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# CULTIVATION OF OYSTER MUSHROOM *PLEUROTUS PULMONARIUS* ON CASSAVA PEELS AND SAWDUST

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## ABSTRACT
*Multiplication of the spawns of Oyster Mushroom (Pleurotus pulmonarius) was carried out by inoculating it unto bottles of cooked grains and incubated at temperature of 26-28$^0$C 23days. Bags of the substrates made from cassava peels and sawdust were inoculated with the replicated spawn. The study revealed that mycelia initiation started on the 3$^{rd}$ and 5$^{th}$ day for Sawdust and Cassava peels respectively after the inoculation and fully colonized the Sawdust in 22days and Cassava peels in 24days under temperature of 26-28$^0$C. The study also revealed that complete fruiting body formation occurred on the 29$^{th}$ and 34$^{th}$ days for Sawdust and Cassava Peels respectively. The results obtained suggest that both Sawdust and Cassava Peels can serve as good substrates for cultivation of mushroom.*

***Keywords:*** *Cultivation, Oyster Mushroom, Pleurotus, Pulmonarius, Cassava.*

## INTRODUCTION
Mushrooms have been regarded as gourmet cuisine across the globe since antiquity for their unique taste and subtle flavor. They are considered as sources of important nutrients including dietary fiber, minerals, and vitamins, in particular, vitamin D. More than 2,000 species of mushrooms

exist in nature, but only around 25 are widely accepted as food and few are commercially cultivated (Valverde *et al.*, 2014).

Oyster mushrooms are a diverse group of saprotrophic fungi belonging to the genus *Pleurotus,* these mushrooms are good source of non-starchy carbohydrates, with high content of dietary fiber and moderate quantity of proteins, including most amino acids, minerals, and vitamins. The protein content varies from 1.6 to 2.5%, and the niacin content is about ten times higher than that of any other vegetable. Moreover, reported that oyster mushrooms are rich in Vitamin C, B complex, and mineral salts required by the human body. They can grow at moderate temperatures, ranging from 20 to 30°C, and at a humidity of 55–70%, on various agricultural waste materials used as substrate. Because of its flexible nature, the *Pleurotus* genus is more cultivated than any other mushroom species ( Randive*,* 2012)

Cassava (*Manihot esculenta*) is a food crop that is cultivated in large quantity in Nigeria and is utilized for local consumption and in commercial preparations both for edible and non-edible purposes (Akinrinola-Akinyemi *et al.*,2017)

Edible preparations from cassava are used as various staple foods in Nigeria, and an average Nigerian will take it as a whole meal or as part of the daily food.

Cassava peels is the byproduct of processing the root of cassava for starch, Cassava flour, and garri (a fermented Cassava meal product) (Stanley *et al.,* 2011)

Sawdust is a byproduct or waste of wood working operations such as sawing, milling, planning, routing drilling and sanding. It's composed of particles of wood

This work is aimed at cultivating oyster mushroom (*Pleurotus pulmonarius*) on sawdust and cassava peels

## METHODOLOGY

### Samples Collection

Fresh Cassava peels was collected from Maina Maji in Alkaleri Local Government Area , Bauchi State. The Cassava peels was sundried and

grinded to crispy. Sawdust was collected from Timber Market Muda Lawal in Bauchi State and Oyster Mushroom Spawn ( *Pleurotus pulmonarius)* was collected from Port Harcourt Rivers State.

## Grain Sterilization

Guinea corn was measured based on the number of bottles of grains to be produced, the grains was thoroughly washed ( 3 times) and non-viable grains (floating grains) were removed and the washed viable grains were put in a pressure pot and water was added.

The pressure pot was placed on fire and allowed to boil for a while till the grains were a-bit softened (tested by trying to bite the grain).When the grain was softened, the pot was carried down, the water was removed and the grains were spread on the floor, it was shade-dried for about 3 hours to reduce its water content.

Neat bottles were filled with the grains close to the line at the neck of the bottle; the bottles were properly covered with cotton wool. The bottles were covered with neat paper and tied with rubber band to prevent microbial penetration and contamination.

The bottled grains were sterilized in a pressure pot under pressure for 45 minutes; it was allowed to cool after the sterilization and was sterilized for another 45 minutes under pressure in a pressure pot. It was allowed to cool.

## Spawn Multiplication

Moderate quantities of the already made spawn were inoculated into the bottles of sterilized grain to produce more spawn. After inoculation, the bottles were placed in the inoculation cabinet (a sterilized box) for sterilization and temperature regulation.

Spirit lamp was lighted in the inoculation cabinet and the spawn bottles were allowed to stay for 3-4 weeks in the cabinet for proper growth and maturity. According to (Kupradit *et al.,* 2017*)*

## Substrate Preparation/Bagging (Sawdust)

100kg was prepared by collecting 90kg of fine dry saw Dust, 7kg of wheat bran was added to the sawdust, 3% of quick lime was added ($CaCO_3$) and

quality water was added then it was mixed thoroughly with a spade. After proper mixing, the substrate were put in small size thick-transparent nylon bags, the bags were doubled and compressed carefully with caution to avoid any rumple on the sides and ensure it was well filled though not to the bream.

Small size of neat plastic pipe were cut to a length of about 1-2cm then put at the top of the nylon and the top of the nylon was wrapped around the plastic pipe with rubber band leaving only the hole in the pipe as the only entrance to the substrate in the bag.

## Substrate Preparation/Bagging (Cassava Peels)

90kg of Cassava peels was weighed and mixed with 7kg of wheat bran,3kg of calcium carbonate was added to the mixture and then moistened with water to molding stage as described by Akinrinola-Akinyemi *et. al*, (2017).

## Inoculation

This is means introducing the spawn into the sterilized Substrates bags. The bags of sterilized substrates were kept on the inoculation table in the inoculation room. Methylated spirit was used with cotton wool to clean the bags properly

A reasonable quantity of spawn was inoculated into the sterilized substrates bags through the opening in the pipe and the inoculated substrate bags were transferred to the incubation room where ramification and colonization took place.

## Incubation

Inoculated substrate bags were kept in the incubation room for a period of 21 days for colonization to take place under a controlled temperature of 26 to $28^0$C which was necessary to boost mushroom growth.

## Fruiting and Harvesting

When the bags of the substrate were fully colonized, they were transferred from the incubation room to the fruiting room where fruiting and harvesting takes place after 2 and 3 months consecutively. After this period of regular harvesting, they become spent substrate.

The thermometer reading was monitored in the incubation room.

## Identification of *Pleurotus pulmonarius*

**Colour of Spawn**: White
**Cap**: 3–10 cm across; convex, becoming flat or somewhat depressed; lung-shaped (hence its Latin name) to fan-shaped or semicircular in outline—or nearly circular if growing on the tops of logs; somewhat greasy when young and fresh; fairly bald; whitish to beige or pale tan, usually without dark brown colorations; fading as it dries out, often resulting in a two-toned appearance; the margin in rolled when
**Gills**: Running down the stem; close or nearly distant; short-gills frequent; whitish; sometimes discoloring yellowish with age.
**Stem**: Sometimes absent or rudimentary, but often present; 1–4 cm long and 0.5–1 cm thick; eccentric or lateral—or central; whitish; bald; basal mycelium white.
**Flesh**: Thick; white; unchanging when sliced as describe by (Bruno *et al*., 2013).
**Odor and Taste**: Odor distinctive but hard to describe ("like oyster mushrooms" works well, but makes for a circular description); taste mild.
**Chemical Reactions**: KOH on cap surface orangish.
**Spore Print**: Whitish, grayish, or lilac.
**Microscopic Features**: Spores 7–11 x 2–3 µm; cylindric-ellipsoid; smooth; hyaline in KOH; inamyloid. Hymenial cystidia not found. Pileipellis a cutis; elements 5–10 µm wide, smooth, hyaline in KOH.

## Performance and Productivity Measurements

The performance and productivity of the mushroom were measured using the method outlined by Mkhize *et. al,* (2016). The following parameters were measured in order to evaluate the performance and productivity of *P. pulmonarius* mushroom. These included the biological efficiency, mycelial growth rate, number of contaminated bags, time to fruiting, yield of the mushroom and the number of days to full colonization of substrate.

## RESULTS

This study reveals that Cassava peels and Sawdust can be used as appropriate substrate for cultivation of edible Mushroom (*Pleurotus pulmonarius*).6 bottles of cooked guinea corn were used to replicate the spawn.24 bags of the substrates were inoculated with the replicated spawn of Pleurotus Pulmonarius, which 12 substrates bags were made from Cassava Peels and 12 bags were made from Sawdust. 4bags became contaminated later, 2 bags from each of the 2 different substrates.

**Table 1. Effects of different substrates on growth and yield performance of *Pleurotus pulminarius* in days**

| *Substrates* | Spawn running | Pin head appearance | **Fruiting body formation** |
|---|---|---|---|
| ***Sawdust*** | 21 | 24 | 29 |
| ***Cassava peels*** | 24 | 27 | 34 |

**Table 2. Effects of substrates on the morphology of *Pleurotus pulminarius***

| *Substrate* | Stipe (cm) | Pileus(cm ) | Height of fruiting bodies (cm) |
|---|---|---|---|
| ***Sawdust*** | 4.2 | 6.1 | 7.2 |
| ***Cassava peels*** | 5.3 | 5.6 | 6.0 |

**Table 3.** Effect of substrate combination on mycelia and fruit body initiation as well as bottom formation and fruit body formation.

| Substrate | Mycelia initiation (days) | Mycelia growth after 14 days | Bottom initiation (day) | Fruit body formation (day) | Average no of fruit body formed |
|---|---|---|---|---|---|
| **Sawdust** | 3 | Moderate | 25 | 29 | 25 |
| **Cassava peels** | 5 | moderate | 26 | 34 | 29 |

## DISCUSSION

Sawdust showed the fastest rate of mycelium growth during the spawn running and took about 21 days for *P. pulmonarus* and 24days in Cassava peels. Appearance of pin heads and formation of fruiting bodies were

delayed most in Cassava peels substrates. This agrees with previous work by Garuba, *et. al,* (2017).

*Pleurotus pulmonarius* cultivated in sawdust had the highest stipe length, pileus diameter and height of fruiting body. This work agrees with previous work by Mojeed, *et.al*, (2015)

*Pleurotus pulmonarius* mycelia initiation, bottom initiation (days) and fruit formation (days) were faster in Sawdust than Cassava peels but the average number of the fruiting body is higher in Cassava peels than Sawdust.

## CONCLUSION

This present study reveals that Sawdust and Cassava Peels can be used as substrate for cultivation of *Pleurotus pulmonarius* under hygienic and control environmental conditions.

*Pleurotus pulmonarius* grows at different rate in different substrate. The use of Sawdust and Cassava Peels as substrate for cultivation of *Pleurotus pulmonarius* is one of the ways of waste control and management.

## RECOMMENDATIONS

1. 1. *Pleurotus pulmonarius* should be cultivated on large scale, using Sawdust and Cassava Peels as substrate to provide cheap source of quality food.
2. Sawdust and Cassava Peels should be used in cultivation of *Pleurotus pulmonarius* to reduce waste of land for their dumping and reduces breeding ground for dangerous microbes.
3. Hygiene should maintain in all steps of production to reduce the risk of contamination because contamination hinders the growth of *Pleurotus pulmonarius.*
4. Environmental factors such as temperature, water, pH, light etc should be given more attention as little deviation in any of the above factors will affect the growth of *Pleurotus pulmonarius.*

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Fig, 1. Spawn growth 3days after inoculation

Fig, 2. Spawn growth 3days after inoculation

Fig.3. Sterilized sawdust and cassava peels ready to be inoculated

Fig. 4. Colonization level after 3 days of inoculation

Fig. 5. The top of the substrates bag cut off

Fig.6.The pin head appearance after 3days

Fig.7. Fruit body formation after 7days

Fig.8. Fruit body after 12days, ready to be harvested