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Efficacy of different substrates on growth 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 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 of oyster mushroom (*Pleurotus florida).* The experiment was laid out in completely randomized design consisted of twelve treatments combination in each replication and replicated thrice. The pooled data of two years showed that the maximum length of stipe (3.94 cm), diameter of stipe (1.24 cm), diameter of pileus (4.47 cm) and diameter of fruiting bodies (12.32 cm) were obtained under the treatment T_6 (Wheat straw 80% + Paddy straw 20%). Whereas, the minimum length of stipe (3.48 cm), diameter of stipe (0.79 cm), diameter of pileus (3.52 cm) and diameter of fruiting bodies (8.68 cm) were obtained under the treatment T_2. The maximum primordia initiation days (24.50) and pinhead initiation days (27.33) were recorded in treatment T_2 whereas the minimum primordia initiation days (20.67 days) and pinhead initiation days (24.00 days) were recorded in treatment T_2 (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.

Keywords: Wheat straw, Paddy straw, oyster mushroom, growth

Introduction
Oyster mushroom commonly called as *dhingri* (Manpreet *et al*., 2004) [8]. Mushroom is also known as 'white vegetable' or 'boneless vegetarian meat' that contains adequate level of proteins, vitamins and fiber apart from having certain valuable properties (Thakur *et al*., 2013 and Meng *et al*., 2016) [17, 9]. Mushroom become an integral part of continental dish due to the fine taste, flavour and high nutritional values. The presence of bioactive compounds in mushroom leads to its production in peri urban areas which also has keen interest by media and scientific community (Pokhrel *et al*. 2006) [10]. It has fleshy fruiting bodies and good source of minerals, proteins, carbohydrate and vitamins (Chang and Miles, 1981) [2]. Oyster mushroom belongs to the class Basidiomycetes, subclass Hollobasidiomycetidae, order Agricales and family pleurotaceae (Alexopolous *et al.* 1996) [1]. India is a basically agricultural country and produces a huge quantity of agro-wastes (approximately 620 million tons) every year (Singh and Sidhu, 2014). Oyster mushroom generally grow on decaying substrate like paddy straw and wheat straw which was a good source of cellulose and lignin (Poppe, 2004 and Das, 2000) [11, 3].

Materials and Methods
The present research work entitled 'Efficacy of different substrates on growth 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 oyster mushroom (*Pleurotus florida).* The experiment was laid down in completely randomized design consisted of twelve treatment combination in each replication and replicated thrice. The details of the treatments combination are T_1 - Wheat straw(100%), T_2 - Paddy straw (100%), T_3 - Wheat straw (95%) + Paddy straw (5%), T_4 - Wheat straw (90%) + Paddy straw (10%), T_5 - Wheat straw (85%) + Paddy straw (15%), T_6 - Wheat straw (80%) + Paddy straw (20%), T_7 - Wheat straw (75%) + Paddy straw (25%), T_8 - Wheat straw (70%) + Paddy straw (30%), T_9 - Wheat straw (65%) + Paddy straw (35%), T_{10} - Wheat straw (60%) +

Paddy straw (40%), T_{11} - Wheat straw (55%) + Paddy straw (45%) and T_{12} - 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*., stipe length (cm), diameter of stipe (cm), diameter of pileus (cm), diameter of fruiting bodies (cm), primordial initiation days and pinhead initiation days 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 length of stipe (3.94 cm) was recorded in treatment T_6 (wheat straw 80% + paddy straw 20%) and minimum (3.48 cm) in treatment T_2 (Paddy straw 100%). The treatment was statistically at par 3.85 cm with T_5 (wheat straw 85% + paddy straw 15%). The difference in the growth pattern of these substrates might be due to the chemical compositions of wheat straw and paddy straw, respectively. These results are in close conformity with the findings of Jonathan *et al*., 2012 [6]. Similarly, maximum diameter of stipe (1.24 cm) was found in treatment T_6 (wheat straw 80% + paddy straw 20%) whereas, minimum (0.94 cm) was recorded in treatment T_2 (paddy straw 100%). The treatment was statistically at par 1.16 cm with treatment T_5 (85% + paddy straw 15%). It might be due to the supplemental growths on agricultural wastes showed positive correlation with available nutrients and favourable environmental conditions. The results are in accordance with the findings of Gbolagade *et al*., 2006 [5]. Significantly, maximum diameter of pileus (4.47 cm) was recorded in treatment T_6 (wheat straw 80% + paddy straw 20%) statistically at par 4.41 cm, 4.38 cm, 4.37 cm and 4.27 cm in treatments T_5 (wheat straw 85% + paddy straw 15%), T_4 (wheat straw 90% + paddy straw 10%), T_3 (wheat straw 85% + paddy straw 15%) and T_1 (wheat straw 100%), respectively. Minimum diameter of pileus 3.52 cm was found in treatment T_2 (paddy straw 100%). It might be due to the size and shape depend on availability of cellulose, hemicelluloses and lignin which provide incremental growth to presence of enzyme. The results are in accordance with the report of Fasidi *et al*., 2008 [4]. Significantly, maximum diameter of fruiting bodies (12.32 cm) was recorded in treatment T_6 (wheat straw 80% + paddy straw 20%) while the minimum 8.68 cm was observed in treatment T_2 (paddy straw 100%). Organic supplements showed the positive effecst on vegetative parameters. Similar results were obtained by Sharma *et al*. (2013) [15] in *Colocybe indica*. Maximum days to primordia initiation (24.50 days) was observed in treatment T_2 (paddy straw 100%) while the treatment T_6 (wheat straw 80% + paddy straw 20%) significantly, showed the minimum days to primordia initiation (20.67 days) which was statistically at par 21.17 days and 21.33 days with T_5 (wheat straw 85% + paddy straw 15%) and T_4 (wheat straw 90% + paddy straw 10%), respectively. The result was in accordance with the report of Tirkey (2017) [18]. Similar trends were also recorded in days to pinhead initiation, the minimum (24.00 days) was found in treatment T_6 (wheat straw 80% + paddy straw 20%) at par with 24.50 days, 24.83 days, 25.33 days and 25.50 days in treatments T_5 (wheat straw 85% + paddy straw 15%), T_4 (wheat straw 90% + paddy straw 10%), T_3 (wheat straw 95% + paddy straw 5%) and T_1 (wheat straw 100%), respectively. The maximum days to pinhead initiation (27.33) was recorded in treatment T_2 (paddy straw 100%). The earlier appearance of pinheads in combination of wheat straw and paddy straw might be due to the C:N ratio availability. Similar results reported by Tan (1981) [16], Shah *et al*. (2017) [14], Khan *et al*. (1981) [7] in species of *Pleurotus sajar-caju* and *Pleurotus ostreatus.* Ramzan (1982) [13] found that 20-40 days of five *Pleurotus ostreatus* strains on wheat and paddy straw.

Table 1: Efficacy of different substrates on growth of Oyster mushroom (*Pleurotus florida*)

Symbol	Treatment combinations	Stipe length (cm)	Diameter of stipe (cm)	Diameter of pileus (cm)	Diameter of fruiting bodies (cm)	Primordial initiation days	Pinhead initiation days
T_1	Wheat straw (100%)	3.73	0.94	4.27	12.15	21.83	25.50
T_2	Paddy straw (100%)	3.48	0.79	3.52	8.68	24.50	27.33
T_3	Wheat straw (95%) + Paddy straw (5%)	3.76	1.00	4.37	12.17	21.83	25.33
T_4	Wheat straw (90%) + Paddy straw (10%)	3.77	1.09	4.38	12.22	21.50	24.83
T_5	Wheat straw (85%) + Paddy straw (15%)	3.85	1.16	4.41	12.28	21.17	24.50
T_6	Wheat straw (80%) + Paddy straw (20%)	3.94	1.23	4.47	12.32	20.67	24.00
T_7	Wheat straw (75%) +Paddy straw (25%)	3.74	0.96	4.07	12.07	22.00	25.67
T_8	Wheat straw (70%) +Paddy straw (30%)	3.74	0.87	4.02	11.78	22.33	25.83
T_9	Wheat straw (65%) +Paddy straw (35%)	3.70	0.88	3.97	11.35	23.00	26.17
T_{10}	Wheat straw (60%) +Paddy straw (40%)	3.63	0.84	3.88	10.25	23.67	26.50
T_{11}	Wheat straw (55%) +Paddy straw (45%)	3.59	0.84	3.77	9.73	24.00	26.50
T_{12}	Wheat straw (50%) +Paddy straw (50%)	3.58	0.82	3.62	8.93	24.17	26.83
	General mean	3.71	0.95	4.06	11.16	22.56	25.14
	S.Em (±)	0.03	0.03	0.08	0.15	0.35	0.57
	C.D. at 5%	0.09	0.07	0.22	0.31	0.99	1.62

Conclusion

Based on the findings of the above investigation to analyse the efficacy different substrates on growth of Oyster mushroom (*Pleurotus florida*) it can be concluded that both the substrates (paddy straw and wheat straw) encouraged the growth. Moreover, combination of wheat straw 80% along with paddy straw 20% substrate fetched good results which was at par with T_5 (wheat straw 85% + paddy straw 15%) and T_4 (wheat straw 90% + paddy straw 10%) in most of the growth 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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