Pakistan J. Sci. Ind. Res, Vol. 31, No. 5, May 1988

STUDIES ON GROWTH OF *AGARICUS BITORQUIS* (QUEL) SACE. ON DIFFERENT CULTURE MEDIA AND SUBSTRATES

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(Received August 9, 1987; revised February 28, 1988)

An experiment was conducted with a view to determine the pattern of growth of *Agaricus bitorquis* on different culture media and substrates. Three culture media, namely complete medium, malt extract medium and potato dextrose medium were tried for linear growth of the fungus. All the three culture media were sterilized and poured in 90 mm patri dishes and incubated at 25°. The data were recorded after every 48 hours till the completion of the fungal growth. Spawn of mushroom was prepared on three different cereal grains of wheat, barley and sorghum.

Of the three media tried, complete medium gave the maximum radial colony diameter of the fungus followed by malt extract and potato dextrose. Sorghum grains were found to be the best grains on which the fungus took only 20 days to complete its growth. The difference in the time taken by sorghum grains for complete growth of fungus was statistically significant as compared to wheat and barley grains. However, there were no significant differences in days taken for full growth of the fungus on wheat and barley. Also, synthetic compost doses of 300 and 350 gms per 5 kgs of the substrate were identified as the optimum doses.

Key words: Agaricus bitorquis, Mushrooms cultivation, Faisalabad, Pakistan.

INTRODUCTION

Fleshy fungi generally known as mushrooms, have been used as delicacy since time immemorial. Even today mushrooms are being relished the world over as delicacy due to their flavour and snob value. Mushroom production seems to be a highly rewarding as well as needed industry to produce sizeable quantity of protein for human consumption to overcome the alarming protein efficiency. Mushroom cultivation is a lucrative business in the world and its production has tremendous prospects in Pakistan. However, its cultivation has not yet gained any importance in the country partly because of lack of research on some basic aspects of mushroom cultivation, especially on cultural and spawn production aspects. The present study was carried-out to investigate the growth of *Agaricus bitorquis* on different cultural media and on the spawning rate on various substrates.

Review of literature. Quimio [7] obtained a pure culture from the single sporophore of *Agaricus bitorquis* by using tissue culture technique on malt agar medium. Preliminary tests showed that it fruits profusely in the laboratory at temperature range of 20-28°, when she mixed this fruiting medium in the uncomposted rice straw and oat meal. It grew similarly on a combination of sorghum and rice bran. Shannugam [8] studied the cultivation of European mushroom *Agaricus bisporus* by using spawn prepared on rice straw compost. The yield in the begining was low which increased gradually as the growing room temperature declined. Hu and Lin [4] studied the granular spawn of *Agaricus sp.* and reported that it possessed many advantages over the compost spawn.

Shub-Wei and Antonio [9] studied the characteristics of spawn by storing the spawn at freezing point for 2 months. The spawn when cultivated retained its original characters and 6 strains of *Agaricus bisporus* were cultivated successfully.

Khan *et al.* [5] studied cultivation methods of button mushroom (*Agaricus sp.*) at Faisalabad, Pakistan. They tried 5 strains of *Agaricus* on horse during compost to find out most productive strain and concluded that *A. bisporus* strain 459 proved to be the most productive strain under local conditions.

Mishra and Jain [6] the preparation of compost and application of casing material was tried. Casing of the $11m^2$ beds and cultural details were described. The beds, cased on I December, started cropping in January until late March. There were 24, 16, and 27 cropping days in January, February and March respectively, and the corresponding total yields were 16.0, 19.5 and 26.2 kg/bed.

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MATERIALS AND METHODS

The culture of *Agaricus bitorquis* was prepared on malt extract agar by tissue culture method, (Chang, [1]). Tissues of the young fruiting body were cut with a sharp sterilized knife and small pieces were separated with the help of clean forceps. These pieces were disinfested with 0.01 percent sodium hypochlorite solution, then washed twice with sterilized distilled water. The disinfested pieces were dried by placing them on sterilized filter paper transferred on Agar slants, and were incubated at 25° for two weeks. The resulting culture on slants was used for further studies.

Three culture media were prepared and used to find out the most suitable agar medium for mycelial growth of the fungus. The culture media and their constituents are as follows.

(i) Complete medium

Magnesium sulphate	0.25 gms.
Potassium dihydrogen phosphate	0.23 gms.
Thiamine hydrogen chloride	0.25 gms.
Peptone	0.1 gm.
Dextrose	10.0 gms.
Agar	20.0 gms.
Yeast extract	10.0 gms.

(ii) Malt extract medium

Agar	20 gms.
Dextrose	20 gms.
Malt extract	20 gms.
Peptone	2 gms.
Distilled water	1000 ml.

(iii) Potato dextrose agar medium

Potato starch	20 gms.
Dextrose	20 gms
Agar	20 gms.
Distilled water	1000 ml.

All the three culture media were sterilized in flasks for 30 minutes at 15 psi, poured in 90 mm patri dishes and each patri dish of agar medium was inoculated upon cooling, with a mycelial play culture of *Agaricus bitorquis*. The inoculated dishes were incubated at 25° and data regarding the radial colony diameter were recorded at 48 hours intervals till the completion of fungal mycelial growth. For spawn preparation, three different cereal grains i.e. wheat, barley and sorghum were used to find out most suitable medium for spawn preparation of *Agaricus bitorquis* from the prepared culture. The grains were boiled in water for 30 minutes and then placed in one litre bottle in six replications. These bottles were later autoclaved for 30 minutes at 25 psi. Upon cooling, these bottles were inoculated with in inoculam of *Agaricus bitorquis* and then put in the incubator at 15° till the completion of the spawn. Data were recorded in days for completion of spawn preparation of different grains using the parameter i.e. ¼, ½, ¾ and complete growth of grains. To determine the optimum dose of spawn on horse dung compost and synthetic compost, 4 doses i.e. 200, 250, 300, 350 gms/5Kgs of the compost were tried.

RESULTS AND DISCUSSION

Table 1 shows, the linear growth of *Agaricus bitorquis* on different media measured in mm. It is evident that complete medium grew at faster rate than malt extract medium and potato dextrose agar (PDA) medium. The total linear growth for these media was 51.6, 43.8 and 28.4 mm in the order. When analysed statistically, the difference between linear growth of complete medium and the rest of the two media was found statistical significant. This implies that complete medium performed better than the other two media used in the study.

Table 1. Linear growth of *Agaricus bitorquis* on different culture media (mm) at 2 days interval.

Media	2nd day	4th day	6th day	8th day	10th day	Total
Complete medium	6.0	8.2	10.2	12.1	15.1	51.6a
Malt extract medium	3.1	6.3	10.2	11.2	13.0	43.8b
Potato dextrose medium	3.2	4.0	6.0	7.1	8.1	28.4c

The time taken (days) for spawn preparation on three different cereal grains is presented in Table 2. It indicates that it took 15, 12, and 7 days to complete 1/3 of spawn for barley, wheat and sorghum respectively. Half of the

Table 2. Time taken (in days) for spawn preparation on three different grains.

Substrate	Start	Spawn preparation (days) 1/3	1/2	3/4	Full*
Barley	7	15	20	25	31a
Wheat	6	12	17	22	28a
Sorghum	3	7	11	16	20b

*Means followed by the same letter do not differ significantly.

spawn preparation was completed in 20 days for barley, 17 days for wheat and 11 days for sorghum grains.

However, for complete preparation of the spawn; it took 31 days for barley, 28 days for wheat and only 20 days for sorghum. The time taken by sorgum grains for complete preparation of spawn was the minimum, (20 days) and significantly different from barley and wheat. Thus, it is clear that sorghum grains are more suitable for spawn preparation. Table 3 presents data on time taken for spawn running at different spawning rates for horse dung compost and synthetic compost. The time taken by horse dung compost at different spawning rates ranged from 28 to 31 days. In case of synthetic compost at the same spawning rates the time taken ranged from 24 to 30 days. An examination of the above data brings to understand that synthetic compost with spawning rates of 300 grams/ 5kg. or 350g/5kg took the same number of days i.e. 24 days. This was found to be minimum time taken for spawn running. Thus, the study elucidates that complete medium along with sorghum grains and the use of synthetic compost at the rate of either 300 gm/5kg or 350 would yield the best results.

Table 3. Time taken for spawn running by different spawning rates in horse dung compost and synthetic compost.

Treatment	Start	Spawn preparation (days) 1/4	1/2	3/4	Full
		Horse dung compost			
T_1 (200 gm/5kg compost)	6	13	17	25	31
T_2 (250 gm/5kg compost)	6	12	16	24	31
T_3 (300 gm/5kg compost)	6	11	15	21	28
T_4 (350 gm/5kg compost)	6	11	15	21	28
		Synthetic compost			
T_1 (200 gm/5kg compost)	5	12	15	22	30
T_2 (250 gm/5kg compost)	5	12	16	20	29
T_3 (300 gm/5kg compost)	5	10	14	19	24
T_4 (350 gm/5kg compost)	5	10	14	19	24

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