Cultivation of Straw Mushroom (Volvariella volvacea) Using Some Agro-Waste Material

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Abstract: Some agro-waste materials, like paddy straw, oil palm fibre and sawdust were screened for the cultivations of the straw mushroom volvariella volvacea. The experiment consisted of four treatments; paddy straw, oil palm fibre, sawdust, and a mixture of oil palm fibre and sawdust; in a Completely Randomized Design (CRD) replicated three times. The paddy straw served as the control as it is the traditional substrate for the growth of the mushroom. The results showed that the straw naturally supported the mycelial growth and production of fruitbodies. Growth and production of fruitbodies on oil palm fibre was similar to that of paddy straw. The production of fruitbodies on the mixture of oil palm fibre and sawdust was scanty. Sawdust alone as a substrate produced few fruitbodies that were comparatively small in size. [Journal of American Science 2009;5(5):135-138]. (ISSN: 1545-1003).

Key words: Cultivation straw mushroom, agro-waste materials

1. Introduction

Mushrooms are known to be among the largest of fungi that attracted the attention of naturalists before microscopes were invented. Chang and Milles (1991) defined mushroom as macrofungus with definitive fruiting body and large enough to be seen with the naked eyes. They extended this definition by adding that mushrooms do not need to be Basidionmycetes nor aerial nor fleshy. They can grow underground having a non fleshy texture and need not be edible. Davis and Aegertar (2000) defined mushroom as the fruit of certain fungi analogous to apple on a tree. Many fungi that form mushrooms exist in mycorrhizal relationship with trees, and this is one of the reasons why forests are often generous to mushroom hunters (Ogunlana, 1978). Some wild mycorrhizal mushrooms cannot be cultivated unless the tree is also cultivated. The mushrooms are sometimes taken to the market after being collected from the forest (Kuyper *et.al.*2002,Quimio, *et al* 1990) Mushrooms are now grown worldwide as they have been recognized as food (Munjal,1970)

Edible mushrooms like *Volvariella volvacea* have attracted much attention as source of food and medicine over the years. The paddy straw mushroom is a preferred type of mushroom by most consumers because of its aroma and taste (Tharun, 1993) It grows on almost all cellulosic agricultural waste material like rice straw, banana leaves dried paddy straw etc (Reyes and Abella, 1997) These substrates are used because they contain cellulose and also pose a problem of disposal to the environment (Onuoha, 2008) So the cultivation of mushroom using the agro-waste is a way of reducing environmental waste materials (Reyes and Abella, 1997). Mushroom in recent times has become a contemporary business enterprise because of its high nutritional and medicinal values, and consequently high societal demand. There is therefore, need to maintain a constant supply of mushroom by cultivating rather than depend on seasonal forest supplies.

It is, therefore, the aim of this study, to determine the suitability of some common agro-waste materials in the growth of *Volvariella volvacea*.

2. Materials and Methods

Sources of Materials: The spawn of the mushroom was collected from Imo State Agricultural Development Programme (ADP) Owerri. The substrates like paddy straw and oil palm fibre were also collected from Imo ADP while sawdust collected from the state timber shed, Owerri.

Species Selection: *Volvariella volvacea* was selected for study because it is particularly common in Nigeria (Zoberi, 1978) It is also mostly preferred by many consumers because of its aroma and taste (Tharum, 1993). The consumption of oyster mushroom and *Volvariella volvacea* has been reported to lower the cholesterol levels in the body (Poppe, 2000).

Growth Substrates: Four agrowaste materials were used as substrates in the study. They include paddy straw, oil palm fibre, sawdust and a mixture of sawdust and oil palm fibre.

Preparation of Substrates: The straw was chopped manually and soaked in water for 24 hours. The soaked straw was rinsed in distilled water twice and drained with a sieve. The oil palm fibre was soaked in distilled water overnight in order to melt the remaining oil in the fibre. Excess water was drained off. Five hundred grammes each of the prepared sawdust and oil palm fibre were mixed up properly. One kilogramme of each substrate was used. The mixture substrates were prepared in equal proportions by weight. This was done using a weighing balance. Sawdust was mildly sprinkled with sterile distilled water.

The four prepared substrates were separately packed into polythene bags and tied up for sterilization. Boiling drum containing stacks of sticks and water up to the level of the sticks was used for sterilization. The substrates were packed into the drum and covered with fresh plantain leaves in order to generate enough heat. The substrates were steam-sterilized for three hours and allowed to cool while still in the drum, they were taken to mushroom house and poured separately on sterile polythene sheets on a table. The spawn was sprinkled on the substrates covered with sterile polythene sheet and watered daily to maintain a high relative humidity of between 75 – 80%.

Data Collection

The following parameters of growth/yield were measured:

1. Number of fruiting bodies: This was done by directly counting the number of fruitbodies produced on each substrate
2. Diameter of the pileus: This was measured by placing a transparent plastic ruler across the centre of the pileus
3. Weight of fruitbodies: Electronic weighing balance was used to determine the average weight of the fruitbodies.
   The results obtained were recorded and subjected to statistical analysis. Analysis of variance (ANOVA)

3. Results

Fifteen days after planting and incubation, whitish mycelia colonized all the substrates. Few days later fruitbodies were observed firstly on the paddy straw (control), then oil palm fibre, then 3 days later on the mixture of oil palm fibre and lastly on the sawdust (plates 1 – 4).

Plate 1: Showing *V. volvaceae* mushroom growing on Oil Palm fibre

Plate 2: Showing *V. volvaceae* mushroom growing on Paddy Straw

Plate 3: Showing *V. volvaceae* mushroom growing on mixture of Oil Palm fibre and sawdust

Plate 2: Showing *V. volvaceae* mushroom growing on Sawdust

Table 1: Yield parameters of the straw mushroom

Substrates	Mean no. of fruitbodies	Mean diameter of the pilens (cm)	Mean fresh weight of the fruitbodies (g)	Mean dry % water weight of the fruitbodies (g)	% of water Content of the fruitbodies
Paddy straw oil palm	13.3	3.7	16.3	10.2	37.4
fibre Saw dust	11.3	3.7	16.3	10.5	35.6
Oil palm fibre	5.6	1.8	8.0	5.3	33.8
sawdust					
	10.3	2.9	15.3	10.3	32.7

The yield parameters of the mushroom from each of the substrates are shown in table 1. While the mean number of fruitbodies produced was highest in the control (paddy straw) with 13.3, oil palm fibre and a mixture of oil palm fibre and sawdust equally produced good number of fruitbodies with 11.3 and 10.3 respectively. Sawdust yielded only 5.6

The mean fresh weight of the fruitbodies produced on paddy straw, oil palm fibre and a mixture of oil palm fibre and sawdust were high with 16.3g, 16.3g and 15.3g respectively. Also the mean fresh weight of the fruitbodies produced on sawdust was relatively low. The mean diameter of the pileus of the fruitbodies as well as the mean dry weight of the fruitbodies produced on the different substrates also appeared in the order of the earlier parameter mentioned. While the fruitbodies produced on paddy straw had the same mean diameter with those produced on palm fibre (3.7cm) the mixture of oil palm fibre and sawdust produced pileus with a mean diameter of 2.9 cm. Sawdust, however produced the smallest sized fruitbodies with a mean pileus diameter of 1.8 cm.

There is no significant difference ($P \leq 0.5$) between the mean dry weight of the fruitbodies produced on paddy straw, oil palm fibre and a mixture of oil palm fibre and sawdust. But there was a significant difference ($P \leq 0.05$) between these and those produced on sawdust.

The percentage of the moisture content of the fruitbodies produced on the different substrates showed slight variations but they are not statistically significant ($p>0.05$) except those produced on paddy straw against those produced on the mixture of oil palm fibre and sawdust.

4. Discussion

The four substrates screened, all supported the growth of the mushroom though to a varying degrees. This confirms the report of Keshari (2004) and Tricita (2005) that *Volvoriella volvacea* could be grown on agricultural waste. Apart from the paddy straw which is the traditional substrate for the cultivation of the mushroom, oil palm fibre was equally good. In terms of the number of fruitbodies produced, weight of the fruitbodies and diameter of the pileus it was as good as the control. This agrees with the findings of Isikhemhen (2004) who reported that *Volvoriella volvacea* can be cultivated on other unsupplemented agricultural waste. The duration of growth is very short and many fruitbodies could be produced within the period. It was also reported by Landford (2004) that they are not only excellent edible mushroom but also can colonize substrates and grow quickly on some unsuplemented agrowaste. There was statistically no significant difference between ($p>0.05$) the yield parameters of control (paddy straw) and oil palm fibre. This means that the oil palm fibre as an agrowaste, could be used to produce the mushroom as much as the paddy straw could produce. It might be a way of reducing agrowaste in the environment first as reported by Kuyper *et.al.*(2002) that the cultivation of *Volvariella volvacea* on local agricultural creates a way of reducing environmental pollution.

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