

Effect of Substrates of Spawn Production on Mycelial Growth of Oyster Mushroom Species

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Abstract: Spawn quality is the most important factor in the production of edible mushroom (which is fast gaining prominence in Nigeria and Africa at large). In order to determine the effects of substrates spawn preparation on mycelial growth of oyster mushroom species, the experiment was conducted in a factorial experiment design at randomized completely with three replications. In this experiment, first and second factors, respectively were substrates (Wheat, yellow maize, guinea corn, millet, red sorghum and white maize, Bende local and oyster mushroom species (*Pleurotus tuber-regium* and *pleurotus pulmonarius*). The results clearly demonstrated that between various substrates used, maximum and minimum growth rate were recorded for white maize (Bende Local) and least mycelial extension and fresh weight on wheat. The second best grain for both species used was Red Sorghum.

Key words: Mycelial growth, oyster mushroom, spawn grains, yellow maize, guinea corn, millet

INTRODUCTION

Mushroom spawn is the mushroom mycelium growing on a given substrate. It serves as the planting material in mushroom cultivation. To produce spawn, inoculate a pasteurized medium, usually grain, with the sterile culture of a particular mushroom species. After the culture has grown throughout the medium, it is called spawn. It is actually the first stage of mushroom production. Spawn quality is counted the most important part in mushroom production (Mohammadi Goltapeh and Purjam, 2003) spawn production is a very technical process and requires a lot of expertise and specialized knowledge and care on the part of people producing it (Chinda and Chinda, 2007). It is infact the bedrock of the mushroom industry and the limiting factor to mushroom cultivation or production all over the world.

In nature mushrooms use spores for generative multiplication and these are microscopic and difficult to handle (Oei, 1991). Alternatively, tissue cultures taken from cap-tissues may be used to prepare spawn. In time, the mycelium completely grows through the grain. The fully colonized grain (spawn) is used to seed already prepared substrates agricultural and non-agricultural wastes) for mushroom production. Grain spawn is in common use because of its ability to ramify the substrate faster and ease of planting (Bahl, 1988). Spawn grains such as wheat, millet and corn have been reported to

affect carpophores production (Nwanze *et al.*, 2005b) and there are various additives that are known to stimulate fruiting. They include rice bran, cassava peels and soybean powder. Nwanze *et al.* (2005a) examined the effect of spawn grains such as weat, millet and corn on the culture of *lentinus squarrosulus*. The results showed that corn spawn induced highest yield and dry weight of fruiting as compared to wheat and millet spawn.

Environmental factors such as temperature, O₂, Co₂, humidity, light and pH have been reported also to affect mycelia growth in the spawn preparation (Nwanze *et al.*, 2005b). The present study to determine the effect of various grains on spawn production of *pleurotus tuber-regium* and *P. pulmonarius* was carried out in the Laboratory of Dilomat farms (N4°48'22", N 6°58'48.7"E and Elevation 16) located in the Rivers State University of Science and Technology, Nkpolu, Port Harcourt in the Niger Delta Region of Nigeria.

MATERIALS AND METHODS

Sources of materials: The mushroom species used for this research were supplied by Dilomat Farms and Services Ltd located in the Rivers State University of Science and Technology, Nkpolu, Port Harcourt. The grains used white maize, broadbende local, red sorahum, guinea corn, yellow maize, millet and wheat were purchased from mile 3 market in Diobu, Port Harcourt.



Fig. 1: Mycelia Growth of *P. tuber-regium*



Fig. 2: Mycelia Growth of *P. pulmonarius*



Fig. 3: Spawn grains

Preparation of culture medium: Potato Dextrose Agar (PDA) was employed as medium of growth for culturing *pleurotus tuber-regium* and *pleurotus pulmonarius*. PDA was prepared as described by oxoid manual. For 1 L of the culture medium prepared, 2.00 g of thirly peeled and sliced Irish potatoes; 20 g of glucose; 20 g of agar powder and 1 L distilled water were used.

Culture of fungi: Fresh cultures of *P. tuber-regium* and *P. pulmonarius* were used with a sterilized razor, a small piece of the mushroom tissue was removed and placed on PDA medium in Petridishes. The inoculated dishes were incubated at 27°C for 10 days. Several sub-culturings were made until pure cultures were obtained (Fig. 1 and 2).

Spawn preparation: Total 250 g each of white maize (local bende), red sorghum, guinea corn, yellow maize, millet and wheat seeds were washed in clean water three times to remove chaff, dust and other particles. The grains were then soaked in water for 24 h for maximum absorption of water. Soaked grains were again washed in water drained and put into spawn bottles. About 2/3 of each spawn bottle were filled with grains of each type and mixed with 5 g of calcium carbonate (CaCO_3) after which they were autoclaved at 121°C (at a pressure of 1 kg cm^{-2}) for 2 h each day, for 3 consecutive days. The grains in the bottles were then inoculated with three 9 mm mycelial discs per bottle (triplicate of each grain type) under aseptic condition (Fasidi and Kadiri, 1993). These were incubated at 27±1°C (Fig. 3). On 9th day of incubation, 1 = Millet, 2 = Gunea Corn, 3 = Red Sorghum, 4 = White Maize, 5 = Yellow Maize, 6 = Wheat. Mycelia fresh weight (grains) was determined as follows:

- Weight (wt) of bottle = xg
- Weaght of bottle and spawn grains = (X+Y) g
- Weaght of bottle + wt of spawn grains+wt of fresh mycelia = (X+Y+Z) g
- Fresh mycelial wt. = (X+Y+Z)-(X+Y) g = Zg. A Ruler was used to measure the mycelial extension in cm.

RESULTS AND DISCUSSION

White maize (Bende Local) was found to be most favourable to mycelial extension and mycelial fresh weight of *P. tuber regium* and *P. pulmonarius*. The result of the analysis of variance (Table 1 and 2) showed that the mean mycelial fresh weight were 3.767±0.030 cm and 1.583±0.0099, respectively for *P. tuber-regium* on the 6th day of incubation. In the case of *P. pulmonarius*, the mean mycelial extension and mean myucelial fresh weight were 3.622±0.032 cm and 1.137±0.008 g. Red sorghum was next to white maize with mean value for mycelial extension and mycelial fresh weight were 2.311±0.032 cm and 0.922±0.008 g. All the substrates supported the growth of mycelia of the two pleurotus species studied but in varying degrees. The least support for both species studied was shown by wheat (Table 1 and 2).

In all substrates *P. tuber-regium* did better than *P. pulmonarius* in terms of mean mycelial extension and mean mycelial fresh weight except on red sorghum whee *P. pulmonarius* was better.

Tinoco *et al.* (2001) found that larger surface area and pore of substrates support more mycelium growth rate. This could account for the result recorded by white maize (bende Local). It is a floury maize grain whose grains were larger than other substrates used in this

Table 1: Effect of various grains on spawn production of *P. tuber-regium*

Types of grain	Mycelial extension (Mean±SE)	Mycelial fresh weight (Mean±SE)
Wheat	1.572±0.030 ^a	0.517±0.009 ^a
Yellow maize	1.750±0.030 ^b	0.683±0.009 ^b
Guinea corn	2.011±0.030 ^c	0.717±0.009 ^c
Millet	2.028±0.030 ^c	0.761±0.009 ^d
Red sorghum	2.089±0.030 ^c	0.844±0.009 ^e
White maize	3.767±0.030 ^d	1.583±0.009 ^f

Means with same superscript along the same column are not significantly different from each other at $p < 0.05$

Table 2: Effect of various grains on spawn production of *P. pulmonarius*

Types of grain	Mycelial extension	Mycelial fresh weight
Wheat	1.583±0.032 ^a	0.483±0.008 ^a
Yellow maize	1.678±0.032 ^b	0.550±0.008 ^b
Guinea corn	1.783±0.032 ^c	0.633±0.008 ^c
Millet	2.107±0.032 ^d	0.683±0.008 ^d
Red sorghum	2.311±0.032 ^e	0.922±0.008 ^e
White maize	3.622±0.032 ^f	1.137±0.008 ^f

Means with same superscript along the same column are not significantly different from each other at $p < 0.05$

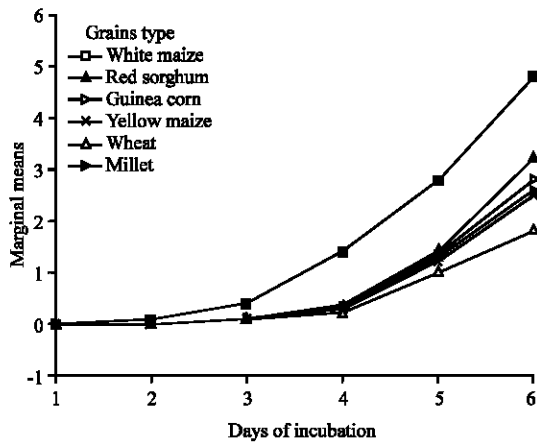


Fig. 4: The trend of day of incubation on different grain type of mycelia extension of *P. tuber-regium*

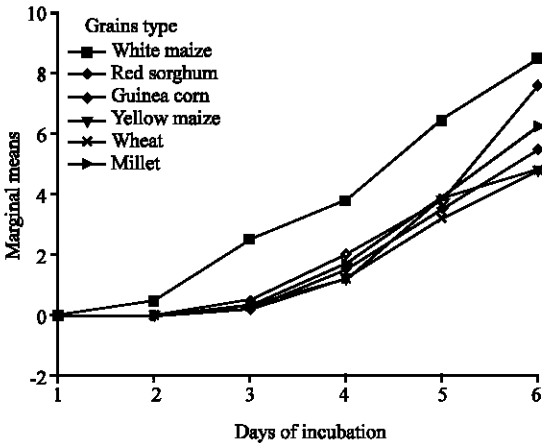


Fig. 5: The trend of day of incubation on different grain type of mycelia extension of *P. pulmonarius*

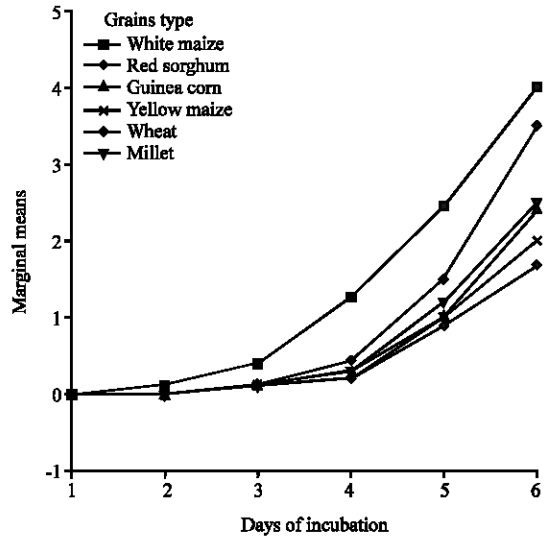


Fig. 6: The trend of day of incubation on different grain type of mycelial fresh weight of *P. pulmonarius*

study. It consists largely of soft starch which is surrounded by the coneous layer under the pericarp. This maize is grown mainly in the southern part of Nigeria. The trend of day of incubation on different grain type of mycelial fresh weight for the two species studied are shown in Fig. 4-6 with white maize as the best substrate.

On the 10th day of incubation, the white maize were fully colonized by vigorously growing mycelium of the studied species whereas the red sorghum was fully colonized by the two species on the 12th day. The other substrates (guinea corn, yellow maize, wheat and millet) were fully colonized on the 14th day of incubation.

CONCLUSION

Mycelial growth of *P. tuber-regium* were faster than that of *P. pulmonarius* on all the substrates used except on red sorghum.

The best substrate for spawn preparation was white maize (bende-local) from the south Eastern part of Nigeria. therefore, all to patronize Nigeria by purchasing the most suitable grain for spawn preparation as this will support the production of high quality and quantity of edible mushroom in Africa and the world at large.

Because of the important role edible mushrooms play in diet, waste management health management/ medicine, environmental sustainability and potentials to

enhance the economics of Nations, Mushroom farming and research should be encouraged in all nations by setting up good spawn preparation centres.

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