Cultivation of the mushroom (*Pleurotus tuber regium*) using some local substrates

Onuoha CI*

Department of Plant Science and Biotechnology, Imo State University, P.M.B 2000 *Owerri, Nigeria*

Received July 9, 2007

Abstract

Some local materials were screened for the cultivation of the mushroom, *Pleurotus tuber regium* (Fr) singer. The five materials included sawdust, poultry droppings, topsoil, a mixture of poultry droppings and topsoil, and a mixture of sawdust and topsoil. The experiments were carried out using completely randomized design (CRD) of five treatments and three replications. The mixed substrates were in the ratio of 1 : 3. The result showed that the mixture of poultry droppings and topsoil produced fruitbodies that were relatively more in number and larger in size. Sawdust (wood) which has been the traditional substrate for the growth of the mushroom produced a relatively poor yield. The ones planted on only poultry droppings did not germinate. There was significant difference in the yields from different substrates at 0.05%. [Life Science Journal. 2007; 4(4): 58 – 61] (ISSN: 1097 – 8135).

Keywords: cultivation; *Pleurotus tuber regium* sawdust; poultry droppings; topsoil

1 Introduction

Man's attention is usually attracted to mushrooms by the unusual shape of their fruitbodies which suddenly appear after rains in striking quantities in fields and woodlands. Edible mushrooms like *Pleurotus* are known to be among the largest of fungi. Davis and Aegerter (2000) defined mushroom as the fruit of certain fungi analogous to apple on a tree. Chang and Miles (1991) called mushrooms macrofungus with distinctive fruitbodies that are large enough to be seen with the naked eye. 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 mushrooms are mycorrhizal ones and cannot be cultivated unless the tree is also cultivated. These mushrooms are sometimes available in the markets but they are collected from the forests (Kuyper, 2002; Quimio, 1990). Mushrooms have been universally recognized now as food and are grown on commercial scale in may parts of the world including Nigeria. *Pleurotus tuber regium* (Fr) Singer is one of the species commonly eaten in Nigeria (Ogunlana, 1978). Stamets (2001) observedthat the fungus is often found growing around the African breadfruit (*Treculia africana*). It attacks dead wood, on which it produces globose or avoid sclerotia (Oso, 1977).

In Nigeria, the most prized edible species are *Pleurotus, Termitomyces, Tricholoma* and *Volvoriella* (Zoberi, 1972). Mushroom cultivation serves as the most efficient and economically viable biotechnology for the conversion of lignocellulose waste materials into high quality protein food and this will naturally open up new job opportunities especially in rural areas (Fasidi, 1993; Hussain, 2001).

Edible mushrooms like *Agaricus spp* and *Pleurotus oastreatus* are commercially produced and sold in markets in Asia, America and Europe. In Nigeria, indigenous mushroom are still hunted for in forests and farmland for sale. The need for commercial production of all edible mushroom in Nigeria cannot be over emphasized in view of its potential contribution to agricultural production and as a source of cheap protein. Nigeria is richly endowed with good quality mushroom like Pleurotus and Agaricus genera which should be mass-produced for local consumption as well as for international market. Since the above species are seasonal and in short supply, commercial production is therefore, necessary to ensure their availability all the time. The present study, therefore ex-

*Corresponding author. Email: onuohaci@yahoo.com

amine the effects of using different easily available local substrates in the cultivation of *Pleurotus tuber regium*.

2 Materials and Methods

2.1 Sources of materials

The sclerotia of the fungus used for the study were collected from school-to-land Authority, Port Harcourt Rivers State in Nigeria. The soil sample and poultry droppings were collected from the Agricultural farm of Imo State University, Owerri, while the sawdust was obtained from Timber shed in Owerri Municipal Council of Imo State, Nigeria.

2.2 Selection of species

Pleurotus tuber reguim was selected for study because it is particularly common in Nigeria (Zoberi, 1978) and the five substrates selected were: topsoil, sawdust, poultry droppings, mixture of sawdust and poultry droppings, mixture of topsoil and poultry droppings. They were selected because they are readily and locally available.

2.3 Preparation of the substrates for cultivation

The five substrates were prepared to ascertain the one that will be good enough in the production of *Pleurotus tuber regium* in terms of quality and quantity of the fruitingbodies. The topsoil and sawdust were mixed, as well as topsoil and poultry droppings in the ratio 1 : 3 by weight. The substrates were sterilized, filled into polyethene bags and allowed to stay over night with moderate watering. Three replicates of each substate were also prepared. The sclerotium was soaked in water for 12 hours and then sliced into minisets of about 5 cm^2. The sliced selerotia were then planted in the bags containing the substrates and properly watered to create a humid environment normally required for fructification.

2.3.1 Data collection. The yield of the fungus on the different substrates were determined by the number and size of the fruit bodies produced. The data were collected from the different replicates and the mean of each set of data calculated. The experiment was designed to determined the best substrate for the cultivation of *Plenrotus tuber regium.*

The substrates included:

Sawdust	=	T_0
Topsoil	=	T_1
Poultry droppings and topsoil	=	T_2
Sawdust and topsoil	=	T_3
Poultry dropping	=	T_4

The fruit bodies of the fungus were harvested at the end of the experiment and the following parameters were measured:

Height: This was measured in centimeters using metre rule from the base to the stipe of the pileus.

Number of fruitbodies: The number of fruitbodies were counted for each treatment and the mean calculated.

Diameter of pileus: This was measured in centimeters using metre rule from one edge of the pileus, across the stipe, to another.

Fresh and dry weight: The fruitbodies were weighed immediately after harvest using electronic balance. After recording the weight, they were then dried in an oven at 80 ºC for 24 hours. Their mean weights was also recorded.

The data collected were subjected to statistical analysis using analysis of variance (ANOVA).

3 Results

Within six days after planting, fruitbodies were observed on sawdust, and other substrates a day later with the exception of poultry droppings (T_4). The sclerotic planted on poultry droppings did not germinate but rather decayed (Figure 1).

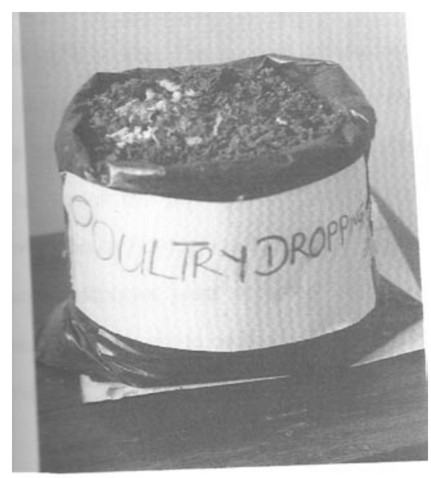

Figure 1. Plate 1: poultry droppings with no fruitbodies

3.1 Number of fruitbodies

The mixture of topsoil and poultry droppings (T_2) as well as the topsoil (T_1) produced larger number of fruitbodies when compared with those from sawdust (T_0) and a mixture of sawdust and topsoil (T_3) (Figure 2).

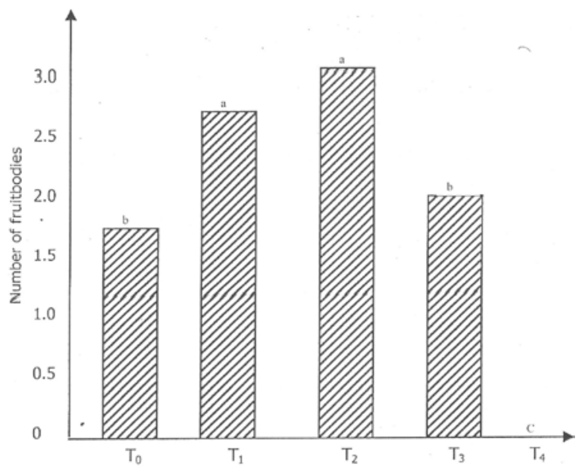

Figure 2. The number of fruibodies of *Pleurotus tuber regium* formed on different substrates.

3.2 Diameter of pileus

The fruitbodies produced on topsoil (T_1) and a mixture of topsoil and poultry dropping (T_2) were wider than those produced on sawdust (T_0) and a mixture of sawdust and topsoil (T_3) (Figure 3).

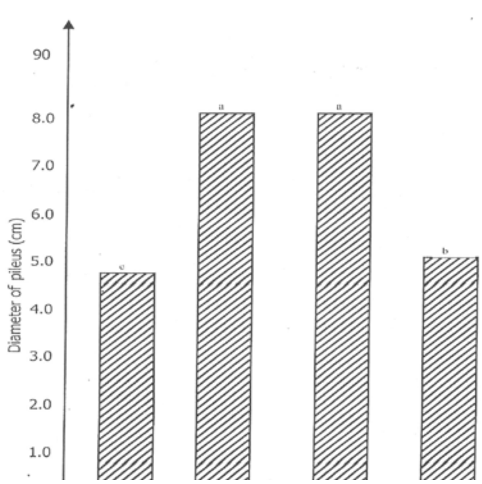

Figure 3. The diameter of pileus of *Pleurotus tuber regium* formed on different substrates.

3.3 Height of fruitbodies

The fruitbodies produced on topsoil were comparatively higher than the mean height of those produced on sawdust (T_0) and a mixture of sawdust and topsoil (T_3) (Figure 4). There was, however, a significant difference between the height of the fruitbodies produced on a mixture of sawdust and topsoil (T_3) and sawdust (T_0) at 0.05%.

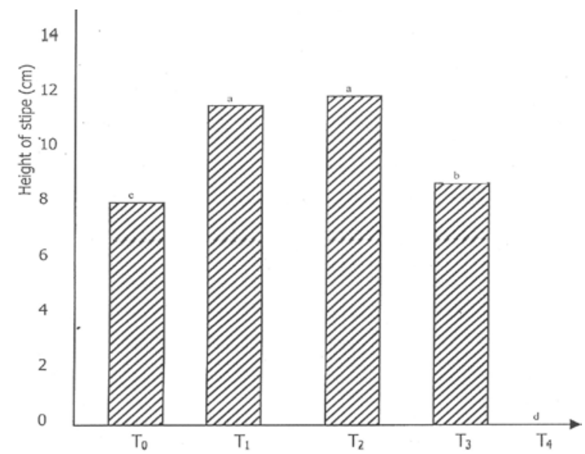

Figure 4. The hight of stipe of *Pleurotus tuber regium* grown on different substrates.

3.4 Fresh weight

Though there was a significant difference between the mean fresh weight of fruit bodies produced on all the substrates, those produced on the mixture of topsoil and poultry dropping weighed higher than the mean weight of those produced on the other substrates (Figure 5).

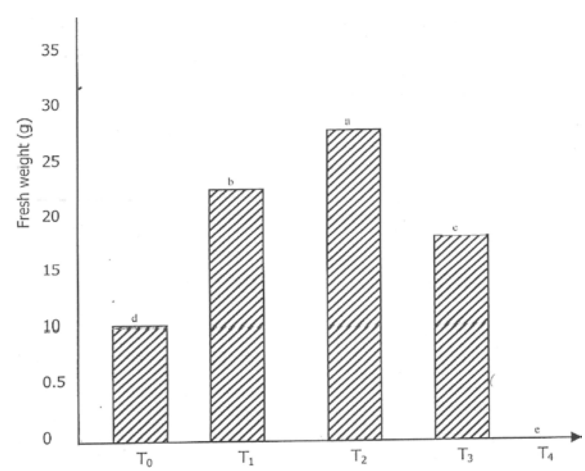

Figure 5. The fresh weight of fruitbodies of *Pleurotus tuber regium* formed on different substrates.

3.5 Dry weight

The fruitbodies produced on topsoil (T_1) and a mixture of topsoil and poultry droppings (T_2) had higher dry weight than those produced on sawdust and a mixture of sawdust and topsoil. There was significant difference between the dry weight of the fruitbodies produced on all the substrates (Figure 6).

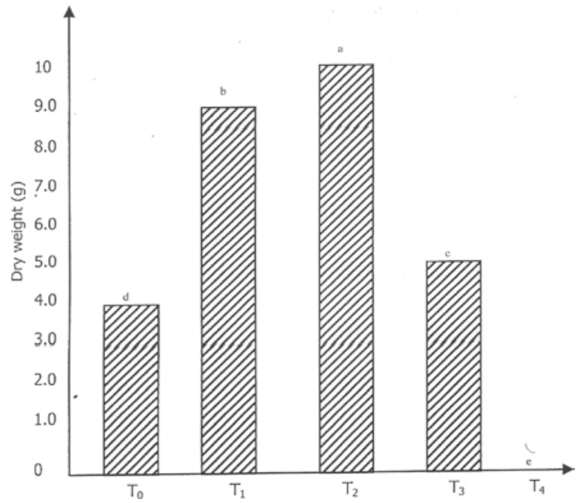

Figure 6. The dry weight of fruitbodies of *Pleurotus tuber regium* formed on different substrates.

4 Discussion

Artificial substrates were screened for cultivation of *Pleurotus tuber regum.* The fact that the fungus grows on artificial media had earlier been reported by Oso (1977), Zadrazil (1978) and Oei (1996). The fungus did not germinate on poultry droppings alone. The heat generated by the rotting poulty droppings may be responsible for the decay of the scleratia planted (Stamets, 2001). Of all the parameters studied, sawdust poorly supported the growth of the fungus relatively. Sawdust should have been the best for the growth of *Pleurotus tuber regium* as the fungus traditionally grows on the wood of *Treculia africana* (Candy, 1990). However, since the sawdust used was a mixture of wood particles from different plants, there may be some particles from some wood that may tend to inhibit the growth of the fungus (Davis and Aegerter 2000). This finding, however disagrees with the reports of Kadiri and Fasidi (1990) which conduced that sawdust was consistently the best substrate supporting mycelia growth and fruitification. A mixture of poultry droppings and topsoil produced the fruit bodies that were very good in all the parmeters studied. According to Chang and Buswell (1996), nutrient content of substrates affect the formation of fruitbodies. Also Zadrazil (1980) has shown that growth of Pleurotus species is favoured on substrates of low nitrogen content, that is, higher carbon and nitrogen ratio to raise good yield. From this study, what was observed was that the mixture of poultry dropping contains the necessary nutrients required for fruitification of *Pleurotus tuber regium*. This conclusion is based on the observation that fruitbodies produced on a mixture of poultry droppings and topsoil were significantly more in number and larger in size than those from any other substrate screened.

References

1. Candy CL. The Cultivation of Pleurotus in Mauritania. Proceedings 1st Conference on African Mycology. Mauritius 1990; 1 – 5.
2. Chang ST, Buswell JA. Mushroom nutricenticals. World Journal of Microbiology and Biotechnology 1996; 12: 473 – 6.
3. Chang ST, Miles PG. Recent trend in world production of edible mushrooms. The Mushroom Journal 1991; 503: 15 – 3.
4. Davis RA, Aegerter BJ. Edible Mushroom Cultivation. Scientific Publishers Jodhpur India 2000; 2 – 5.
5. Fasidi IO, Ekuere F, Usukama U. Studies on *Pleurotus tuber regium (*Fries) singer: Cultivation, proximate composition and mineral content of sclerotia. Food Chemistry 1993; 48: 255 – 8.
6. Fasidi IO, Olorunmanje KS. Studies on the requirements for vegetative growth of *Pleurotus tuber regium* (Fr) Singer: a Nigerian mushroom. Food Chemistry 1994; 50: 397 – 401.
7. Hussain T. Growing mushroom: a new horion in agriculture. Mushroom Journal 2001; 21: 23 – 6.
8. Kadiri M, Fasidi IO. Variations in chemical composition chlorophyllum molybodies (Mayerex. Fr.) Massres and *Plenrotus tuber regium* (Fries) during fruitbody development. Nigerian Journal of Sci 1990; 24: 86 – 9.
9. Kuyper TW, Van Dijk FW, Onguene NA. Knowledge and utilization of edible mushrooms by local populations of the rains forest of South Cameroon 415.
10. Oei P. Mushroom Cultivation with Special Emphasis on Appropriate Techniques for Developing Countries. Tool Publications, Leiden, Netherlands 1996; 274.
11. Ogunlana SK. Studies on the cultivation of the edible mushroom *Pleurotus tuber regium* (Fr) Singer. Tropical Journal of Applied Sciences 1992 2; 56 – 60.
12. Oso BA. *Pleurotus tuber regium* from Nigeria. Mycologia 1977; 69: 271 – 9.
13. Quimio TH, Chang ST, Royse DJ. Technical guidelines for mushroom growing in the tropics. Food and Agriculture Organization of the United Nations. Rome, 1990; 106.
14. Stamets P. A novel approach to farm waste management. Mushroon Journal Winter 2001; 30: 28 – 32.
15. Zachazil F. Influence of ammonium nitrate and organic supplements on the yield of Pleurotus sajor-caju (Fries) Singer. European Journal of Appl Microbiol and Biotech 1980; 9: 31 – 4.
16. Zadrazil F. Cultivation of Pleurotus, in Chang ST and Hayes WA(ed) the Biology and Cultivation of Edible Mushrooms, Academic Press, New York 1978; 521 – 58.
17. Zoberi MH. Tropical Macrofungi. Mamillian Press Limited, London 1972; 158.