J. Bangladesh Agril. Univ. 5(2): 181–187, 2007 ISSN 1810-3030

Effect of different hormone, media and variety on mycelial growth of mushroom

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Abstract

An experiment was carried out to study the effect of IAA and NAA on mycelia, colony proliferation of Milky mushroom and varietal performance of different mushroom varieties on different media. The MEA medium supplemented with 5 mgL^{-1} IAA gave highest mycelial growth (8.20 cm) and lowest (6.50 cm) with 20 mgL^{-1} at 21 DAI; NAA at 10 mgL^{-1} gave the best mycelial growth (8.10 cm) and poor (6.90 cm) with 5 mgL^{-1} at 21 DAI. In case of combined effect, 5 mgL^{-1} IAA + 10 mgL^{-1} NAA performed highest for mycelial growth (8.80 cm), while the lowest (6.80 cm) with 20 mgL^{-1} IAA + 5 mgL^{-1} NAA at 21 DAI. The highest mycelial colony diameter (10.50 cm) was found in Milky mushroom with YPDA media whereas, the lowest (4.667 cm) was found in Button mushroom with PDA media at 21 DAI. Among the three varieties and media, Milky mushroom and YPDA medium performed best in mycelial colony proliferation of mushroom.

keywords: Hormone, Media, Variety, Mycelial growth, Mushroom

Introduction

Mushrooms are fleshy fungi, which are generally used as delicacy from the time immemorial. Edible mushrooms have been treated as important tool in modern medicine for their medicinal values (Kovfeen, 2004). Mushroom helps to reduce serum cholesterol and high blood pressure (Mori *et al.,* 1986). The polysaccharides derived from Oyster and Button mushrooms are found to have antitumor property. *Ganoderma lucidum* is renowned for its medicinal properties (Willard, 1990) and often is associated with health and repercussion, longevity, wisdom, and happiness (Stamets, 1990). Edible mushrooms are recommended by the FAO as food to meet protein requirement of developing countries, the large portion of which depends mainly on cereals (World Bank, 2004). The actual organ that produces the mushrooms is called mycelium, a strand like mass of white cells found in the growing substrate. The mycelial growth of different mushroom species is greatly influenced by media (Fasidi and Olorunmaiye, 1994; Eswaran and Ramabadran, 2000). Plant growth regulators viz. IAA, GA_3 and Kin at different concentrations increased the biomass production of *P. sajor-caju* by 15–26% and also increased the protein content of the mycelia (Mukhopadhyay *et al.*, 2005). Plant growth regulators and media also play an important role for *in vitro* mycelial colony proliferation of mushroom (Maniruzzaman, 2004; Arkan *et al.,* 2001; Shukla, 1995; Chodchoi, 1986). Variety is another important factor for production of mycelia. Variety has influence on mycelial growth as well as mushroom production. Varietals difference was observed for mycelial colony proliferation (Khandakar, 2004; Haque, 2004). Therefore, the present experiment was carried out to investigate the effect of different concentrations of NAA and IAA on mycelial colony proliferation of Milky mushroom and varietal and media performance of different mushroom varieties.

Materials and Methods

The experiments were conducted at the Mushroom and Tissue Culture Laboratory, Horticulture Demonstration and Training Center (HDTC), DAE, Keyotkhali, Mymensingh during the period from February to May 2006. The methodology used in these experiments was as per Siddiqui (2002) with some modification. The PDA, YPDA, MEA media and also MEA media supplemented with IAA (0, 5, 10 and 20 mgL^{-1}) and NAA (0, 1, 5 and 10 mgL^{-1}) were used for mycelial colony proliferation of milky mushroom. Three varieties of mushroom viz. Milky, Button and Ganoderma were grown on PDA, YPDA and MEA media. At first, 30 ml of prepared MEA media were poured in bottles and packed tightly with nonabsorbent cotton using paper and rubber band were sterilized. Then a piece of MEA media containing mycelia was placed aseptically and the bottles were kept on wooden rake in culture room at 20-22^{0}C for spawn run. The whole substrate became white due to fungal mycelia proliferation within 10 days and was ready for spawning in different media. In this experiment, 48 bottles were used in 16 treatments with 3 replications. In these bottles, about 1 cm of mycelia of milky mushroom from the mother culture was inoculated. Then these bottles were kept at the culture room on wooden rake at 20-22^{0}C for 21 days and allowed for mycelial proliferation. The bottles containing PDA, YPDA and MEA media were inoculated taking 1 cm inoculums into each bottle in presence of flame in the laminar air flow cabinet following treatment patterns and were kept in the culture room maintaining proper conditions for 21 days and are allowed for mycelial colony proliferation. All instruments, glassware and culture media were sterilized by autoclaved with 15 PSI at 121^{0}C for 1-2 hours. The culture room of the laboratory was cleaned by gently washing with detergent followed by 70 % ethyl alcohol regularly. Mycelial colony diameter was measured in centimeter using scale from out side the bottles at 3 days interval. The data were statistically analyzed following the Completely Randomized Design (CRD). Means were compared following Duncan's Multiple Range (DMRT) test at 1% level of probability for interpretation of results (Gomez and Gomez, 1984).

Results and Discussion

Best mycelial growth with a colony diameter of 0.650 cm was found at 5 mgL^{-1} IAA and the lowest growth having the colony diameter of 0.550 cm at 20 mgL^{-1} IAA observed at 3 DAI. The mean value of mycelial growth in terms of colony diameter of Milky mushroom was statistically significant for different concentrations of IAA. The similar trends were also observed at all DAIs, where mean values of mycelial colony diameter were statistically significant for different concentrations (Fig. 1). Alexander and Lippert (1989) in their experiment revealed that IAA at 0.05 ppm concentration enhanced best mycelia proliferation of *Calvatia gigantean, C. booniana and C. craniiformis.* The result of the present study did not comply with those findings possibly because of the varietal difference. Maniruzzaman (2004) in his study found the best mycelial growth at 5 ppm IAA in Oyster mushroom. Shukla (1995) found that IAA at 5 ppm gave the highest yield in Shiitake mushroom production. These findings were almost similar with the present study.

In case of NAA at 3 DAI, the best mycelial growth with a colony diameter of 0.650 cm was obtained at 10 mgL^{-1}NAA and the lowest mycelial colony diameter of 0.550 cm at 5 mgL^{-1} NAA. Similar trends were also observed at 15, 18 and 21 DAI (Fig. 2). However, in case of 6 DAI, data revealed that the best mycelial growth was obtained at 0 mgL^{-1} NAA and the lowest at 5 mgL^{-1} NAA. The similar trends were also observed at 9 and 12 DAI (Fig. 2). The present result was similar with the findings of Chodchoi (1986). Who observed the best mycelial growth of ear mushroom (*Auricularia polytricha)* with NAA at 10 ppm and the worst with 100 ppm NAA.

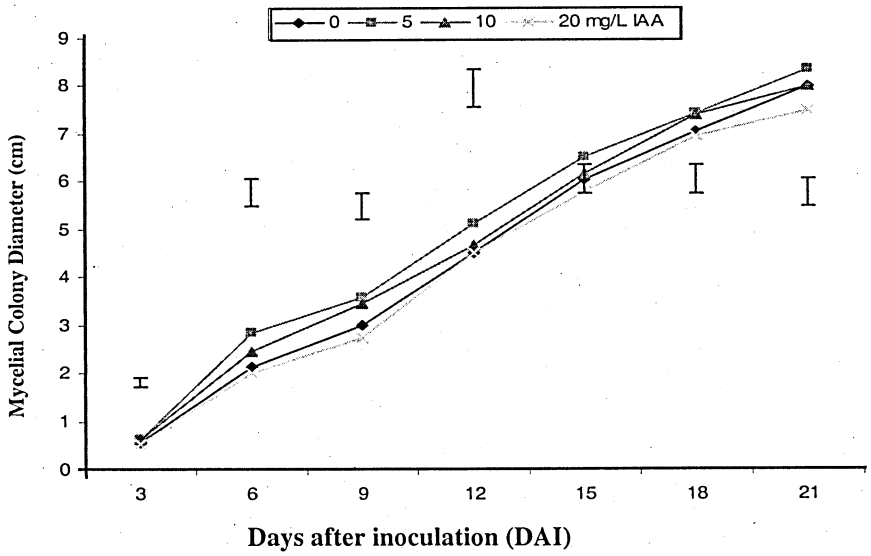

Fig. 1. Effect of IAA on mycelial colony diameter at different DAI. The vertical bars represent LSD at 1% level of probability

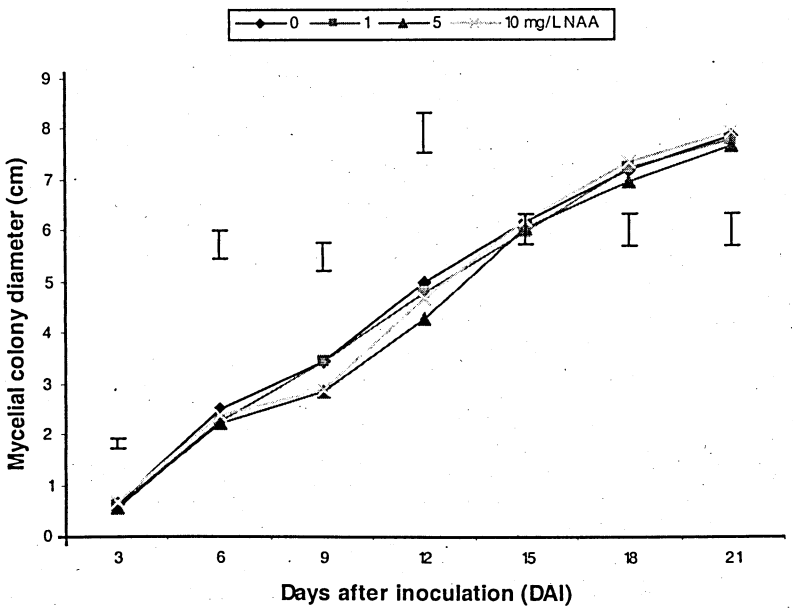

Fig. 2. Effect of NAA on mycelial colony diameter at different DAI. The vertical bars represent LSD at 1% level of probability

The best mycelial colony diameter 0.80 cm was found at 5 mgL^{-1} IAA + 10 mgL^{-1} NAA, while the lowest 0.400 cm was found at 20 mgL^{-1} IAA + 5 mgL^{-1} NAA and it was statistically significant for different concentrations and combinations of IAA + NAA at 3 DAI. Similar trends were also observed at 6, 9, 12, 15, 18 and 21 DAI. (Table 1). Maniruzzaman (2004) found the best MCD at 5 ppm IAA + 0 ppm NAA in Oyster mushroom.

Table 1. Combined effects of IAA and NAA on mycelial growth

Hormone Concentrations(mgL^{-1})		Colony diameter of mycelium (cm)						
IAA	NAA	3 DAI	6 DAI	9 DAI	12 DAI	15 DAI	18 DAI	21 DAI
0	0	0.600 c	2.200 d	3.600 a	5.100 b	6.500 b	7.500 b	8.100 cd
	1	0.500 d	2.200 d	3.300 bc	4.500 cd	5.700 fg	6.900 d	7.100 f
	5	0.600 c	2.100 d	2.500 e	4.700 c	6.400 bc	7.200 c	8.100 cd
	10	0.6 00 c	2.000 de	2.500 e	3.600 f	5.500 g	6.100 f	6.800 g
5	0	0.600 c	2.800 b	**3.700 a**	5.200 ab	6.500 b	7.500 b	8.500 b
	1	0.600 c	2.800 b	3.500 b	5.100 b	6.100 d	7.200 c	8.100 cd
	5	0.600 c	2.600 bc	3.300 bc	4.600 cd	6.200 cd	7.100 cd	7.900 de
	10	**0.800 a**	**3.100 a**	**3.700 a**	**5.500 a**	**7.200 a**	**7.900 a**	**8.800 a**
10	0	0.600 c	2.500 c	3.600 a	4.500 cd	5.600 fg	6.500 e	7.100 f
	1	0.600 c	2.100 d	3.500 ab	4.367 cde	6.100 d	7.700 ab	8.200 c
	5	0.600 c	2.500 c	3.500 ab	4.267 de	6.500 b	7.500 b	8.100 cd
	10	0.700 b	2.700 bc	3.100 cd	**5.500 a**	6.400 bc	7.800 a	8.500 b
20	0	0.700 b	2.500 c	3.000 d	5.100 b	6.100 d	7.200 c	7.800 e
	1	0.600 c	2.000 de	3.500 ab	5.200 ab	6.000 de	7.200 c	7.800 e
	5	0.400 e	1.700 de	2.200 f	3.500 f	5.100 h	6.500 e	6.800 g
	10	0.500 d	1.800 ef	2.300 ef	4.100 e	5.800 ef	7.200 c	7.700 e
CV (%)		7.19	4.26	2.95	2.13	1.74	1.48	2.03

In a column, figures followed by common letter (s) do not differ significantly at the level of 1% probability as per DMRT.

The mean values of three media PDA, YPDA and MEA were found statistically significant for mycelial colony diameter at 3, 6, 9, 12, and 15 DAI respectively. However, at 18 and 21 DAI, no significant variation was found among the media for supporting mycelial colony growth. At 3 DAI, the best 1.00 cm mycelial diameter was observed in YPDA media, whereas the lowest (0.733 cm) in PDA media (Fig. 3). The similar trend continued up to 21 DAI, indicating YPDA media is superior to PDA and MEA for mycelial growth. The present study was similar with Maniruzzaman (2004) and Islam (2007) findings. They observed the best mycelia colony proliferation with YPDA media in Oyster mushroom.

The best mycelial growth (1.289 cm) was found in Milky mushroom followed (0.811 cm) by Ganoderma mushroom and the lowest (0.611 cm) in Button mushroom at 3 DAI (Fig. 4). The results also showed the mean value of mycelial growth of Milky mushroom was significantly higher as compared to Button, whereas Ganoderma and Button were statistically identical. The same trend continued up to 21 DAI. Milky mushroom had an overall superiority throughout the entire growing period. Islam, 2007 and Uddin, 2006 observed the best mycelia colony proliferation in Oyster mushroom. This finding did not coincide with present findings.

The highest performance of mycelial colony diameter (1.50 cm) was observed with Milky × YPDA and the lowest (0.50 cm) was found with Button × PDA at 3 DAI. The result also showed that the mean colony diameter of Milky × YPDA was statistically identical to Milky × MEA. The trend of highest and lowest performance continued up to 21 DAI respectively with Milky × YPDA and Button × PDA media combinations (Table 2). But at 18 DAI colony diameter of mycelium was statistically not significant.

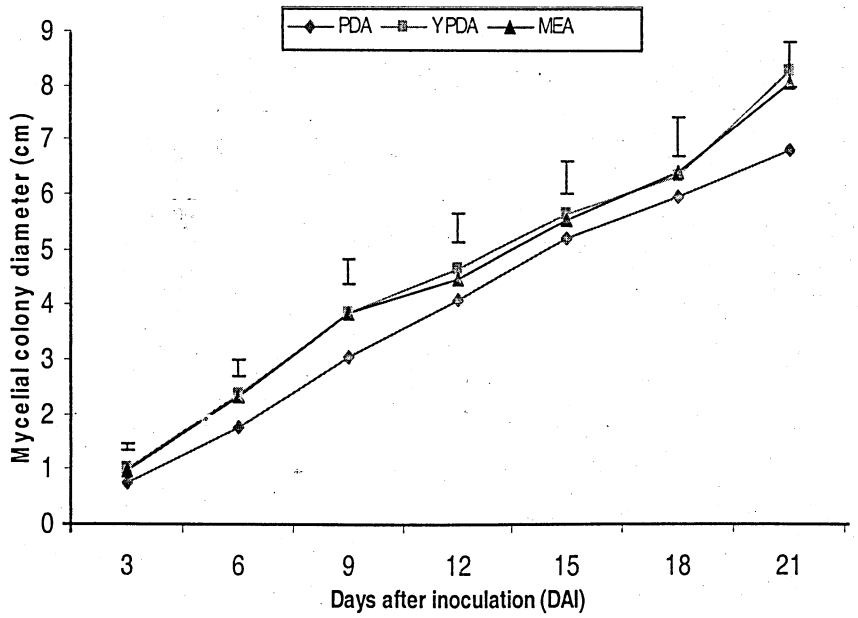

Fig. 3. Effect of different media on mycelial colony diameter at different DAI. The vertical bars represent LSD at 1% level of probability

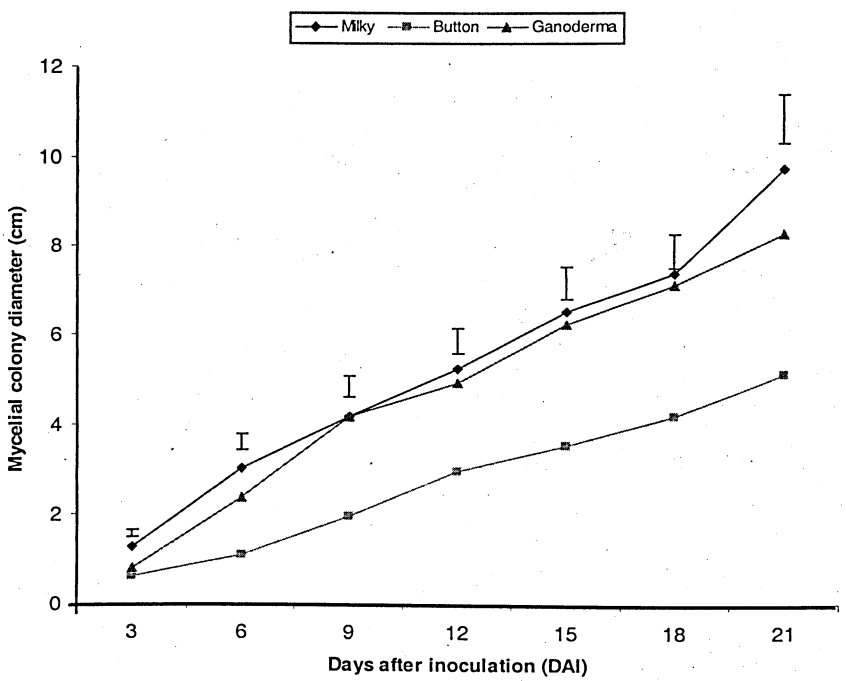

Fig. 4. Effect of different variety on mycelial colony diameter at different DAI. The vertical bars represent LSD at 1% level of probability

Table 2. Combined effect of medium and variety on mycelial growth

Treatments		Colony diameter of mycelium (cm)						
Media	Variety	3 DAI	6 DAI	9 DAI	12 DAI	15 DAI	18 DAI	21 DAI
PDA	Milky	1.07 b	2.30 d	3.40 c	5.10 b	6.20 c	7.10	8.60 bcd
	Button	0.50 e	0.90 f	1.60 e	2.50 f	3.20 e	4.10	4.67 f
	Ganoderma	0.63 de	2.10 d	4.10 b	4.50 d	6.10 c	6.70	7.20 de
YPDA	Milky	**1.50 a**	**3.50 a**	**4.833 a**	**5.40 a**	**6.80 a**	7.50	**10.50 a**
	Button	0.70 de	1.30 e	2.50 d	3.60 e	3.90 d	4.30	6.03 ef
	Ganoderma	0.80 cd	2.30 d	4.10 b	4.80 c	6.20 c	7.20	8.30 cd
MEA	Milky	1.30 a	3.20 b	4.20 b	5.20 ab	6.60 ab	7.57	10.10 ab
	Button	0.63 de	1.10 ef	1.70 e	2.70 f	3.40 e	4.167	4.70 f
	Ganoderma	1.00 bc	2.70 c	4.20 b	5.40 a	6.50 b	7.50	9.36 abc
CV (%)		4.19	3.09	3.75	1.86	2.48	4.86	3.03

In a column, figures followed by common letter (s) do not differ significantly at the level of 1% probability as per DMRT.

From the above study, it was found that 5 mgL^{-1} IAA and 10 mgL^{-1} NAA performed best for mycelial growth of Milky mushroom at all DAIs and Milky mushroom performed best among three varieties, YPDA media was superior to PDA and MEA media for mycelial colony proliferation.

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