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COMPARATIVE STUDY OF DIFFERENT GRAIN ON SPAWN DEVELOPMENT OF *PLEUROTUS DJAMOR*

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ABSTRACT
An experiment was carried out using CRD with three replications during *Kharif* 2014 to investigate the effect of different substrate on spawn development of oyster mushroom. Spawn plays an important role for production of best quality mushroom. During the mushroom season, the production of spawn in minimum days and availability for planting beds of mushroom is a big challenge for mushroom growers. The present study was carried out with the aim of finding the most favorable grain for the production of Oyster mushroom (*Pleurotus djamor*) spawn in minimum days. This Study depicted the six locally available different grains viz. Wheat, Black gram, Pigeon pea, Barley, Chickpea and Oat were used as a substrate. The results obtained during the present investigation, Chickpea grains (98.33 mm) were found at 12 days to be the best grains for speedy development of spawn of *Pleurotus djamor*. The minimum mycelial growth of the *P. djamor* (50.33 mm) was recorded in barley grains, followed by Wheat (52.33 mm) respectively and thus it's recommended for *Pleurotus djamor* speedy spawn production to be use. Based on the results obtained, for production of *Pleurotus djamor* spawn, Chickpea grain would be recommended most appropriate for speedy spawn production use as substrate.

INTRODUCTION

Mushrooms have been used by human being since ancient times and they are closely related to the history of mankind. (Biswas, 2015). Spawn comprises mycelium of the mushroom and a supporting medium which provides nutrition to the fungus during its growth. The propagating material used by the mushroom growers for planting beds is called spawn (Dehariya and Vyas, 2015). In 2007, the production of edible mushrooms in Japan was estimated to be 4, 23, 224 tones and it is expected that this amount will increase in the future due to market demand. (Shitole, 2014). The production of oyster mushrooms has become an attractive economic alternative over past few years, mainly due to increase in its demand and market value (Chang, 2006, Moore and Chiu, 2001). Oyster mushrooms are one of the most important species among the cultivable varieties. This is world wide spread in temperate zones, can grow at moderate temperature and is suitable to grow in most places in India (Atkinson, 1961 and Sivaprakasam, 1986). Besides being a fast spinning cash crop, it is also an ideal health food capable to fight malnutrition in general and protein-deficiency in particular (Verma, 2014). Recently, mushroom cultivation in India has witnessed a tremendous growth with respect to the type of mushrooms and their productivity. Mushrooms are considered as valuable health food since they are known for rich proteinacious food; it consists of about 75% proteins and are low in calories, fat, fatty acids, vitamins and minerals. (Sharma, 2013). Oyster mushrooms are grown from hyphae (threadlike filaments) that become interwoven into mycelium and propagated on a base of steam sterilized cereal grain usually sorghum, rye or millet. This mycelium-impregnated cereal grain is called spawn and is used to inoculate mushroom substrate (Dlamini *et al*., 2012). Failure to achieve a satisfactory harvest may often be traced to unsatisfactory spawn used (Chang, 2009).

Spawn production comprises the mycelium of the mushroom and a supporting medium which provides nutrition to the fungus during its growth. The propagating material used by the mushroom growers for planting beds is called spawn. The spawn is equivalent to vegetative seed of higher plants (Pathak *et al*., 2000). In mushroom growing technology, the inoculums are known as the 'spawn'. Spawn is a medium that is impregnated with mycelium made from a pure culture of the chosen mushroom strain. Spawn production is a fermentation process in which the mushroom mycelium will be increased by growing through a solid organic matrix under controlled environmental conditions (Jain and Vyas, 2005, Pathak *et al*., 2000). The most recurrently used substrate for spawn production of oyster mushroom is wheat and there is need to use the more widely available maize grain as substrate for grain mother spawn production of oyster mushrooms (Mbogoh, 2010). Spawn grains such as wheat, millet and corn have been reported to affect carpophores production (Nwanze, 2011). Improved spawn production technology is necessary to increase the production of mushroom. The objective of this study was to examine the effect of different

substrate on spawn development of oyster mushroom.

MATERIALS AND METHODS

In mushroom production programme the primary concern is preparing an appropriate spawn. The experiments were conducted during, 2014-2015 in the Laboratory of Department of Plant Pathology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP, India, which is situated on the Western side of the Delhi-Dehradun high way (NH-58) at a distance of 10.0 Km away in the north of Meerut city. The district Meerut is situated between 29º 01′N latitude and 77º45′E longitude at an altitude of 237 meters above the mean sea level.

Culture of *Pleurotus djamor* were purified and maintained by single hyphal tip method. For this purpose, the culture was grown in sterilized Petri plates on Potato Dextrose Agar Medium (PDA) for 8-10 days. Single branched hyphae from the periphery of the growing colony were marked under low power (10x) in the compound microscope and transferred to PDA slants. These tubes were incubated at 21-24^{0}C for about a week, again sub cultured on PDA and then stored in a refrigerator at 5-10^{0}C for further use (Royse, 2003)**.** This study showed six different type grains viz. Wheat, Black gram, Pigeon pea, Barley, Chickpea and Oat were used as substrate. For this study, the spawn was prepared in half litre capacity wide mouthed glass bottles. The grains were cleaned to remove any broken, shrivelled grains either by sieving or winnowing or by hand picking of undesired grains. After this, the grains were soaked overnight in clean water and then washed. They were boiled in water for 15 minutes taking care that grains should not split but remain slightly hard after boiling.

The boiled grains were spread in thin layer over a wire net to remove excessive water and enable them to cool about 25-30^{0}C. The cooled grains were then mixed with 1.2 percent commercial grade gypsum ($CaSO_4$) and 0.3 percent calcium carbonate ($CaCO_3$). Gypsum prevents the sticking of wheat grains together and calcium carbonate maintains the pH 5.5 - 7.5 (Jain, 2005). The grains were filled up to (100 mm) in the bottle in three replicates. The bottles were plugged with non-absorbent cotton and covered with butter paper. These bottles were then sterilized at 121^{0}C (15 lbs pressure) for 2 hours on two consecutive days. Sterilized bottles were taken out from the autoclave, while still hot and were shaken to avoid clumping of grains. Sterilized bottles were inoculated by 9 mm disc in individual bottle. The spawn bottles were incubated without shaking at 24 ± 1ºC in BOD incubator and observations were recorded on 4th, 6th, 8th, 10th and 12th day till to completely cover by mycelial growth in bottles (Stamets, 2000). The experiment was laid out in Completely Randomized Design (CRD) with three replicates of each was applied and the data was obtained were analyzed statistically. Analysis of variance technique and critical difference was calculated at five percent level of significance for comparison with other treatment. The data were analyzed by MSTAT-C programme. The treatment means were compared using Duncan's Multiple Range Test *i.e.* DMRT (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The present study depicted the different grains; mycelial growth (98.33 mm) and growth rate (8.19mm/days) were obtained on 12th day when chickpea grains used as substrate which was significantly superior then all other grains spawn. It was followed by oat (72.00 mm) and growth rate (6.00mm/days) which were significantly similar to black gram (67.67 mm) and growth rate (5.63mm/days). The minimum mycelial growth (50.33 mm) and growth rate (4.19mm/days) observed in Barley which were significantly similar to Wheat (52.33 mm) and pigeon pea (53.67mm) on 12th day. Results are shown in Table 1.

These results were found in accordance with the findings of (Sharma and Puttoo, 2004) (Pathmashini, 2008) reported that barley, corn and oat grains were more efficient than wheat grain. Similarly, Sharma *et al*. (2003) observed that oat; kutki and maize grains took minimum time for spawn development (Sharma, 2003).

Pathmashini *et al*. (2008) revealed that the efficacy of four different types of grain spawns viz. kurakkan, maize, sorghum and paddy on oyster (*Pleurotus ostreatus*) mushroom production. Four types of spawns were tested on a medium based on sawdust. Highest mean numbers of sporophore (fruiting bodies) were noticed in the harvests obtained from sorghum spawn (7.67+ or -0.66). The kurakkan spawn significantly. Enhanced biological efficiency and increased size and yield, when compared with other spawn types viz; maize, sorghum and paddy (Sharma and Puttoo, 2004). Mbogoh *et al*. (2011) reported the spawn is pure culture of mycelium growing on a solid substrate such as cereal grain. Maize, wheat and millet grains were used as substrates for production of grain mother spawns of Pleurotus ostreatus.

Table 1: Effect of different grain on spawn growth (mm) and growth rate of oyster mushroom *(Pleurotus djamor)*

Grains	4th day Spawn growth (mm)	growth rate (mm/day)	6th day Spawn growth (mm)	growth rate (mm/day)	8thday Spawn growth (mm)	growth rate (mm/day)	10th day Spawn growth (mm)	growth rate (mm/day)	12thday Spawn growth (mm)	growth rate (mm/day)
Wheat	17.33	5.83	24.75	4.12	33.00	4.12	40.33	4.03	52.33	4.36
Oat	22.00	5.50	30.33	5.05	43.33	5.41	51.67	5.16	67.67	5.63
Barley	19.33	4.83	25.12	4.18	32.33	4.04	36.12	3.61	50.33	4.19
Black gram	22.00	5.50	34.33	5.72	46.67	5.83	57.00	5.70	72.00	6.00
Pigeon pea	23.00	5.75	30.33	5.05	39.67	4.95	44.67	4.46	53.67	4.47
Chickpea	38.67	8.41	48.67	8.11	65.33	8.16	81.67	8.16	98.33	8.19
SE	1.15	-	1.40	-	1.50	-	1.73	-	2.30	-
CD at 5%	2.54	-	3.08	-	3.31	-	3.81	-	5.07	-

Linear mycelium extension was measured (Mbogoh *et al*., 2011).

Bhadana (2014) was also reported the best grain mother spawns from the maize substrate being the best, followed by wheat, then millet (Bhadana, 2014).

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