RESEARCH PAPER International Journal of Agricultural Sciences, June to December, 2009, Vol. 5 Issue 2 : 340-342

Efficacy of various farm wastes on cultivation of *Pleurotus ostreatus* (Jacquin ex. Fr.) Kummer

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ABSTRACT

Various farm wastes were investigated as substrates for *Pleurotus ostreatus*. The highest mushroom harvest (fresh weight) was obtained from oil palm fruit fibre substrate and the lowest yield was from yam (*Dioscorea* sp.) peelings. Casing enhanced yield from all substrates. Oil palm fruit fibre spawn is an alternative to the sclerotium in propagating the fungus. Some fungi and pests were associated with the mushroom on these substrates but only *Sclerotium rolfsii* caused stipe rot.

Key words : *Pleurotus ostreatus*, Mushroom, Substrates, Spawn

INTRODUCTION

Pleurotus ostreatus (Jacquin ex.Fr.) Kummer, an edible Basidiomycetous fungus, occurs in both tropical and subtropical regions of the world (Gray, 1970; Hayes and Nair, 1975).

It is a common mushroom in the southern part of Nigeria and forms large spherical to ovoid, subterranean sclerotia which sometimes measure up to 30 cm in diameter (Okhuoya and Harvey, 1984). The fungus infects dry wood, where it produces the sclerotium, usually buried within the wood tissues but also found between the wood and the bark. Both the sclerotium and the mushrooms are eaten. Sclerotia are used in various soup and medicinal preparations both for human consumption and in traditional medical practice (Gray, 1970; Hayes and Nair, 1975; Zoberi, 1972). The fungus grows with relative ease in the laboratory and is noted for rapid growth and for causing extensive wood decay (Okhuoya and Harvey, 1984). Mushroom cultivation is still in its infancy in Nigeria, and many species that might be cultivated for food are known only in the wild state. The objective of this study was to evaluate the use of different farm wastes as possible substrates for the growth of *P. ostreatus.*

MATERIALS AND METHODS

Sclerotia used for this study were obtained from Tamil Nadu Agricultural University, Coimbatore. They were taken to the laboratory and stored for 4-5 days at room temperature before use. The wastes products used were : cassava (*Manihot* sp.) peelings collected fresh from a cassava mill, corn (*Zea* sp.) straw collected from the University farm, oil palm fruit fibre from the private oil mill of Coimbatore City, rice (*Oryza* sp.) straw from a private farm, wild grass (*Pennisetum* sp.) collected after land preparation from the University farm and yam (*Dioscorea* sp.) from local field. The cassava and yam peelings were sun-dried for 10 days and crushed to coarse sizes (ca. 3 cm) with amortar and pestle. Corn, rice, and wild grass straws were separately cut into small pieces (ca. 3 cm) and the large cylinders of straw were split into 3-4 slices. Oil palm fruit fibres were also sun-dried for 10 days before use.

The substrates were separately bulked and treated with 5% bleach (v/v) with a moisture content maintained at 70%, read with a Sargent Welch (U.S.A.) moisture meter. Two hundred grams of each of these substrates were loaded into plastic trays (30 trays), 60x60x15 cm. Controls trays were filled with 200 g of white river sand. Each tray was seeded with 50 g of fresh sclerotia, at three different equidistant points on the tray. Trays (uncovered) were then placed in a greenhouse (25 ± 3 °C) for observation of fungal growth.

Spawn trial:

Oil palm fruit fibre supported extensive growth and was tested as a spawning material. The spawn was prepared by stuffing three polyethylene bags (75 x 60 cm) with oil palm fruit fibre treated with 5% bleach (v/v) and inoculated with sclerotial pieces (25 g each), 10 to each bag, and incubated at room temperature. After 20 days, extensive and compact mycelium (mushroom "seed") had developed on the oil palm fruit fibre. The bags were opened, and the mushroom seed divided into 15-g portions and used to inoculate the different substrates. Fifteen days after "seeding," 10 trays were cased with garden top soil. Fresh mushroom yield per tray was recorded 20 days after casing. Each tray was watered once per day with 40 ml of sterile distilled water.All fungal contaminants and other pests associated with the different substrates and mushrooms were recorded. Fungal contaminants growing directly on the

sporophores and causing damage or disfigurement were isolated on Potato Dextrose Agar (PDA) medium and later subcultured. Pathogenicity tests for each isolate were carried out using Kochs' postulate (Lambert, 1938)

RESULTS AND DISCUSSION

Higher yields were produced on substrates inoculated with sclerotia than for those inoculated with spawn, except for the oil palm fibre and corn straw substrates (Table 1).

Sclerotia grow directly into sporophores and mycelium. This is not the case with spawn, which has to develop extensive mycelium before fruiting, and the more the mycelium developed, the greater the yield (Maduewesi, 1975). Hence, the better developed mycelium on oil palm fruit fibre supported the highest sporophore production. Although the substrates were not analyzed for nutrients, the extensive mycelial development on oil palm fibre indicates that it is a rich medium for the growth of this mushroom. Higher yields were recorded on substrates cased than those without casing (Table 1). This confirms the general observations that casing enhances cropping (Okhuoya and Harvey, 1984). This was best illustrated with oil palm fibrespawn- treatments, which produced mainly vegetative mycelia with little or no yield from uncased substrates. The role of casing in mushroom cultivation has been principally associated with

Table 1 : Average yield of fresh mushrooms per tray

Sr. No.	Substrates	Sclerotial inoculation		Oil palm fruit fibre spawning	
		Uncased	Cased	Uncased	Cased
1.	Cassava peelings	12.85	23.45	0.0	6.20
2.	Corn straw	6.50	19.74	8.10	64.30
3.	Oil palm fruit fibre	0.0[a]	123.40	0.0	130.20
4.	Rice straw	13.26	39.29	6.01	26.08
5.	Yam peelings	10.25	15.74	0.0	10.10
6.	Wild grass straw	18.58	32.33	0.0	13.10
7.	River sand	16.54[a]	b	0.0	b

Yield is in grams

[a] Sclerotium failed to produce mushrooms on the rich oil palm fruit fibre owing to the extensive mycelia developed, but it formed (germinated) mushrooms directly when inoculated onto river sand. [b] Not determined

Table 2 : Common fungal weeds and pests associated with mushroom

Sr. No.	Fungal species / pests	Effect[1]	State of mushshroom[2]
1.	*Aspergillus flavus* Link.	COS	NA
2.	*Aspergillus niger* van Tiegh.	SG; DM	IS
3.	*Aspergillus tamari* Kita	COS	NA
4.	*Botryodiplodia theobromae* Sacc	COS	NA
5.	*Coprinus comatus* Gray	COS	NA
6.	*Sclerotium rolfsii* Sacc.	Stipe rot	IS
7.	*Penicillium* sp.	SG; DM	IS
8.	*Physarum polycephalum* Schw.	COS	NA
9.	*Rhizophus stolonifer* Lind.	COS	NA
10.	*Schizophyllum commune* Fr.	COS	NA
11.	*Xylaria hypoxylon* Grey	COS	NA
12.	Insects	DM	IS; MS
13.	Nematodes	SNF	Sporophore primordia

[1] COS- contaminant on substrate; SG- stunted growth
DM-disfigurement of mushroom;
SNF-sporophores not formed
[2] before attack; NA-not applicable
IS-immature sporophore; MS-mature sporophore

aiding the change from the vegetative phase (mycelium) to a reproductive phase (fruiting) (Lambert, 1938; Oso, 1975). All the substrates bore different fungal contaminants (Table 2).

Aspergillus spp., *Penicillium* spp. and *Rhizopus stolonifer* occurred on cassava and yam peelings, *Xylaria* sp. and *Physarum* sp. grew on corn and rice straw. *Botryodiplodia* sp. occurred more specifically on yam peelings. These results appear to be related to the ecological disposition of these fungi: storage fungi, such as *Aspergillus*, *Penicillium*, and *Rhizopus* occurred on yams and cassava, and the higher lignicolous species such as *Xylaria* occurred on corn and rice straw. *Physarum* sp. occurred frequently on straw. Most fungi are found on particular substrates e.g., *Coprinus filmentarius* colonizes mushroom composts in which ammonia and amines accumulate (Ikediugwu and Ejale, 1980). Also, *Botryodiplodia theobromae* was commonly associated with cassava tuber. Oil palm fibre supported a very low incidence of *Aspergillus*, perhaps because of rapid colonization of the substrate by the mycelium of mushroom. Mushrooms, like any other cultivated crops,

are attacked by pests and competitors. In this study, *Sclerotium rolfsii* was the only fungus that caused stipe rot while others caused crop failure or disfigurement of the mushrooms (Table 2). The stipe rot appeared as a yellowish brown rot on the stipe, which prevented the formation of the cap. The stipe gradually deteriorated and disintegrated into the substrate. *S. rolfsii* is a soil-borne pathogen, especially in subtropical and tropical countries, causing diseases ranging from root rot to fruit rot (Gray, 1970; Zoberi, 1973). Its pathogenicity on mushrooms has not been previously reported. This disease occurred on mushrooms developed on substrates that were cased, which suggests that the fungus may have originated from the casing garden soil. To avoid use of soil contaminated with *S. rolfsii*, casing soil could be screened for this fungus before use with a baiting technique (Ikediugwu and Osude, 1977). The disfigurement on mushrooms as a result of fungal stains generally lowers the commercial value of the mushrooms. However, strict maintenance of high standards of hygiene during cultivation will reduce the occurrence of fungal contaminants.

REFERENCES

Gray, W.D. (1970). *The use of fungi as food in processing.* Butterworths, London, 113 pp.

Hayes, W.A. and Nair, H.G. (1975). The Cultivation of *Agaricus bisporus* and other edible mushroom. In: *TheFilamentous fungi* (Smith, J.E. and Berry, D.R., Eds.) Edward Arnold, London, 340 pp.

Ikediugwu, F.E.O. and Ejale, A. (1980). Rootsurface mycoflora of cassava *(Manihot esculenta)* and post harvest rot of the tubers. *Mycopathologia,* **71** : 67 - 71.

Ikediugwu, F.E.O. and Osude, P.U. (1977). A method for baiting *Corticium rolfsii* and of estimating the sclerotial population in the soil. *Trop. Pest Manage,* **23** : 395-401.

Lambert, K. (1938). *Principles and problems of mushroom culture. Bot. Rev.,* **4** : 397-426.

Maduewesi, J.N.C. (1975). Host-range and thermal inactivation of cowpea isolate of *Sclerotium rolfsii. Niger. J. Plant Protect.,* **1**: 23-28.

Okhuoya, J.A., and Harvey, R. (1984). Laboratory cultivation of *Pleurotus ostreatus* (Jacquin ex. Fr.) Kummer using elm (*Ulmus* sp.) and poplar (*Populus* sp.) sawdusts. *Biologia,* **30** : 245 - 258.

Oso, B.A. (1975). *Pleurotus ostreatus* from Nigeria. *Mycologia,* **69** : 271- 279.

Zoberi, M.H. (1972). *Tropical macrofungi.* Macmillan, London, 158 pp.

Zoberi, M.H. (1973). Some edible mushrooms from Nigeria. *Nigerian Field,* **38** *:* 81-90.

Received : April, 2008; Accepted : February, 2009