Effect of Dextrose Sugar on the Growth and Production of Oyster Mushroom (*Pleurotus ostreatus*) through Tissue Culture

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Abstract: The study was conducted to investigate the dextrose sugar effect as carbon source on mycelial growth and production of Oyster mushroom (*Pleurotus ostreatus*). The experiment was performed in Mushroom Laboratory, Plant Pathology Section, Agriculture Research Institute, Tandojam, during 2013-2014. Mycelial growth was developed by using tissue culture on medium (PDA) potato dextrose agar with various concentrations of dextrose sugar. Analysis of variance for concentrations was statistically highly significant for all the parameters. In some cases among the different concentrations, 2.0% dextrose sugar showed after 2 days of micro propagation, the mycelial growth (1.9 cm) was recorded, followed by 1.5% dextrose sugar that showed (1.7 cm). The earlier spawn mycelia growth was observed in case of amending same 0/2% dextrose sugar (24.5 days). The pinhead first appeared (29.5 days) after the date of spawning by using 2.0% dextrose sugar. The minimum period (4.2 days) for maturation of mushroom fruiting body were recorded at 20% and 1.5% dextrose sugar. The maximum numbers of fruiting bodies (56.2) were observed with an application of dextrose sugar at 2.0%. The maximum number of bunches per bag (16.5) were harvested with an application of dextrose sugar 2.0%. The highest (350.5 g) fresh yield of Oyster mushroom *Pleurotus ostreatus* was recorded from 2.0% am ended of dextrose sugar.

Keywords: Oyster mushroom, carbon source, media, mycelia growth, tissue culture dextrose sugar.

INTRODUCTION

Mushrooms (saprophyte) fungi that belongs to the Basidiomycetes, grown in moisten areas organic matter decomposing, they are highly valuable for nutrient cycling [1] (Subramanian, 1995). Mushrooms that are edible known as food of gods also used delicacy or garnish and eaten routinely as in human diet generally known as healthy food. Mushrooms considered as a good source of vitamins, which are essential for human diet including vitamin C, niacin, and riboflavin. Dhingri (*Pleurotus* spp.) Oyster mushrooms are mostly found in India and Pakistan. They belong to the genus *Pleurotus* and family of Tricholomataceae, which has about well-known 40 species [2] (Ahmed *et al.*, 2009). The *Pelurotus* specie are known easily to obtain high production of many types of lignocellulolosic substances. Growing of Oyster mushrooms *Pleurotus ostreatus* are less expensive productive technology and simple as well. Carbon removal form ecosystem can be responsible for poor growth of mushrooms, whereas media and growth regulator of plant can play major role *in vitro* colony proliferation of mycelial mushrooms, [3] (Maniruzzaman, 2004). Tissue culture is simple method for obtaining the mycelial culture and considered important as a mushroom clone. There are different methods but basic method for removing the sterilely a cap, stem or a piece of mushroom and place in an agar plate. Culturing of tissue and production of spawn are initial steps for production of mushrooms. The development of tissue culture has two important parts i.e. media culture and fungal component i.e. mycelia. In current research, mushroom culturing was done on different types of media potato dextrose agar medium (PDA) and growth rate of mycelial was determined.

MATERIAL METHODS

Experiment was conducted with Oyster mushroom (*Pleurotus ostreatus).* The research was carried out in complete random design with three replications in Mushroom Laboratory, Plant Pathology Section, Agriculture Research Institute, Tandojam, during 2013-2014.

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Preparation of the Starter Culture

Two methods were followed to raise the start culture including tissue culture and spore culture techniques.

1. Tissue culture technique
2. Spore culture Technique

Preparation of media:

PDA- potato dextrose agar medium

Potato	200 g
Dextrose	1.0%, 1.5%, 2.0%, 2.5% and 3.0%
Agar	15 g
Water	1000 ml

Treatments: Five treatments were employed

T_1 = Dextrose sugar 1.0%

T_2 = Dextrose sugar 1.5%

T_3 = Dextrose sugar 2.0%

T_4 = Dextrose sugar 2.5%

T_5 = Dextrose sugar 3.0%

RESULTS

The results on numbers of days taken for mycelial growth, numbers of days taken to spawn mycelial growth, numbers of days to pin head development, numbers of days to maturation of fruiting body, numbers of fruiting bodies per bad, numbers of bunches per bag and yield (g) harvesting of Oyster

Table 1: Mean Performance for Days Taken to Mycelial Growth (cm) on (PDA) under Different Concentrations of Dextrose Sugar as Carbon Source

Concentrations PDA+dextrose sugar (%)	Time intervals						Mean for Concentrations
	2 days	4 days	6 days	8 days	10 days	12 days	
1.0	0.9 r	1.6 q	2.3 nop	3.0 lm	4.8 ij	6.2 h	3.1 E
1.5	1.7 pq	2.8 lmn	4.6 jk	6.9 fg	8.8 d	10.7 ab	5.9 B
2.0	1.9 opq	3.2 l	5.4 i	7.3 ef	9.0 cd	11.0 a	6.3 A
2.5	1.6 q	2.5 mno	4.3 jk	6.5 gh	8.5 d	10.3 b	5.6 C
3.0	1.4 qr	2.4 mno	3.9 k	6.0 h	7.5 e	9.6 c	5.1 D
Mean for Time interval	1.5 F	2.5 E	4.1 D	5.9 C	7.7 B	9.5 A	

	Concentrations	Time intervals
SE	0.08724	0.09557
LSD @ 5%	0.2468	0.2703

Table 2: Days taken to Spawn Mycelial Growth of Oster Mushroom (*Pleurotus ostreatus)* under Different Conditions of Dextrose Sugar as Carbon Source

Concentration of Dextrose sugar (%)	Replications			Mean for concentrations
	RI	RII	RIII	
1.01	40.3	42.7	44.5	42.5 A
1.5	33.2	31.2	33.9	32.7 D
2.0	25.1	26.2	22.2	24.5 E
2.5	35.4	36.0	36.6	36.0 C
3.0	35.8	36.9	39.8	37.5 B

mushroom *Pleurotus ostreatus* micro propagation at various concentrations of dextrose sugar as carbon source are given in Table **1**. The parameter wise results are described as under.

Effect of Dextrose Sugar as Carbon Source on Mycelial Growth

The effect of dextrose sugar concentration on mycelial growth is shown in Table **1**. It is evident from the results presented in Table **1** that the mycelial growth on PDA recorded after 2, 4, 6, 8, 10 and 12 days micro propagation of mushroom. After 2 days of micro propagation, the mycelial growth (1.9 cm) was recorded at 2.0% dextrose sugar, followed by 1.5% dextrose sugar that showed (1.7 cm). After 4 days, the effect of dextrose sugar on mycelial growth was recorded (3.2 cm) at 2.0% dextrose sugar, whereas increased or decreased concentrations produced fewer mycelial growths. After 6 days, the effect of dextrose sugar increasing concentration of dextrose sugar 2.0% mycelial growth was recorded (5.4 cm). After 8 days increasing concentration of dextrose sugar 2.0% was recorded (7.3 cm). After 10 days, the effects of dextrose sugar progressively increase concentration of dextrose sugar 2.0% was recorded mycelial growth (9.0 cm). Therefore, results indicate that after 12 days of micro propagation, the mycelial growth (11.0 cm) was recorded at 2.0% dextrose sugar. Generally, it was observed that increasing in the concentration of dextrose sugar 2.0% gave best result for mycelial growth.

Effect of Dextrose Sugar as Carbon Source on Spawn Mycelial Growth

The effect of dextrose sugar concentration on spawn mycelial growth is shown in Table **2**. The effect of dextrose sugar concentration on spawn mycelial growth showed highly significant. The spawn mycelial growth was record as earlier as the dextrose sugar was increased (Table **2**). The earlier spawn mycelial was observed in case of amending 2.0% dextrose sugar (2.45 days) followed by 1.5% and 2.5% dextrose sugar i.e. 32.7 and 36.0 days, respectively. It is also clear from (Table **2**) that maximum days (42.5 days) were taken in case of amended concentration of dextrose sugar 1.0% followed by highest amended concentration of dextrose sugar 3.0% in which the spawn mycelial growth showed (37.5).

DISCUSSION AND CONCLUSION

The effect of different concentrations of dextrose sugar as carbon source on mycelial growth was recorded after 2 days of micro propagation of mushroom which suggested that maximum mycelial growth showed (1.9 cm) at 2.0% dextrose sugar respectively. After 4 days the effect of dextrose sugar on mycelial growth was recorded (3.2 cm) at 2.0% dextrose sugar. After 6 days, the effect of dextrose sugar increasing concentration of dextrose sugar 2.0% mycelial growth was recorded (5.3 cm). After 8 days the effectiveness of dextrose sugar changed progressively. The increasing concentration of dextrose sugar was similar in that the maximum mycelial growth (7.3 cm) recorded at 2.0%. After 10 days the effect of dextrose sugar increasing concentration 2.0% were recorded (9.0 cm). The result further indicated that after 12 days of micro propagation, the mycelial growth was recorded (11.0) at 2.0% dextrose sugar. Generally, it was observed that increasing in concentration of dextrose sugar up to 2.0% gave least response for mycelial growth, whereas further increase in concentration of dextrose sugar did not prove feasible. Our findings are in conformity with other experts [4] (Sridevi *et al*., 2013) who studied the carbon requirement on *P. ostreatus* and *P. florida* and showed that dextrose was the best carbon source. This was closely followed by fructose, sucrose and galactose. He also observed that the mycelial growth of *Pleurotus*

ostreatus isolated on media used different carbon sources i.e. dextrose sugar mycelial growth was recorded (1.8), fructose (1.6), galactose (1.2) and mannitol (0.9 cm) on PDA medium [5]. (Thulasi *et al*., 2010) Observed that mycelial growth of Oyster mushroom *Pleurotus ostreatus* recorded (1.5 cm) within 2 days on 20 (g) dextrose sugar under PDA media [6]. (Dudka *et al*., 1979) reported that PDA is suitable for fungal growth and could also be used as growth stimulator for *Pleurotus ostreatus* [7]. (Solangi, 1988) reported 33-47.3 days for completion of spawn running. While [8] Vetayasuporn *et al*. (2006) recorded 22 days for spawn running [8]. (Vetayasuporn, 2006) observed 28 days [9]. (Iqbal *et al*., 2005) reported 14-46 days. The findings of the current study revealed that, increasing concentration of dextrose sugar up to 2% took minimum days (40.2) to pinhead development followed by (33.5 days) at 1.5% and 2.5% dextrose sugar (40.2 days), respectively. This trend demonstrated that absolutely low concentration and high concentration took maximum days of pinhead development [10]. Solangi, (1988) also cultivated different strains *P. ostreatus* on banana leaves and reported 33-50 days for pinhead formation [11]. (Jiskani *et al.,* 1999) recorded 33 days, [12] (Shah *et al.,* 2004) recorded 24.30.3 days, and [10] (Iqbal *et al.* 2005) recorded 16-49 days. The data related to number of bunches of fruiting bodies (16.5) were harvested at 2.0% dextrose sugar followed by 1.5% dextrose sugar (11.0) [13]. Bhatti *et al.,* (2007) recorded 6-7 days [14]. (Khan *et al*., 2012) reported that Oyster mushroom *Pleurotus ostreatus* showed relatively more yield on cotton waste (296.2 g) [12]. (Shah *et al*., 2004) reported that yield ranged between 210.6-646.7 g from different substrates [15]. (Baysal *et al*., 2003) recorded highest yield (350.2 g) [16]. (Rinker, 1989) reported the highest yield (275-300 kg/t substrate).

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