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Effect of different substrates on yield of Oyster mushroom (*Pleurotus florida*)

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Abstract

The present research work was carried out in the Research laboratory of the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow in winter season of the year 2019-20 and 2020-21, respectively to assess the effect of various substrates such as wheat straw and paddy straw in different treatments combination on yield of oyster mushroom (*Pleurotus florida*). The experiment was laid out in completely randomized block design consisted of twelve treatments combination in each replication and replicated thrice. The pooled data of two years showed that the maximum number of sporophores (97.17), number of pinheads (169.50), yield of first harvest per bed (400.33 g), yield of second harvest per bed (360.17 g) and yield of third harvest per bed (142.52 g) was reported in treatment T₆ (wheat straw 80% + paddy straw 20%) while the minimum number of sporophore (85.00), number of pinhead (154.17), yield of first harvest per bed (351.98 g), yield of second harvest per bed (319.33 g) and yield of third harvest per bed (125.93 g) was reported in treatment T₂ (Paddy straw 100%). Thus, the different substrates used in treatments combination showed that the combination of Wheat straw (80%) + Paddy straw (20%) is best for the mushroom cultivation under Lucknow condition in terms of yield and economic returns and by cultivating mushroom crop income of marginalized sections of society can be improved.

Keywords: Oyster mushroom, wheat straw, paddy straw, yield

Introduction

Mushrooms, also referred as 'white vegetables' or 'boneless vegetarian meat' contains significant level of proteins, vitamins and fiber apart from having certain valuable properties (Thakur *et al.*, 2013 and Meng *et al.*, 2016). Mushroom become an integral part of continental dish due to the fine taste, flavour and high nutritional value. The adequate amounts of bioactive compounds, mushroom production in peri urban areas keen interest by media and scientific community (Pokhrel *et al.* 2006) [11]. It produces enzymes and used as complex organic compounds (Baysal *et al.* 2003) [2] and easily converted to lignocellulosic material to protein rich foods (Cagalarimak, 2007 and Randive, 2012) [5, 14]. Oyster mushroom (*Pleurotus florida*) is commonly called as *dhingri* in India (Alexopolous *et al.* 1996). Oyster mushroom is grown in different substrates such as wheat straw and paddy straw (Panday *et al.* 2012). The main nutrients in these substrates are less nitrogen and more carbon which supports the growth (Chang, 1989) [6]. In present investigation, *Pleurotus florida* was grown on wheat straw and paddy straw in different ratio and the yield and yield attributing characters of the oyster mushroom were analysed.

Material and Methods

The present research work entitled 'Efficacy of different substrates on yield of oyster mushroom (*Pleurotus florida*)' was carried out in the Research laboratory of the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University during the winter season of the year 2019-20 and 2020-21 to assess the effect of substrates such as wheat straw and paddy straw in different treatments combinations on yield of oyster mushroom (*Pleurotus florida*). The experiment was laid down in completely randomized block design consisted of twelve treatments combination in each replication and replicated thrice. The details of the treatments combination are T₁ - Wheat straw(100%), T₂ - Paddy straw (100%), T₃ - Wheat straw (95%) + Paddy straw (5%), T₄ - Wheat straw (90%) + Paddy straw (10%), T₅ - Wheat straw (85%) + Paddy straw (15%), T₆ - Wheat straw (80%) + Paddy straw (20%), T₇ - Wheat straw (75%) + Paddy straw (25%), T₈ - Wheat straw (70%) + Paddy straw (30%), T₉ - Wheat straw (65%) + Paddy straw (35%), T₁₀ - Wheat straw (60%) + Paddy straw (40%), T₁₁ - Wheat straw (55%) + Paddy straw (45%) and T₁₂ - Wheat straw (55%) + Paddy straw (45%).

Mother culture of oyster mushroom was collected from Buddha Mushroom Spawn Lab, Rajgir, Bihar. 100 liters of water were taken into a rust proof drum specially in G.I. tub of 200 liters water holding capacity. Total 3 tubs has been taken for given amount of substrate. 12 kg of wheat straw was taken slowly steeped in water. In another plastic bucket, Carbendazim (Bavistin) 7.5 g and 125 ml formaldehyde (37-40%) was readily dissolved and slowly poured on the already soaked wheat straw. Straw is pressed deeply and mixed thoroughly and covered with a polyethylene sheet. After 18 hour the straw is taken out and excess water was drained. The wet substrate was taken up to a moisture content of 75-78%. The substrates were spread on a pre-sterilized polyethylene sheets and thoroughly spawned at 2% of the wet substrate. Spawned substrates as per treatment combinations were filled in polyethylene bags size dimensions of 80cm length and 40 cm width having thickness of 125- 150 gauge. 15 to 25 small holes were made having diameter of 0.5- 1.0 cm on all sides of the polyethylene bags for draining excess water. Polyethylene sheets of 200-300 gauge having thickness of 1.25 x 1.25 m are spread in floor. Spawned substrates were filled and the polyethylene sheet is folded from all the four sides and compressed to make a compact rectangular block. The block is incubated as such and after mycelium growth polyethylene sheet is removed. The observations on the various parameters, viz., number of sporophores, number of pinhead, substrate spawn run (days), yield of first harvest per bed, yield of second harvest per bed, yield of third harvest per bed were recorded. The pooled data of two years were statistically analyzed and illustrated accordingly in concerned table.

Results and discussion

A perusal of pooled data given in Table-1 recorded on various parameters exhibited significant variation in their performance in different treatment combinations. The maximum number of sporophores (97.17) was recorded in treatment T₆ (wheat straw 80% + paddy straw 20%) statistically at par with 95.33 and 94.00 in treatments T₅ (wheat straw 85% + paddy straw 15%) and T₄ (wheat straw 90% + paddy straw 10%), respectively while the minimum (85.00) was recorded in treatment T₂ (paddy straw 100%). It might be due to the compactness of substrates and effective colonization. Similar results have been reported by Stamets (2005) and Thakur *et al.* (2001). Similarly, maximum number of pinhead (169.50) was found in treatment T₆ (wheat straw

80% + paddy straw 20%), whereas minimum (154.17) was recorded in treatment T₂ (paddy straw 100%). statistically at par (166.83) with treatment T₅ (wheat straw 85% + paddy straw 15%). Characteristics feature of fast mycelial growth leads to the dense outgrowth on combination of substrate. Similar findings are in concurrence by Josephine, 2014 and Yang *et al.*, (2014) [7]. The data showed that the maximum days (21.50 days) to substrate spawn run days was observed in treatment T₂ (paddy straw 100%) while the minimum days (18.17 days) to substrate spawn run days was recorded with treatment T₆ (wheat straw 80% + paddy straw 20%) at statistically par 18.83 days with treatment T₅ (85% + paddy straw 15%). It might be due to the partial breakdown of hemicellulose, cellulose in presence of enzymes. It was readily available to competitors. Similar results reported by Bhatti *et al.* (1987) [4] and Balasubramanya and Kathe (1996) [1]. Similar trends were also recorded in yield of first harvest, the maximum yield of first harvest (400.33g) found in treatment T₆ (wheat straw 80% + paddy straw 20%) statistically at par 398.63g, 397.42g and 392.62g with treatment T₅ (wheat straw 85% + paddy straw 15%), T₄ (wheat straw 90% + paddy straw 10%) and T₃ (wheat straw 95% + paddy straw 5%), respectively. The minimum yield of first harvest (351.98 g) was recorded in treatment T₂ (paddy straw 100%).

Similarly, the maximum yield (360.17g) of second harvest was found in treatment T₆ (wheat straw 80% + paddy straw 20%) at par with 355.17g and 352.00g in treatments T₅ (wheat straw 85% + paddy straw 15%) and T₄ (wheat straw 90% + paddy straw 10%), respectively. The minimum yield of second harvest (319.33 g) recorded in treatment T₂ (paddy straw 100%). Finally, Similar trends were recorded in yield of third harvest with maximum yield (142.52 g) found in treatment T₆ (wheat straw 80% + paddy straw 20%) statistically at par with 140.37g in treatment T₅ (wheat straw 85% + paddy straw 15%). The minimum yield of first harvest (125.93 g) recorded in treatment T₂ (paddy straw 100%). It might be due to the positive correlation with cellulose availability. Sometimes, it showed negative effects as lignin and ortho-dihydroxy phenolics content of substrate composition. Peksen and Yakupoglu (2009) [10] reported that positive correlation among yield, nitrogen content and biological efficiency of substrate. Other scientist recorded similar results as Bhatti *et al.* (1987) [4], Zadrazil (1983) [18] observed two flushes, Ramzan (1982) [13] obtained 3-5 flushes, Rangunathan *et al.* (1996) [12] and Bhandari *et al.* (1991) [3].

Table 1: The effect of different substrates on yield of Oyster mushroom (*Pleurotus florida*)

Symbol	Treatments combination	Number of sporophores	Number of pinheads	Substrate spawn run (days)	Yield of first harvest per bed (g)	Yield of second harvest per bed (g)	Yield of third harvest per bed (g)
T ₁	Wheat straw (100%)	91.83	162.83	19.33	383.82	346.83	134.65
T ₂	Paddy straw (100%)	85.00	154.17	21.50	351.98	319.33	125.93
T ₃	Wheat straw (95%) + Paddy straw (5%)	92.83	164.33	19.17	392.62	349.00	135.85
T ₄	Wheat straw (90%) + Paddy straw (10%)	94.00	165.33	19.17	397.42	352.00	137.68
T ₅	Wheat straw (85%) + Paddy straw (15%)	95.33	166.83	18.83	398.63	355.17	140.37
T ₆	Wheat straw (80%) + Paddy straw (20%)	97.17	169.50	18.17	400.33	360.17	142.52
T ₇	Wheat straw (75%) + Paddy straw (25%)	91.17	161.33	20.17	382.98	344.50	134.12
T ₈	Wheat straw (70%) + Paddy straw (30%)	90.33	159.33	20.33	371.98	341.17	132.08
T ₉	Wheat straw (65%) + Paddy straw (35%)	88.83	158.17	20.33	364.80	334.67	131.87
T ₁₀	Wheat straw (60%) +	87.17	157.17	20.67	356.95	330.50	130.03

	Paddy straw (40%)						
T ₁₁	Wheat straw (55%) + Paddy straw (45%)	86.33	156.50	20.67	355.75	328.17	128.58
T ₁₂	Wheat straw (50%) + Paddy straw (50%)	85.83	154.67	21.17	353.15	322.33	126.82
	General mean	90.49	160.85	19.96	375.87	340.32	133.38
	S.Em (±)	1.26	1.74	0.35	3.46	3.50	1.40
	C.D. at 5%	3.57	3.48	1.00	9.79	9.90	3.96

Conclusion

Based on the findings of the above investigation to analyse the efficacy of different substrates on yield of Oyster mushroom (*Pleurotus florida*) it can be concluded that both the substrates (paddy straw and wheat straw) in different ratio enhanced the yield of oyster mushroom. Moreover, combination of wheat straw 80% along with paddy straw 20% substrate fetched good results which was at par with T₅ (wheat straw 85% + paddy straw 15%) and T₄ (wheat straw 90% + paddy straw 10%) in most of the parameters. Thus, substrates used in combinations showed that the mushroom crop can be successfully produced by using alternate substrates under Lucknow conditions. Hence, income of marginalized sections of society can be improved by adopting the cultivation of oyster mushroom using different agro-waste substrates as alternate source of income.

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