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Anurag Kerketta
College of Horticulture and Research Station, Jagdalpur, Chhattisgarh, India

CS Shukla
Department of Plant Pathology, CoA, IGKV, Raipur, Chhattisgarh, India

HK Singh
Department of Plant Pathology, CoA, IGKV, Raipur, Chhattisgarh, India

Correspondence
Anurag Kerketta
College of Horticulture and Research Station, Jagdalpur, Chhattisgarh, India

Evaluation of different casing materials for growth and yield of button Musrhroom (*Agaricus bisporus* (L.) Sing.)

Anurag Kerketta, CS Shukla and HK Singh

Abstract
Six different casing materials (alone and combination) were evaluated for growth and yield of button mushroom. Casing materials *viz.*, cocopeat, vermicompost + cocopeat (1:1), vermicompost + soil (1:1), cocopeat + soil (1:1) vermicompost + cocopeat + soil (1:1:1) and soil + FYM + sand (1:1:1) were used as casing materials and analysed for pH, EC (Electrical conductivity) and WHC (Water holding capacity). The results revealed that the pinhead initiation was significantly fastest in cocopeat + soil and it was delayed in soil + FYM + sand. Yield attributing characters like stalk length, stalk diameter and pileus diameter did not differed significantly with respect to casing materials and it varied form 2.63-3.45cm, 1.58-1.76cm and 3.99-4.50cm respectively. Number of fruiting bodies and yield were also found insignificant and ranges from 8.66-19 and maximum yield (355g) was obtained in cocopeat + soil with highest biological efficiency 11.83%. pH, EC and WHC found in ranges from 5.4-7.5, 0.55-1.98 ds/m and 59.44-271.10% respectively. When it correlated with yield, the maximum yield was obtained in casing material (cocopeat + soil) which has 5.6 pH, EC 1.98 ds/m and WHC 238.97% whereas, the minimum yield was found in the casing material (soil + FYM + sand) which has pH 7.5, EC 0.55 ds/m and WHC 59.44%.

Keywords: Casing, cocopeat, vermicompost, EC and WHC

Introduction
Cultivation of button mushroom is being undertaken by the farmers on large scale, especially in cooler hilly regions. One crop can easily take during the winter season in the plains and foot hills of North India and other parts of country where temperature goes below 20 ºC accompanied with high relative humidity.

Crop residues such as grain crop straw are characterized by the predominance of lignocelluloses with cellulose, hemicellulose and lignin as the main components (Yildiz *et al.*, 2002; Das and Mukherjee, 2007; Mamiro and Mamiro, 2011; Jonathan *et al*., 2012) [1-4]. Using such crop residue as a mushroom substrate would subsequently convert them into a more protein-rich biomass and influence the mushroom yields (Mamiro and Mamiro, 2011) [3]. The high potential of such substrates for growing mushroom could be economically attractive and profitable for farmers and agriculture more widely. Besides, it is converting farm waste into useful products which could later help maintain the nutrient requirement of crops, soil physical and chemical condition, and also balance the ecological demands on the crop production system (Naresh, 2013) [5].

Agaricus bisporus requires two different substrates to form the fruiting bodies i.e. the compost for nutrition on which it grows vegetatively and the casing soil in which the suitable physicochemical/biological conditions stimulate the initiation process of pin head formation for fruit body production. In spite of being nutritionally deficient medium, casing layer plays an important role in the production of button mushroom. The casing layer is one of the important growing parameter and source of variation in production, quality and uniformity of commercial cropping (Kaur and Rampal, 2017) [6]. Huge quantities of farm yard manure, vermicompost, saw dust and other organic wastes are generated annually through the activities of agricultural, forest and food processing industries. Mushroom yield can be increased if these locally available casing mixtures are used to produce button mushrooms (Chandra *et al.*, 2014) [7]. Therefore, present investigation was carried out to see the effect of different casing mixtures on the growth parameters and yield potential of button mushroom in Chhattisgarh.

Materials and Methods
Pure culture and other materials
Pure culture of button mushroom was procured from AICRP on mushroom, Department of Plant Pathology, CoA, IGKV, Raipur, Chhattisgarh. And

for experiment were obtained from mushroom Research Laboratory of the Department of Plant Pathology.

Composting and spawning

Wheat straw based compost was prepared using long method of composting (Khanna and Kapoor, 2007) [8]. For compost preparation, wheat straw 5000 kg, Rice bran 12 kg, Urea 9 kg and Gypsum 18 kg were used. The spawning was done by layer method in polypropylene bags (16"x22") filled 05 kg compost in each bag and spawned @ 50 g bag^{-1} by layer method and shifted to the growing room for spawn run.

Preparation of casing materials

Five different base materials viz., vermicompost, cocopeat, soil, FYM and sand were selected for preparation of casing mixtures which were obtained from Agro farm of IGKV and commercial outlet of Raipur. Base materials were used alone and in combination (equal amount of each base material) for casing the completely colonized mushroom bag. Before use, casing mixtures were sterilized using 5% formaldehyde/litre of water (50 ml formalin and 1 litre water). Observations were recorded for their effect on growth behaviour of button mushroom.

Analysis of casing materials

The casing soils analysed for chemical and physical properties. Under physical properties pH and water holding capacity of casing mixtures were analysed. The pH was determined using pH meter (Systronic Digital pH meter 335) after shaking the sample with water for 30 minutes (Jackson, 1967) [9] Under chemical property electrical conductivity was determined by using digital EC meter (Elico CM 183) (Jackson, 1967) [9] and expressed as Electrical conductivity (dS m^{-1}). The water holding capacity was calculated by using following formula:

$$WHC_{max} = \frac{M_s - M_t}{M_t - M_b} \times 100$$

Where,

M_s - Mass of beaker containing water saturated soil (g).
M_t - Mass of beaker containing oven dried soil (g).
M_b - Mass of beaker.

Design and statistical analysis

Completely randomized design was used in present experiment. All observed and recorded data was calculated online by using OPSTAT statistical software package for agricultural research workers developed by Sheoran *et al.* (1998) [10] at CCS HAU, Hisar. Critical difference was calculated at the level of 0.05% degree of freedom.

Results and Discussion

Analysis of casing mixtures

Prepared six different casing materials were analysed for pH, EC (Electrical conductivity) and WHC (water holding capacity) and data are depicted in Table No 1.

The Cocopeat had lowest pH value (5.4) followed by combination of cocopeat + soil (5.6), vermicompost + cocopeat + soil (6.5), vermicompost + cocopeat (6.7) and vermicompost + soil (7.2). While maximum pH value (7.5) was recorded in mixture of soil + FYM + sand. Water holding capacity of casing materials was found maximum (271.10%) in cocopeat whereas the minimum (59.44%) water holding capacity had combination of soil + FYM + sand followed by combination of vermicompost + cocopeat (69.39%), vermicompost + soil (108.50%), vermicompost + cocopeat + soil (163.92%) and cocopeat + soil (238.97%). Result is close to the obtained by Peyvast *et al*. (2011) [11] reported that the required physical and chemical properties of a good casing should be high porosity and water holding capacity (WHC), 7.2-8.2 pH, low content of soluble inorganic and organic nutrients, and free of disease and pests. The electrical conductivity of casing mixtures had no more fluctuation and range from 0.55-1.98 mmhos/cm. According to Gier (2000) [12] an EC value of more than 7 to 9 mho had a negative influence on the quality and especially quantity of mushrooms.

Table 1: Analysis of Casing materials for pH, EC and WHC.

Casing materials	pH	EC (dS m^{-1})	WHC (%)
Cocopeat	5.4	1.45	271.10
Vermicompost + Cocopeat (1:1)	6.7	1.97	69.39
Vermicompost + Soil (1:1)	7.2	1.35	108.50
Cocopeat + Soil (1:1)	5.6	1.98	238.97
Vermicompost + Cocopeat + Soil (1:1:1)	6.5	1.02	163.92
Soil + FYM + Sand (1:1:1)	7.5	0.55	59.44

Table 2: Evaluation of casing materials for yield of button mushroom

Casing materials	Pinhead initiation*	Stalk length*	Stalk diameter*	Pileus diameter*	No of fruiting bodies**	Yield (gm)**	BE (%)
Cocopeat	13.62	2.95	1.71	4.37	14.66	263.33	8.77
Vermicompost + Cocopeat (1:1)	12.87	2.63	1.69	4.30	9.66	198.33	6.61
Vermicompost + Soil (1:1)	14.12	2.76	1.73	4.18	10.33	216.66	7.22
Cocopeat + Soil (1:1)	12.25	3.10	1.71	4.24	19.00	355.00	11.83
Vermicompost + Cocopeat + Soil (1:1:1)	13.37	3.05	1.70	4.50	13.00	288.33	9.61
Soil + FYM + Sand (1:1:1)	15.62	3.45	1.58	3.99	8.66	191.66	6.38
SEm±	0.32	0.17	0.05	0.19	2.52	36.67	
CD (5%)	0.92	-	-	-	-	-	

Note: (*): Average of ten replications/fruiting bodies. (**): Average of three replications. (-): Non significant.

Effect of casing mixtures on growth and yield of button mushroom

Six different casing materials were evaluated to see the effect on growth and yield of button mushroom and data are presented in table No. 2.

Pinhead initiation differed significantly with respect to different casing materials and yield attributing characters like stalk length, stalk diameter, pileus diameter, number of fruiting bodies and yield also found insignificant. Pinhead initiation was fastest (12.25 days) in bag which had cocopeat + soil (1:1) as casing material followed by vermicompost + cocopeat (1:1) (12.87 days), vermicompost + cocopeat + soil (1:1:1) (13.37 days), cocopeat (13.62 days) and vermicompost + soil (1:1) (14.12 days) whereas it was delayed (15.62 days) in soil + FYM + sand (1:1:1). Stalk length, stalk diameter, pileus diameter and number of fruiting bodies varied from 2.63 - 3.45 cm, 1.58 – 1.73 cm, 3.99 – 4.50 cm and 8.66 – 19.00 respectively. The maximum (355.00 gm) fresh yield obtained from bag which had cocopeat + soil (1:1) with highest (11.83%) biological efficiency while minimum (191.66 gm) fresh yield recorded from bag which had soil + FYM + sand (1:1:1) as casing material with lowest (6.38%) biological efficiency. This result is close with finding of Dhar *et al* (2006) [13] that reported eight commonly available casing materials in India *viz*., Farm Yard Manure (FYM), Spent Mushroom Compost (SMC), Coir pith, Municipal Garbage, Vermicompost, Terracare-A, Terracare-B and farmyard manure (FYM) + SMC in button mushroom cultivation.

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References

1. Yildiz S, Yildiz UC, Gezer ED, Temiz A. Some lignocellulosic wastes used as raw material in cultivation of the *Pleurotus ostreatus* culture mushroom. Process Biochem. 2002; 38:302-306.
2. Das N, Mukherjee M. Cultivation of *Pleurotus ostreatus* on weed plants. Bioresource Technology. 2007; 98:2723-2726.
3. Mamiro DP, Mamiro PS. Yield and mushroom size of *Pleurotus ostreatus* grown on rice straw basal substrate mixed and supplemented with various crop residues. Journal of Animal and Plant Sciences 2011; 10:1211-1218.
4. Jonathan SG, Okorie AN, Babayemi OJ, Oyelakin AO, and Akinfemi A. Biodegradation of agricultural wastes (rice straw and sorghum stalk) into substrates of utilizable products using white rot fungus (*Pleurotus florida*). Nature and Science. 2012; 10:131-137.
5. Naresh RK. Rice residues: from waste to wealth through environment friendly and innovative management solutions, it's effects on soil properties and crop productivity. International Journal of Life Sciences Biotechnology and Pharma Research. 2013; 2:133-141.
6. Kaur AP, Rampal VK. Assessment of Casing Mixtures on Yield Potential and Quality of Button Mushroom (*Agaricus Bisporus*) – On Farm Trial. Int. J Curr. Microbiol. App. Sci. 2017; 6(2):430-436.
7. Chandra R, Pandey VN, Singh HB. Comparative evaluation of casing mixtures on the yield potential of button mushroom *(Agaricus bisporus*). Proceedings of the 8th International Conference on Mushroom Biology and Mushroom Products (ICMBMP8), 2014, 345-350.
8. Khanna PK, Kapoor S. A manual on mushroom production, 2007, 26-31.
9. Jackson ML. Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd., New Delhi, 1967,
10. Sheoran OP, Tonk DS, Kaushik LS, Hasija RC, Pannu RS. Statistical Software Package for Agricultural Research Workers. Recent Advances in information theory. Statistics and Computer Applications by D.S. Hooda and R.C. Hasija Department of Mathematics Statistics, CCS HAU, Hisar, 1998, 139-143.
11. Peyvast, GH, Shahbodaghi J, Remezani P and Olfati JA. Performance of tea waste as a peat alternative in casing materials for bottom mushroom (*Agaricus bisporus* (L.) Sing.) Cultivation. Bio sci. Biotech. Res. Asia 2011; 4:1-6
12. Gier JF de. A different perspective on casing soil. In: Science and Cultivation of Edible Fungi (Van Griensven. ed.) Balkema Rotterdam 2000, 931-34.
13. Dhar BL, Ahlawat OP, Gupta P, Raj Dev. Casing layer as related to mushroom yield and quality in *Agaricus bisporus* in India. Mush. Res. 2006; 15(2):111-117.