EFFECT OF SELECTED SAWDUSTS AND AGRICULTURAL WASTE EXTRACTS ON THE GROWTH OF *Ganoderma lucidium* (Curtis) P. Karst AND *Pleurotus tuberregium* (Fr.) Singer.

BY

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SR/2303/RPR/25/45

UNIVERSITY OF BENIN

BENIN CITY.

OCTOBER, 2025.

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF PLANT BIOLOGY AND BIOTECHNOLOGY, FACULTY OF LIFE SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE UNIVERSITY OF BENIN, BENIN CITY, AWARD OF BACHELOR OF SCIENCE (B.Sc HONS) DEGREE.

OCTOBER, 2025.

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This is to certify that this project work was carried out by Deborah Urhukposa OSAZUWA (Miss) of the Department of Plant Biology and Biotechnology. Faculty of life sciences. University of Benin, Benin city.

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(Project Supervisor)	

Prof. B. Ikhajiagbe	**Date**
(Head of Department)	

DEDICATION

This Project work is dedicated to God Almighty for His immeasurable Grace and Mercies upon me, to my Dad for his support, encouragement, prayers, love and care, to my mother for her unending prayers and to my Brother for his profounding encouragement throughout my period of study.

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ABSTRACT

The study was conducted to determine the effect of the extracts of selected sawdusts of *Brachystegia nigerica* and *Bombax buonopozense, Greenwayodendron suaveolens* seed powder, a combination of *Brachystegia nigerica* and *Bombax buonopozense* Sawdust, making up a mixed known sawdust, Mixture of unknown sawdust and PDA Control were used in the preparation of media for the cultivation of *Ganoderma lucidum* and *Pleurotus tuberregium.* The pure culture of *Ganoderma lucidum* and *Pleurotus tuberregium* were gotten from the African Center for Mushroom Research and Technology Innovation (ACMRTI), Uniben. The pure cultures were inoculated into the sterilised extracts of *Brachystegia nigerica sawdust, Bombax buonopozense sawdust, Greenwayodendron suaveolens* seed powder, and a mixture of known sawdust and unknown sawdust and PDA Control. After the first day of inoculation, mycelium growth of *Ganoderma lucidium* was highest for PDA (3.47±0.03) and the least was Mixed known sawdust (2.30±0.60). However, after five days of inoculation, mycelia extension of *Ganoderma lucidium* was highest for PDA (5.65±0.60) with a morphology of an appressed density, and the least mycelia extension was observed in mixed known sawdust extract (3.38±2.50) with a morphology of a wooly density. In *Pleurotus tuberregium,* it was also observed that after the first day of inoculation, mycelium growth was the highest for B. buonopozense sawdust extract (3.62±0.21), and the least was observed in mixed known sawdust extract (1.28±0.14). However, after five days of inoculation, mycelium extension for *Pleurotus tuberregium* was highest for B. buonopozense sawdust extract (7.3±0.78) with a morphology of a wooly density and mixed known sawdust was the least (2.15±0.62) with a morphology of a wooly density. These results revealed that *Ganoderma lucidium* and *Pleurotus tuberregium* can be grown on the various subtrates material tested. The study has also shown that local material tested can be used to cultivate mushrooms when synthetic media are not available. There is the need to further test for the substrate materials for the production of spawn and fruit bodies of these mushrooms for mass production.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Mushrooms belong to the kingdom Fungi. A mushroom has been defined to mean an enlarged fleshy fruiting body of a fungus. It is a macro fungus with distinctive fruiting body which can either be epigenous (above ground) or hypogenous (underground) and large enough to be seen with the naked eye (Chang and Miles, 1992). Some mushrooms are edible and safe to eat, while others pose a great risk of harm when eaten or touched. Mushrooms are typically found near plants and may even use plants for stability as they grow. Mushrooms with other fungi were previously grouped into the plant kingdom but now they belong to the kingdom Fungi due to unique fungal characteristics which draw a clear line from animals or plants (Lindequist et al., 2005). Recent research has confirmed that mushrooms, along with other fungi, possess unique characteristics that set them apart in their own fungal kingdom known as the kingdom Myceteae. Unlike the plant and animal kingdoms, fungi have notable distinctions, such as a cell wall composition different from plants and a mode of nutrition that is heterotrophic. Unlike animals, fungi use an absorptive (osmotrophic) method for obtaining nutrients rather than a digestive one (Chang and Miles, 1992).

Among heterotrophic organisms, mushrooms have fundamental roles in the biological equilibrium. They along with other fungi are especially for the degradation and transformation of plant and animal substances of the forest ecosystem, restoring soil fertility by returning to the soil minerals with the plants transform into organic matter. Relatively, recent knowledge of the systematic physiology, genetic and biochemistry of fungi has a strong impact on their use and

industrial processing, which now includes production of antibiotics, fermentation and biodegradation of polluting substances.

Mushrooms take nutrients from other sources such as animal waste, plant matter and organic carbon. Mushrooms have been valued for many centuries for their gastronomic value. This may be partly due to increase in researches and technological exploitation of this fungi especially in the last two decades and partly as a result of increasing search for alternate sources of protein. Mushrooms as food now assumes greater importance in human diets world wide. They have been the source of food in places like Europe, North America and Asia, Farr (1983), Fad (1983), Kate (1984), and Okhuoya (1997). They are highly nutritive and are known to contain a lot of water, protein, lipids, sugars, amino acids, glycogen, vitamins (B,C, D) and mineral elements. Apart from their nutritive value, mushrooms also have potential medicinal benefits especially on antitumor and hypocholosteramic agents, Fasidi and Kadiri (1990).

Mycology is the scientific discipline dedicated to the study of fungi, encompassing over 74,000 known species. Fungi play a crucial role in human affairs hor various reasons. They act as primary agents responsible for plant diseases and some significant human ailments. Additionally, fungi contribute significantly to various industries through their fermentation processes, producing essential products like ethyl alcohol, citric acid, and the antibiotic penicillin. The word "Mushroom" is most often applied to those fungi that possess a stem, a cap (pileus) and gills (lamellae) on the underside of the cap.

1.2 Ganoderma lucidium (Reishi Mushroom):

Ganoderma lucidium also known as "Lingzhi", "Reishi", "Mannentake", and "Youngzi" is a specie of the clas Basidiomycetes, which belongs to the family Ganodermataceae of the order Aphyllophorales (Chang and Miles, 1994). Often known as a wood decaying fungus, this organism is responsible for causing white rot in a diverse range of trees, making it a phytopatjogenic film gus. In recent times, its fruiting body has gained considerable popularity as a dietary supplement, not only in China and Japan but also in North America and various other regions. The international attention it receives as a valuable Chinese herb can be attributed to its diverse biological activities, including antitumor, immunomodulatory, cardiovascular, respiratory, antihepatotoxic, and antinociceptive (pain-relieving) effects. The fruiting bodies of this fungus can take on various shapes, including stipitate, dimidiate, reniform, and occasionally suborbicular. As they grow, they have thick, corky textures with a yellowish hue along the edges, gradually turning brown as they mature, displaying a glossy laccate surface. The margin of the fruiting bodies is typically thin or truncated, occasionally slightly incurved. The stipe is positioned laterally and rarely off-center, exhibiting a dark, thick appearance that eventually becomes purple-brown. The laccate on the stipe appears more noticeably shiny than that found on the pileus. The pores start off white and transition to a light brown as they develop. The spores are brown, ovoid and possess a truncate end. The episodes have a smooth texture, while the endospores are rough, with a prominent large central feature.

Ganoderma lucidium is more commonly found in subtropical regions than in temperate zones. It is an annual mushroom that thrives on a wide variety of dead and dying trees. The temperature range suitable for mycelial growth is 15°C to 35°C, with optimum temperature being around 24°C to 25°C. For primordial initiation, the range is 18°C to 25°C, and for fruiting body

development, it is 20°C to 25°C. During mycelial running, the relative humidity should be in the range of 60% to 70%. For primordial initiation, it should be at 85% to 90%, and during fruiting development, it should be kept at 70% to 85%. The optimal pH for mycelial running is 5.0 to 5.5. *Ganoderma lucidium*, is naturally distributed in temperate, subtropical, and tropical regions. Due to the limited supply and the challenges in controlling the quality of its fruiting bodies in natural settings, there has been a growing trend of using Lingzhi cultivated in controlled environments. The successful artificial cultivation of this valuable mushroom was achieved in the early 1970s, leading to a rapid development G. lucidium production since the 1980s. (Chang and Miles 1994).

1.3 TAXONOMY OF Ganoderma lucidium (Reishi Mushroom)

KINGDOM: Fungi

PHYLUM: Basidiomycota

CLASS: Agaricomycetes

ORDER: Polyporales

FAMILY: Ganodermataceae

GENUS: Ganoderma

SPECIES: Lucidium

1.4 *Pleurotus tuberregium* (king tuber Mushroom)

Pleurotus tuberregium is a tuberous wild species of white rot basidiomycete which produces fruitbodies from a unique globose sclerotium that is more like a giant truffle (Nwokolo, 1987). It is tropical and subtropical in distribution and found growing on many species of hard and soft woods like Mangifera indica, Daniellia oliveri and Treculia africana. *Pleurotus tuberregium* is

the only known Pleurotus species which produces true sclerotium, and also differs from all other Pleurotus species in its non-pleurotoid habit (Isikhuemhen and Nerud, 1999). The sclerotia are usually of various sizes, ranging from a few centimeters to several centimeters in diameter. They are spherical to oval in shape, dark brown on the outside and whitish on the inside (Okhuoya and Okogbo, 1991).

In Nigeria, *Pleurotus tuberregium* is used as both food and medicine. The tuber is highly nutritional (very rich in proteins), expensive and considered a delicacy (Okhuoya and Okogbo, 1990). The hard sclerotium is peeled and ground while the fruitbody is chopped and used in vegetable soup (Oso, 1977). The tuberous sclerotium can be used as a partial replacement for melon (*Citrullus lanatus*) seed or groundnut (*Arachis hypogea*) cake in traditional preparation of sauces and soups. In many parts of tropical Africa, the sclerotium is milled with melon or groundnut seeds, seasoned and moulded into patties for cooking or baking. The groundnut cake patties are consumed as snacks while fruitbodies are cooked as cheap source of protein in tropical Africa (Nwokolo, 1987).

Pleurotus tuberregium is known to possess medicinal properties and used by traditional medical practitioners in Nigeria (Okhuoya and Okogbo, 1990). In combination with various herbs, it has been used to cure headache, stomach ailments, colds, fever, asthma, smallpox, high blood pressure and as a tonic and treatment for coughs (Fasidi and Olorunmaye, 1994; Oso, 1997). Traditionally in some communities of Ghana, P. tuber-regium is known to possess medicinal values and have been used by herbal doctors to cure illnesses such as underweight in children, asthma and high blood pressure among others (Dzomeku, 2009). It has been reported that the pure culture of this fungus is able to kill and feed on nematodes (Hibett and Thorn, 1994). It is

also able to ameliorate crude oil polluted soils (Isikhuemhen et al., 2003; Adenipekun, 2008). Yongabi (2004) confirmed that the sclerotium of P. tuber-regium is a good coagulant and a disinfectant which can be used in natural and waste water purification. In China it is used in some folk recipes as a tonic and medicine for the treatment.

1.5 TAXONOMY OF *Pleurotus tuberregium* (King tuber Mushroom)

KINGDOM: Fungi

PHYLUM: Basidiomycota

CLASS: Agaricomycetes

ORDER: Agaricales

FAMILY: Pleurotaceae

GENUS: Pleurotus

SPECIES: Tuberregium

1.6 AIM

The aim of this study is to compare the growth rate, morphology and temperature of *Ganoderma lucidium* with *Pleurotus tuberregium* tissue culture, inoculated into different substrate medium which are; Okwen sawdust as substrate A, Bombax sawdust as substrate B, Dendron seed powder as substrate C, Mixed known sawdust (Okwen + Bombax) as substrate D, Mixed unknown sawdust as substrate E and Potatoe Dextrose Agar (PDA).

1.7 OBJECTIVES

The objectives of this study are to;

1. Determine the effect of selected Sawdust extracts and Agricultural waste extracts of the Mycelial extension on *Ganoderma lucidium* and *Pleurotus tuberregium*.

2. Determine the effect of selected Sawdust extracts and Agricultural waste extracts of the growth rate on *Ganoderma lucidium* and *Pleurotus tuberregium*.

3. Determine the effect of Selected Sawdust extracts and Agricultural waste extracts of the density on *Ganoderma lucidium* and *Pleurotus tuberregium*.

4. Determine the effect of Selected Sawdust extracts and Agricultural waste extracts of the Biomass on *Ganoderma lucidium* and *Pleurotus tuberregium*.

CHAPTER TWO

MATERIALS AND METHODS

This research was carried out at the African Centre for Mushroom Research and Technology Innovation (ACMRTI), Upniversity of Benin, Benin City, Nigeria from July to August, 2025. Below are the descriptions of the materials and methods used in this study.

2.1 SOURCES OF MATERIALS

Pure cultures of *Ganoderma lucidium* and *Pleurotus tuberregium* were collected from the African Centre for Mushroom Research and Technology Innovation (ACMRTI), University of Benin, Petri dishes, methylated spirit, and cotton wool, were purchased from Saint. Jude's Medical equipments and laboratory at opposite UBTH, Substrates: Okwen sawdust, Bombax sawdust, Mixed known sawdust and mixed unknown sawdust were gotten from a local sawmill, Dendron seed powder weas gotten from ACMRTI, University of Benin.

2.2 INNOCULUM

In this study, two species of mushrooms were used. They are *Ganoderma lucidium* and *Pleurotus tuberregium*. Pure cultures of *Ganoderma lucidium* and *Pleurotus tuberregium* were collected from The African Centre for Mushroom Research and Technology Innovations of the University of Benin. The pure cultures were sub-cultured in the Laboratory and kept in the incubator at 4^0C for further use in the study.

2.3 POTATO DEXTROSE AGAR (PDA)

200g of irish potato was peeled and boiled for 20 minutes in 1 litre of water. The extract was filtered and collected into a beaker. To the extract 20 g of dextrose, 20 g of agar was added and the content was made up to 1000 ml with distill water. The media was dispensed into 250 ml conical flask and autoclaved at 121 15psi for 15 minutes. After sterilization, the media were removed from the autoclave and allowed to cool to about 45. The media was then dispensed into disposable petri-dishes of 85mm in diameter and allowed to cool and solidify in the Laminar flow chambers.

2.4 PREPARATION OF EXTRACTS

50g of *Brachystegia nigerica* (Okwen) sawdust, *Bombax buonopozense* sawdust, *Greenwayodendron suaveolens* seed powder, Mixed known sawdust (containing a mixture of both *Brachystegia nigerica* and *Bombax buonopozense* sawdusts) and Mixed unknown sawdust (containing unknown mixture of sawdusts) were each weighed and turned into clean glass jars each. The substrates were mixed with boiling water, covered properly and stored for a day. This was done for proper extraction of the broth from the different substrates. After a day, the broths were sieved and poured into conical flasks measuring 500mls of each extracts. 20g of Dextrose sugar and 20g of Agar powder were weighed and poured into the broths of the different substrates in each conical flasks and autoclaved or sterilised for 20 minutes. The media were allowed to cool for some minutes and were dispensed into disposable petri-dishes of 85mm in diameter and were allowed to solidify in the Laminar flow chamber for inoculation.

2.5 INOCULATION AND INCUBATION

Inoculation was carried out in the laminar flow chamber. 18 Mycelium discs (5 mm in diameter) each were cut from a pure tissue culture of *Ganoderma lucidium* and *Pleurotus tuberregium* using the cork borer, was inoculated and placed in the center of each Petri dishes. This was done for all the media treatments. Each of the treatments was replicated three times. The petri dishes were sealed with a masking tape to secure the samples. They were labeled and transferred into the incubator at 28^0C for mycelia growth to occur.

2.6 MEASUREMENT OF MYCELIA GROWTH

The vegetative growth of the mushroom mycelia on the different media treatments was determined by measuring the diameter of the mycelium in the Petri dishes using a ruler. The diameter and growth rate of the mycelium was measured regularly and recorded in millimeters (mm). Average mycelia extension and growth rate were recorded. Six replications were conducted for each treatment to determine the average mycelial growth that occurs.

2.7 DATA ANALYSIS

Statistical analysis was done using averages, percentages, means and standard deviations of the six replicates. The results were calculated and presented in tables, graphs and figures.

CHAPTER THREE

RESULTS

The study has revealed that *Ganoderma lucidium* and *Pleurotus tuberregium* can grow in the different media tested at varying degrees. The media supported the growth of the mushrooms in culture plates. The mycelia extension was measured daily to determine their growth. *Ganoderma lucidium* was able to completely colonize the petri-dish in an average of 6 to 7 days while *Pleurotus tuber-regium* took an average of 5 to 6 days to colonize the petri-dish. After the first day of inoculation, mycelium growth of *Ganoderma lucidium* was the highest for PDA (3.47±0.03), this was followed by Bombax sawdust (3.43±0.47), Mixed unknown sawdust (2.75±0.65), Dendron seed powder (2.72±1.06), B. nigerica sawdust (2.52±0.70) and the least was Mixed known sawdust (2.30±0.60). However, after five days of inoculation, mycelia extension of *Ganoderma lucidium* was highest for PDA (5.65±0.60), followed by Bombax sawdust (5.15±1.74), B. nigerica sawdust (4.38±2.68), Mixed unknown sawdust (4.15±1.58), Dendron seed powder(4.08±1.57), and the least was Mixed known sawdust (3.38±2.50). The result is shown in table 1.

Table 1. Effect of media on the daily mycelia extension (cm) of *Ganoderma lucidium*

		Daily mycelium extension (cm)				
Media		**1DAI**	**2DAI**	**3DAI**	**4DAI**	**5DAI**
PDA	*	3.47 ± 0.03	4.30 ± 0.13	4.87 ± 0.35	5.55 ± 0.42	5.65 ± 0.60
BRA		2.52 ± 0.70	3.25 ± 1.28	3.57 ± 1.57	4.03 ± 2.14	4.38 ± 2.68
BBX		3.43 ± 0.47	3.67 ± 0.88	4.32 ± 1.14	4.80 ± 1.17	5.15 ± 1.74
GSP		2.72 ± 1.06	3.42 ± 1.40	3.98 ± 1.53	3.98 ± 1.53	4.08 ± 1.57
MKS		2.30 ± 0.60	2.60 ± 1.13	3.08 ± 1.95	3.08 ± 1.95	3.38 ± 2.50
MUS		2.75 ± 0.65	3.22 ± 0.95	3.37 ± 1.17	4.27 ± 1.74	4.15 ± 1.58

*Value= means ± standard deviation. DAI- Day after inoculation. PDA- Potato dextrose agar, BRA - *Brachystegia nigerica* sawdust media, BBX- *Bombax buonopozense* sawdust media, GSP- *Greenwayodendron suaveolens* seed powder media, , MKS- mixed known sawdust media and MUS mixed unknown sawdust media.

Here in this experiment, After the first day of inoculation, mycelium growth of *Pleurotus tuberregium* was the highest for Bombax sawdust (3.62±0.21), this was followed by PDA (3.18±1.07), followed by Dendron seed powder (1.97±0.41), B. nigerica sawdust (1.88±0.45), Mixed unknown sawdust (1.53±0.90) and the least was Mixed known sawdust (1.28±0.14). However, after five days of inoculation, mycelium extension for *Pleurotus tuberregium* was highest for Bombax sawdust (7.3±0.78), this was followed by PDA (6.94 ±1.2), followed by B. nigerica sawdust (4.58±0.53), Dendron seed powder (4.02±2.18), Mixed unknown sawdust (2.22±1.18) and Mixed known sawdust was the least (2.15±0.62). The result is shown in table 2.

Table 2. Effect of media on the daily mycelia extension (cm) of *Pleurotus tuberregium*

	Daily mycelium extension (cm)				
Media	**1DAI**	**2DAI**	**3DAI**	**4DAI**	**5DAI**
PDA	* 3.18 ± 1.07	3.10 ± 0.71	5.20 ± 0.77	6.11 ± 1.0	6.94 ± 1.2
BRA	1.88 ± 0.45	2.68 ± 0.94	3.18 ± 1.07	3.5 ± 1.13	4.58 ± 0.53
BBX	3.62 ± 0.21	4.73 ± 0.11	5.98 ± 0.30	5.98 ± 0.30	7.3 ± 0.78
GSP	1.97 ± 0.41	2.52 ± 0.75	3.27 ± 1.33	3.27± 1.33	4.02 ± 2.18
MKS	1.28 ± 0.14	1.63 ± 0.20	2.17 ± 0.65	2.17 ± 0.65	2.15 ± 0.62
MUS	1.53 ± 0.90	1.60 ± 1.12	1.72 ± 1.15	1.88 ± 1.30	2.22 ± 1.18

*Value= means ± standard deviation. DAI- Day after inoculation. PDA- Potato dextrose agar, BRA - *Brachystegia nigerica* sawdust media, BBX- *Bombax buonopozense* sawdust media, GSP- *Greenwayodendron suaveolens* seed powder media, , MKS mixed known sawdust media and MUS- mixed unknown sawdust media

The media type also influenced the mycelia biomass of *Ganoderma lucidium and Pleurotus tuberregium* to varying degree. The highest mycelial biomass obtained for *Ganoderma lucidium* recorded was in PDA(0.678±0.60 g), followed by Bombax sawdust (0.618±1.74 g), then *B. nigerica* sawdust (0.526±2.68 g), Mixed unknown sawdust (0.498±1.58 g), Dendron seed powder (0.490±1.57 g) and least in Mixed known (0.406±2.50 g). On the other hand, the highest mycelia biomass for *Pleurotus tuberregium* recorded, was in Bombax sawdust (0.880±0.78 g), this was followed by PDA (0.710±0.11 g), followed by *B. nigerica* sawdust (0.550±0.53 g), Dendron seed powder (0.341±2.18 g), Mixed unknown sawdust (0.266±1.18 g) and least biomass for *Pleurotus tuberregium was* observed in Mixed known sawdust (0.258±0.62 g). The result is shown in table 3.

Table 3: Effect of media on the biomass (g) of *Ganoderma lucidium* and *Pleurotus tuberregium*.

Media		Biomass (g)	
		G. lucidium	***P. tuberregium***
PDA	*	0.678±0.60	0.710±0.11
BRA		0.526±2.68	0.550±0.53
BBX		0.618±1.74	0.880±0.78
GSP		0.490±1.57	0.341±2.18
MKS		0.406±2.50	0.258±0.62
MUS		0.498±1.58	0.266±1.18

*Value= means ± standard deviation. PDA- Potato dextrose agar, BRA - *Brachystegia nigerica* sawdust media, BBX- *Bombax buonopozense* sawdust media, GSP- *Greenwayodendron suaveolens* seed powder media, , MKS mixed known sawdust media and MUS- mixed unknown sawdust media

The result revealed that the media influenced the mycelia density and morphology of *Ganoderma lucidium*, where the morphology of PDA was appressed with a thin density, the okwen was wooly, the Bombax was a little appressed, the Dendron Seed Powder was cottony with a thick density, the mixed known was alao appressed with a thin density and the mixed unknown was wooly and dense. Table 4 shows the mycelia density and mycelia morphology of *Ganoderma lucidium* respectively.

Table 4: Effect of culture media on mycelia density and culture morphology of *Ganoderma lucidium*

Media	Density	Morphology
PDA	++	Appressed
BRA	+++	Appressed
BBX	++	Appressed
GSP	+++	Cottony
MKS	++	Appressed
MUS	+++	Wooly

PDA- Potato dextrose agar, BRA - *Brachystegia nigerica* sawdust media, BBX- *Bombax buonopozense* sawdust media, GSP- *Greenwayodendron suaveolens* seed powder media, , MKS mixed known sawdust media and MUS- mixed unknown sawdust media, + = very thin, ++ = thin, +++ = dense.

The result also revealed that the media influenced the mycelia density and morphology of *Pleurotus tuber-regium*, where the morphology of PDA was wooly with a thick density, that of B. nigerica was little cottony, the Bombax was a little wooly or cottony, the Dendron Seed Powder was wooly with a thick density, the mixed known was a bit wooly with a thick density and the mixed unknown was wooly with a very thick density. Table 5 shows the mycelia density and mycelia morphology of *Pleurotus tuberregium* respectively.

Table 5: Effect of culture media on mycelia density and culture morphology of *Pleurotus tuberregium*

Media	Density	Morphology
PDA	+++	Wooly
BRA	++	Cottony
BBX	+++	Wooly/cottony
GSP	+++	Wooly
MKS	+++	Wooly
MUS	++++	Wooly

PDA- Potato dextrose agar, BRA - *Brachystegia nigerica* sawdust media, BBX- *Bombax buonopozense* sawdust media, GSP- *Greenwayodendron suaveolens* seed powder media, , MKS mixed known sawdust media and MUS- mixed unknown sawdust media, ++ = thin, +++ = dense, ++++ = very dense

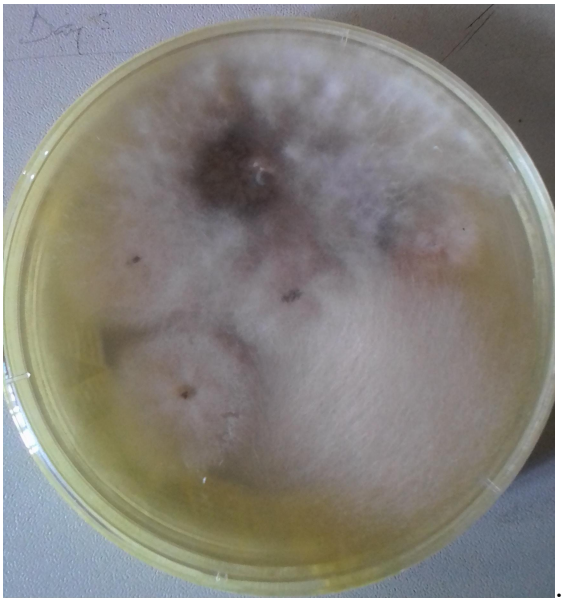

Plate 1: A pure culture plate of *Ganoderma lucidium*

Plate 2: A pure culture plate of *Pleurotus tuberregium*

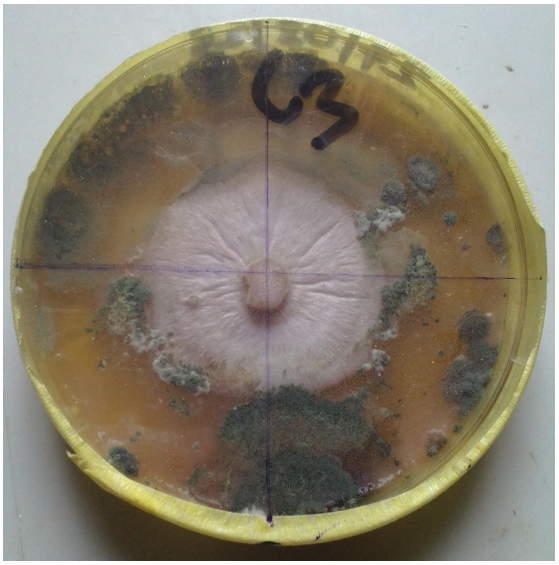

Plate 3: A culture of *Ganoderma lucidium* on *Greenwayodendron suaveolens* extract after 4 days of inoculation.

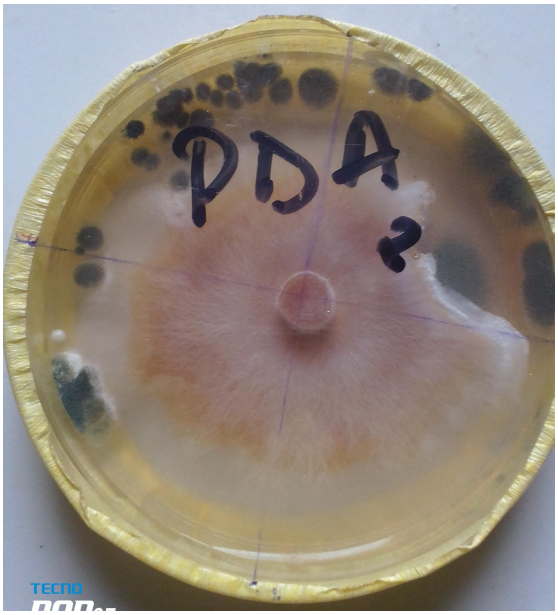

Plate 4: A colonized culture plate of *Ganoderma lucidium* growing on a PDA media

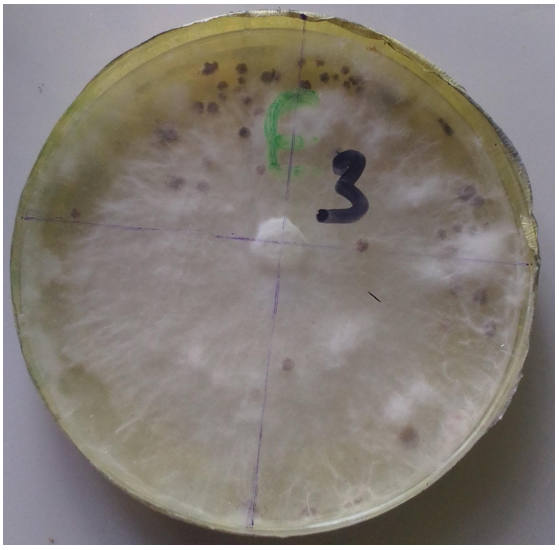

Plate 5: . A fully colonized mixed unknown culture media having a very wooly thick density.

CHAPTER FOUR

DISCUSSION

Substrate is one of the most important factors in mushroom cultivation as mushrooms depend on substrate for nutrition to support mycelia growth and development into mushroom fruiting bodies (Lakshmi and Sornaraj., 2014). In this study, it took an average of Six days for the mycelium of *Pleurotus tuberregium* to completely colonize the media tested while *Ganoderma lucidium* took longer days to attain complete mycelia colonization of the petri-dish plates. All the media supported the growth of both mushrooms. This indicates that media tested can be used to cultivate these mushrooms *in vitro* and fruit bodies production. This result compares favorably with the report by Ukoima *et al*., (2009) on the growth of *Volvariella volvacea, Pleurotus tuberregium* and *Pleurotus sajor-caju* on oil palm fiber, cassava peels, rice bran supernatants. It is further supported by the findings of Jenison (1948) and Kaul (1981) who obtained excellent mycelia growth when they incorporated legumes, meals of grain, extracts of banana, etc. into agar. A study carried out by Quimio (1981) reported accelerated mycelia growth of *Auricularia* spp when malt and rice bran extracts were incorporated into agar. The reason for this accelerated growth of the mycelia on waste extract media is suspected to be because of the presence of certain substances that induces faster growth of the fungus. *Pleurotus tuberregium's* ability to completely colonize the plate within a short time could be attributed to the presence of enzymes that were able to utilize the media for food. This in line with the reports of Farnet *et al.,* (2002) that *Pleurotus* species produce a number of phenoloxidases, such as laccases, important in ligninolysis and a number of eco-friendly technologies such as bleaching of paper pulp, bioremediation, or detoxification of toxic xenobiotics in effluent. For *Ganoderma lucidium,* Temperature is an important factor that determines the mycelial growth of this fungus. The

results of this study indicated that growth of *Ganoderma lucidum* was temperature dependent. For the optimum growth of most of the mushrooms, the higher temperature favours mycelial invasion whereas fruiting body forms at relatively lower temperature (Dawit, 1998, Oei, 2003).

In this study, it has been shown that the ability for *Ganoderma lucidium* and *Pleurotus tuberregium* to grow on the various media is an indication that the fungi can be cultivated using a wide range of media sources. Sourcing for growth media for the cultivation of these mushrooms, other edible and medicinal mushrooms would not pose a challenge to commercial production.

CONCLUSION

This study shows or demonstrated that PDA, *Brachystegia nigerica* sawdust, *Bombax buonopozense* sawdust, *Greenwayodendron suaveolens* seed powder, Mixed known sawdust and Mixed Unknown sawdust can be sustainably used to cultivate mushrooms. The study has also shown that local material tested can be used to cultivate mushrooms when synthetic media are not available. There is the need to further test for the substrate materials for the production of spawn and fruit bodies of these mushrooms for mass production.

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