from 7.10-12.78 per cent.

Table 1 : Effect of cocopeat casing thickness on yield and yield attributing characteristics of white button mushroom (*A. bisporus*)

Thickness	Pin head initiation (Days) after casing	Ist harvest (Days) after casing	Sporophore weight (g)*	Pileus diameter (cm)	Stipe length (cm)	Stipe diameter (cm)	Yield (g/bag)	BE (%)
1"	16.20	19.00	58.00	3.14	5.68	8.02	638.00	12.76
2 "	16.40	19.00	55.00	3.70	8.14	9.38	634.00	12.68
3 "	16.20	19.00	52.66	3.81	7.64	9.96	504.00	10.08
4 "	16.60	20.00	48.33	3.64	5.20	9.78	397.00	7.94
5 "	19.20	22.00	50.00	3.84	6.50	10.94	355.00	7.10
CD							12.60	
SEm							4.24	
CV							1.87	

(*) Average of three Fruiting bodies

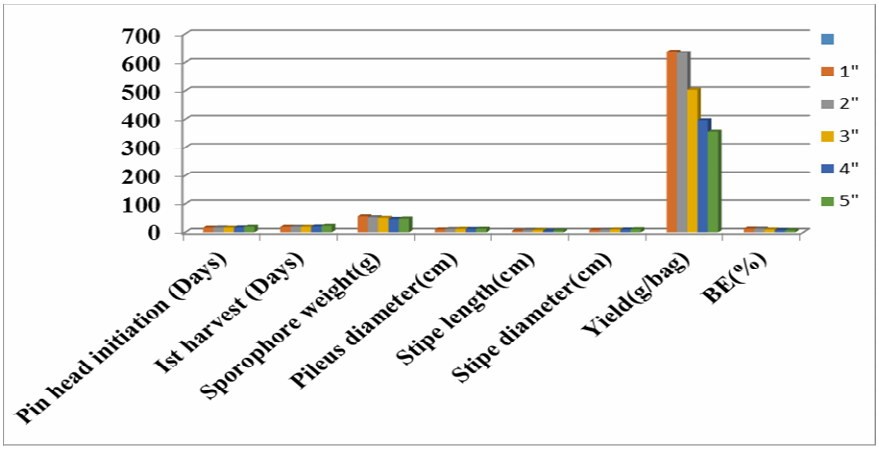

Fig. 1 : Effect of cocopeat casing thickness on yield and yield attributing characteristics of white button mushroom (*A. bisporus*)

Effect of thickness of vermicompost casing material on yield and yield attributing characteristics of white button mushroom (*A.bisporus*)

Thickness of vermicompost greatly influenced the yield and yield attributing character. The number of days required for pin head initiation greatly varied with respect to different thickness and fastest pin head initiation was found at 1" (16.20 days) while it was slowest observed 5" (19.20 days) thickness. In other thickness it varied from 16.40- 17.40 days. Similarly, days required for 1st harvest was also considerably differ with respect to thickness of casing material and it was earlier (19.00 days) noticed in 1,2 and 3" thickness and next was 4" (20.00 days) while considerably delayed in 5" (22.00 days) thickness. The sporophore weight was, considerably higher (58.00g) found at 1" and 2" (55.00g) while least (46.66g) weight of sporophore gave by 4" and 5" (51.66g).

The pileus diameter of fruit bodies of *A. bisporus* greatly influenced by different thickness of casing thickness when vermicompost was used as casing materials. The highest (5.32cm) diameter of pileus was recorded at 3" and 5" thickness and it was lowest (3.39cm) noticed at 2" thickness, in other thickness, it was in between 11.98 and 13.34 cm. The length of stipe was taken and it considerably differ with respect to thickness of vermicomposting. More length was recorded at 4" (6.74cm) while considerably less (4.16cm) found at 1" thickness. In other thickness it varied from (5.22-6.52cm). Similarly, stipe diameter was observed and it was higher observed at 5" (10.60cm) while lower (9.14cm) was recorded at 4" thickness. In other thickness it ranged between 9.46-10.36cm. The yield of *A. bisporus* significantly influenced by different thickness of vermicompost. Significantly higher (637.00g/bag) yield was obtained at 1" and it was closely followed by 2" (625,00g/bag) thickness and both were significantly at par with each other, However, 5" thickness gave significantly less (340.00g/bag) yield which was inferior with other thickness. At 3" and 4" yield was 385.00 and 500.00g/bag, respectively and were significantly differ with other thickness. The biological efficiency in accordance with that of yield and it varied from 6.80-12.74 per cent.

Table 2: Effect of vermicompost thickness on yield and yield attributing characteristics of white button mushroom (*A. bisporus*)

Thickness	Pin head initiation (Days) after casing	Ist harvest (Days) after casing	Sporophore weight (g)*	Pileus diameter (cm)	Stripe length (cm)	Stripe diameter (cm)	Yield (g/bag)	BE (%)
1"	16.20	19.00	58.00	3.81	4.16	9.64	637.00	12.74
2 "	16.40	19.00	55.00	3.39	4.44	9.46	625.00	12.5
3 "	16.20	19.00	52.66	5.32	5.22	10.36	500.00	10.00
4 "	17.40	20.00	46.66	3.61	6.74	9.14	385.00	7.70
5 "	19.20	22.00	51.66	3.94	6.52	10.60	340.00	6.80
CD							15.37	
SEm							5.17	
CV							2.32	

(*) Average of three Fruiting bodies

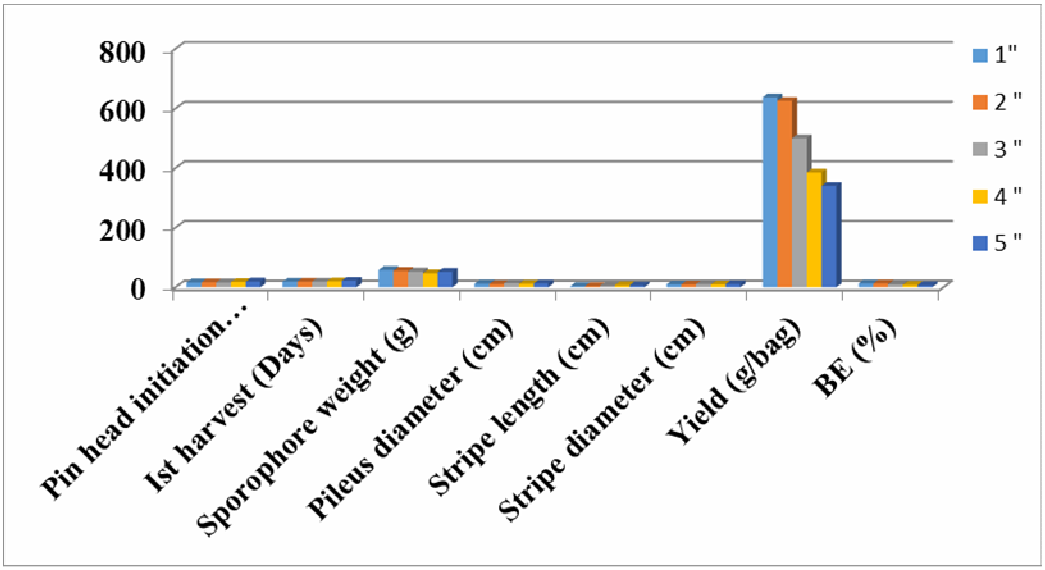

Fig. 2 : Effect of vermicompost casing thickness on yield and yield attributing characteristics of white button mushroom (*A. bisporus*).

Plate 1 : Effect of cocopeat casing thickness

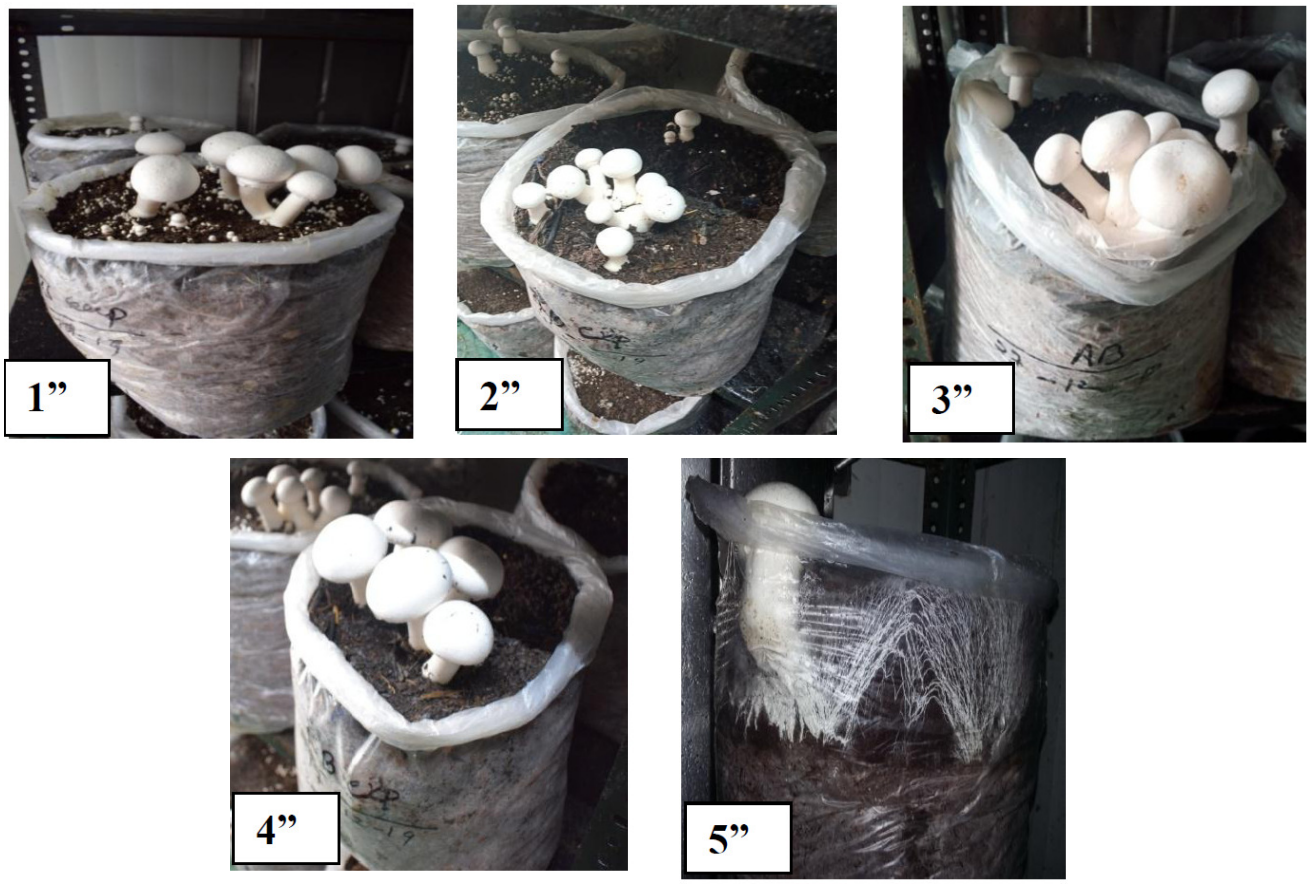

Plate 2: Effect of vermicompost casing thickness

Conclusion

The optimum thickness of cocopeat to procure maximum yield of *A. bisporus* was also worked out. Considerably higher (58.00g) weight of sporophore was obtained at 1" and next was 2" (55.00g) whereas 4" (48.33g) and 5" (50.00g) gave least weight. The sporophore weight was considerably higher (58.00g) found at 1" and 2" (55.00g) while least (46.66g) weight of sporophore gave by 4" and 5" (51.66g) when vermicompost was used as casing material. Considerably higher (59.09g) sporophore weight was found in 1" and next was 2" (55.66g) while 4" thickness gave least (47.33g) weight of sporophore and 5" (51.66g) when vermicompost and cocopeat in (1:1) ratio.

References

Taylor, A., Flatt, A., Beutel, M., Wolff, M., Brownson, K. & Stamets, P. (2015). Removal of *Escherichia coli* from synthetic stormwater using mycofiltration. *Ecological Engineering, **78**,* 79–86.

Hawksworth, D.L. (1991). The fungal dimension of biodiversity: magnitude, significance and conservation. *Mycology Research,* **95**: 641-655.

Boa, E. (2004). Wild edible fungi: a global overview of their use and importance to people. NonWood Forest Products, FAO, Forestry Department, Rome, Italy. 17.

Chandra, A., & Purkayastha, R. (1977). Physiological studies on Indian edible mushrooms. *Transactions of the British Mycological Society , **69***, 63-70.

Krishnamoorthy, A., Hebeebullah, B., & Marimuthu, T. (1991). Studies on chemical sterilization of paddy straw for Oyster mushroom cultivation. 27-29. (T. Marimuthu, A. Krishnamoorthy, & R. Jeyarajan, Eds.) Coimbatore, Tamil Nadu, India.

Krishnamoorthy, A.S., & Muthusamy, M. (1997). Yield performance of Calocybe indica (P&C) on different substrates. *Mushroom Research , **6***(11), 29-32.

Krishnamoorthy, A., Marimuthu, T., & Muthusamy, K. (2002). Enzyme related biodegradative potential of Calocybe indica. *Third Mushroom Conference, 6-7 march 2002.* (p. 36). Coimbatore: Tamil Nadu Agricultural University.

Kumar, K., Ahmed, S., & Roy, S. (2014). Evaluation of Different Substrate Combinations for Quality of Spawn Production and Biological Efficiency of Milky Mushroom in Andaman and Nicobar Islands. *Journal of Mycology and Plant Pathology , **44***(3), 294-297.

Ragupathi, V., Kumerasan, S., Selvaraju, S., & Karthikeyan, V. (2016). Optimizing the growth conditions and adopting new methods growing oyster and milky mushrooms in same conditions. *International Journal of Herbal Medicine , **4***(3), 01-04.