

Investigations of growth hormone on growth parameter and biological efficacy of *Pleurotus florida* (Mont.) Singer

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Abstract

The data presented in the table-1 showed that highest fresh and dry weight of mushroom, was found in treatment T₅ (GA₃ 10 ppm) with the value of 1324 gm and 134.60 gm, respectively and maximum biological efficiency is found in treatment T₅ (GA₃ 10ppm) representing the value 33.10% as against 22.255 in case of control. The data presented on the table 2 showed maximum yield was obtained from T₅ treatment where 10ppm concentration of gibberellic acid were spray at the time of spawning representing the value 1324 gm however the largest average stripe length was found in T₅ treatment (GA₃ 10ppm) which is 9.4 cm at the time of harvesting against 5.1 cm in case of (T₇ treatment). As per concerned of width of pileus, the data presented in the table-3 showed that the largest average width of pileus was found in T₅ treatment (GA₃ 10ppm) representing the value 13.8 cm diameter, which was followed by T₆ (GA₃15ppm) and T₄ (GA₃ 5ppm) treatments.

Key words – Biological, Mushroom, Hormone, Fungus, Growth

Introduction

Oyster mushrooms (*Pleurotus* spp.) also called as “*Dhingri*” or “*Abalone*” ranks second among the important cultivated mushroom in the world (Chang and Miles, 1991). Because of the tongue shaped pileous with an eccentric lateral stripe, this mushroom has been named Oyster mushroom. The flexible nature of the genus give it more cultivated species than any other mushroom (Zadrazil and Dube 1992). Mushroom having various size shapes, colour and aroma and can be grown in various agro climatic condition The name “*Pleurotus*” has its origin from Greek word, ‘pleuro’ means formed laterally or lateral position of the stalk or stem. Oyster mushroom belongs to phylum- basidiomycota, class –teleomycetes sub_class- holobasidiomycetidae, order- polyporales, family-polyporaceae and genus ‘*Pleurotus*’. The fruiting bodies of this mushroom are distinctly shell fan or spatula shaped with deficient shades of white, cream, grey, yellow, pink or light brown depending upon the species. The variability of colour of the sporophores also influenced by the temperature, light intensity and nutrients of the substrate. The *Pleurotus* mushroom is also known for its good nutritive value in comparison to other edible mushrooms like paddy straw mushroom and white button mushroom. The chemical composition of the fresh fruiting bodies of oyster mushroom, *P. ostreatus* indicates a large quantity of moisture (90.8%), where as fresh so well as dry Oyster mushrooms are rich in proteins (30.4%), fat (2.2%), carbohydrates (57.6%) , fiber (8.7%) and ash (9.8%) with 345 Kcal energy value on 100 g dry weight basis ; while vitamins such as thiamin (4.8 mg), riboflavin (4.7 mg) and niacin (108.7 mg), minerals like calcium (98 mg),phosphorus (476 mg), ferrous (8.5 mg) and sodium (61 mg) on 100 g dry weight basis (Pandey and Ghosh, 1996). Mushroom are also the rich source of Vitamin C and B complex which are required for the human body. The niacin content is about ten times higher than any other vegetables. The folic acid present in Oyster mushrooms helps to cure anaemia. It is suitable for people with hypertension, obesity and diabetes due to its low sodium: potassium ratio, starch, fat and calorific value. Alkaline ash and high fiber content makes them suitable for consumption for those having hyperacidity and constipation and cholesterol inhibitors. Mushrooms are rare vegan sources of vitamin D and conjugated linoleic acid (Patil S. S.,2010). Oyster mushroom could be a good source of natural antioxidants that can be used as a possible food supplement with beneficial effect in health and also in the pharmaceutical industry.

Materials and Methods

Collection of culture of *Pleurotus florida*

The pure culture of *Pleurotus florida* was obtained from Mushroom Research and Development Centre, Department of Plant Pathology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, which was multiplied and maintained on freshly prepared Potato Dextrose Agar (PDA) medium in laboratory for further studies. Spawn was prepared from the purely grown fungus cultured and used for spawning.

Spawn preparation:

For the preparation of spawn, wheat grains were washed dried and boiled separately for 45-55 minutes and again dried in shade by spreading on Polythene sheet to remove surface moisture. There after 2 % CaCO_3 and 1% CaSO_4 powder were mixed thoroughly with boiling grain. Then 500 g boiling grain were taken in to glass made bottle or polypropylene bag and plugged with cotton and rubber band for autoclaving.

Collection of materials

Wheat straws were obtained from the Student Farm, Chandra shekhar Azad University of Agriculture and Technology Kanpur (208002). The empty glucose bottles, polythene bags, grains of cereal (wheat) and other chemicals, fungicides, insecticides, calcium carbonate, calcium sulphate, formalin, bleaching powder were procured from the Mushroom Research and Development centre, Department of Plant Pathology, Chandra Shekhar Azad University of Agriculture and Technology Kanpur (208002).

Observations were recorded under following parameters:-

1. Yield data – Number and weight of fruiting bodies per treatment.
Fresh and dry weight of mushroom, total number of fruiting body
2. Size of stripe
3. Size of pileus
4. Biological efficiency

Spawning:

Spawning was done by freshly prepared spawn, generally 15-20 days old spawn which considered the best for spawning. Old spawn (3-6 months) stored at room temperature (at 20-30⁰ C) forms a very thick mat like structure due to mycelium aggregation and sometimes young pinheads and fruit bodies start developing in the spawn of polythene or bottle itself. The spawning should be done in a pre-fumigated room (36 hrs. with 2% formaldehyde). Normally polypropylene methods are used for cultivation of Oyster mushroom. During spawning the treatment scheduled were given as follow :-

Treatment details.

T₁ = spraying on straw with IAA @ 5 ppm

T₂ = spraying on straw with IAA @ 10 ppm

T₃ = spraying on straw with IAA@15 ppm

T₄ = spraying on straw with GA₃5 ppm

T₅ = spraying on straw with GA₃@10 ppm

T₆ = spraying on straw with GA₃@15 ppm

T₇ = Control

Cropping room:

After spawning, bags were shifted in to the cropping room. How ever, before shifting, the cropping room was cleaned and sterilized by fumigation with formalin to avoid micro organism infestation and contamination. The formalin (2%) was sprayed in the room and the room was air tightly closed for 48 hours. Then all the doors and windows are opened and put on fans to remove the trace of formalin.

All the bags were than kept on iron rakes for 10-15 days to complete the vegetative stages of mushroom and were maintained as Temperature- 24 °C, Relative humidity-85-90%, Ventilation- 0.1 to 0.5%, Visible light in the range- 360 to 420 nm, Unit/ bags are look like a covered with white mycelia mat.

Opening of the bags:

After the spawn run period is covered, the bags were cut and polypropylene portion will be removed. The bags look like cylinder shape structure which were stored in cage and sprayed with water daily once or twice depending on the crop room condition season. The spraying of water should be stopped a day before harvesting and again continued. During fruiting, the following conditions of rooms are to be maintained as Temperature-1 8-20°C and Relative humidity 85%

Result & discussion

Effect of different concentrations of IAA and GA₃ on fresh, dry weight and moisture content and yield of *Pleurotus florida*

Fresh and dry weight

It is evident from the table-1.that the fresh and dry weight of mushroom show significant showed variation among the treatments. The data presented in the table-1 showed that highest fresh and dry weight of mushroom, was found in treatment T₅ (GA₃ 10 ppm) with the value of 1324 gm and 134.60 gm, respectively. The treatment T₆ (GA₃ 15ppm) representing 1271 and 120.75gm fresh and dry weight of mushroom respectively which is second highest among the treatments. In contrary, the lowest with 1064gm fresh and 93.08 gm dry weight were recorded in the treatment T₃ where treatment was given as 15 ppm of indole acetic acid. The treatment T₇ (Control) showing 890 and 87.32gm fresh and dry weight of mushroom, respectively which is lowest among all the treatments.

Moisture content

The quality of the any product depends on high amount of biomass content and low content of water. Mushrooms generally have high moisture content which accounts for their short shelf life as they deteriorate easily after harvest if preservative measures are not employed. The data presented in the table 1 showed that the moisture content in all the treatment is about 90

per cent or above except treatment T₅ (GA₃ 10 ppm) which contain 89.83 percent moisture. Moisture content in all the treatment mushroom is approximately equal.

These results were in contrast with the results obtained by Sarker and Chowdhury *et al.*,(2013) who obtained higher yields in 10 ppm GA₃ treated mushroom substrate. The result was almost similar to the findings of Dey (1996), Ashrafuzzaman *et al.* (2005). Dey (1996) reported that GA₃ at the rate of 5-15 mg/L is very effective to obtain a good yield. The huge amount of moisture the mushrooms of the *Pleurotus* genus are delicate and sensitive, and start deteriorating within 1 day after the harvest (Apati, Furlan, & Laurindo, 2010).

Effect of different concentrations of IAA and GA₃ on biological efficiency of *Pleurotus florida*.

Biological efficiency and yield:

Suitable concentrations of plant growth regulators (IAA and GA₃) for mushroom cultivation was also confirmed by the average biological efficiency which was show variable among the treatments. Maximum biological efficiency is found in treatment T₅ (GA₃ 10ppm) representing the value 33.10% as against 22.255 in case of control. Followed by treatment T₆ (GA₃ 15ppm) as 31.65%. From the (Table 5) it is also cleared that both the plant growth regulators IAA and GA₃are produce positive effect on Oyster mushroom cultivation. However effectivity of showing superior over IAA in respected of growth characters, biological efficacy, fresh and dry weight etc.

Yield is important parameter for increase production and productivity of any crops. The data presented on the table 2 showed maximum yield was obtained from T₅ treatment where 10ppm concentration of gibberellic acid were spray at the time of spawning representing the value 1324 gm. The T₆ treatment (GA₃15ppm) showing 1271 gm, indicating second highest among the treatments. From the table itis cleared that both growth regulators (IAA, GA₃) increase yield of mushroom but gibberellic acid treated bags gives more yield in comparison to indole acetic acid treated bags. The respective highest biological efficiencies found in my trial for 11ppm GA₃ and 15ppm GA₃ were 35. it is also cleared that both plant growth regulators IAA and GA₃ is produce good effect on dhingri mushroom cultivation Hans(1997). Application of GA₃ in high concentration, increases biological and economical yield by increasing cell

division and enlargement of pileus diameter and pileus girth and elongation of stalk length Ashrafuz zaman *et al.* (2005) reported similar results.

Effect of different concentrations of IAA and GA₃ on length and width of stripe of *Pleurotus florida*

Length of stripe and width of pileus

Length are t important parameters of higher yield, the data represented in the table- 3 showed that the largest average stripe length was found in T₅ treatment (GA₃ 10ppm) which is 9.4 cm at the time of harvesting against 5.1 cm in case of (T₇ treatment). The treatments T₆ (15ppm GA₃) representing 8.5cm stripe length, which is second highest among the treatment. From the table is also cleared that the maximum number of fruiting body was found in first harvesting of mushroom with the maximum in T₅treatment(GA₃ 10ppm), representing the value 22 which was followed by T₄ (5 ppm GA₃) and T₆ (15 ppm GA₃) treatments representing if each from the both. As per concerned of width of pileus, the data presented in the table-3 showed that the largest average width of pileus was found in T₅ treatment (GA₃ 10ppm) representing the value 13.8 cm diameter, which was followed by T₆ (GA₃15ppm) and T₄ (GA₃ 5ppm) treatments indicating 12.6 and 12.2 cm, respectively. Among all treatments, the average minimum diameter of pileus was found in T₇ treatment (control).

Xavier *et, al.* (2001). the application of gibberellic acid showed a positive effect on number of effective stripe length, stripe width, and biological and economical yield compared with IAA and NAA. Chowdhury *et al.* (2013) reported that the concentration level 10 ppm and 20 ppm produced the highest no. of effective pileus width. The lowest was found with control condition and 40 ppm which was statistically identical to all other treatments. This similar finding has also been reported by Dey *et al.*,(2007).

Table-1: Effect of different concentrations of plant growth regulators on fresh and dry weight of mushroom

Treatment	Total fresh weight(g)	Total fresh Increase over control (%)	Total dry weight(g)	Total dry weight increase over control (%)	Moisture content on fresh weight (%)
T ₁ IAA 5ppm	1220	37.07	110.33	26.35	90.95
T ₂ IAA 10ppm	1162	30.56	100.42	15.00	91.35
T ₃ IAA 15ppm	1064	19.55	93.08	11.74	91.25
T ₄ GA ₃ 5ppm	1266	42.24	120.57	33.25	90.47
T ₅ GA ₃ 10ppm	1324	48.76	134.60	54.14	89.83
T ₆ GA ₃ 15ppm	1271	42.80	120.75	38.28	90.49
T ₇ Control	890	-----	87.32	-----	90.18
C.D.	71.829		11.143		
SE(m)	21.115		3.276		
SE(d)	29.862		4.632		
C.V.	2.550		4.214		

Table 2: Effect of different concentrations of plant growth regulators on average yield and biological efficiency of *pleurotus florida*

Treatment	Weight of substrate used (g)	Total yield(g)	Yield increase over control	Biological efficiency (%)
T ₁ IAA 5ppm	4000	1220	37.07	30.50
T ₂ IAA 10ppm	4000	1162	30.56	29.05
T ₃ IAA 15ppm	4000	1064	19.55	26.60

T ₄ GA ₃ 5ppm	4000	1266	42.24	31.65
T ₅ GA ₃ 10ppm	4000	1324	48.76	33.10
T ₆ GA ₃ 15PPM	4000	1271	42.80	31.75
T ₇ Control	4000	890	-----	22.25
C.D.		71.829		
SE(m)		21.115		
SE(d)		29.862		
C.V.		2.550		

Table-3: Effect of different concentrations of plant growth regulators on growth parameters of *pleurotus florida*

Treatment	Average Stripe length(cm)	Maximum stripe length (cm)	Minimum stripe Length (cm)	Average Pileus width(cm)	Maximum pileus width (cm)	Minimum pileus width (cm)
T ₁ IAA 5ppm	7.5	13	5.5	11.3	17.0	8.5
T ₂ IAA 10ppm	7.2	12	4.5	10.6	20.0	7.0
T ₃ IAA 15ppm	6.4	12	4.5	9.7	15.5	8.0
T ₄ GA ₃ 5ppm	7.8	14	5	12.2	20.5	9.0
T ₅ GA ₃ 10ppm	9.4	16	6.5	13.8	22.5	10.5
T ₆ GA ₃ 15ppm	8.5	15	4.7	12.6	21.5	9.0
T ₇ Control	5.1	10	2	9.3	15.0	6.0
C.D.	2.348	3.149	2.227	2.688	3.857	2.490

SE(m)	0.690	0.926	0.665	0.790	1.134	0.732
SE(d)	0.976	1.309	0.926	1.117	1.604	1.035
C.V.	13.083	9.962	20.127	9.802	8.504	12.386

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