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Cultivation of Mushroom (*Volvariella volvacea*) on Various Farm Wastes in Obubra Local Government of Cross River State, Nigeria

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Abstract: A study on the cultivation of *Volvariella volvacea* mushroom (Basidiomycetes), a Non-Timber Forest Product (NTFP) on different wastes (palm fibers, rice husk and saw dust) was conducted at CRUTECH, Obubra Campus, Cross River State, Nigeria. The aim was to investigate the influence of selected farm wastes on the growth of *V. volvacea*, so as to organically utilize these farm wastes and minimize the environmental nuisance caused by their burning (incineration). The highest yield of 345 g was recorded from palm fiber, followed by 231 g from rice husk and 146 g from sawdust. Palm fiber is considered the most suitable farm waste for growing *V. volvacea*. The chemical properties of the various substrates combined to influence the chemical endowment and growth of *V. volvacea*.

Key words: *V. volvacea*, farm wastes, substrates, environment

INTRODUCTION

Volvariella volvacea (Bull ex. fr.) Singer, an edible basidiomycete, occurs in both tropical and subtropical regions of the world. According to Zoberi (1972), the species grows naturally on dead leaves, dead wood, animal droppings, on trees and waste stumps. Grube *et al.* (2001) reported that mushrooms are believed to have properties that could produce supper human strength, help in finding lost object and lead the soul to the realm of the gods. The Romans ate mushrooms on special occasions. According to Lebo (2004), in Ohafia, Abia State, Nigeria, Mushrooms are eaten as snacks during their festivals. Craig *et al.* (1981); Hammond and Wood (1985) also reported that fruit body development in basidiomycetes is primarily due to osmotically driven cell elongation. However, most farm wastes contain cellulose residues. Fasidi (1993) and Kadiri (2005) reported that most materials with cellulose residues have been found to stimulate the growth of wood rotting fungi. These fungi are capable of degrading cellulose materials and ultimately oxidize lignin content of the materials. In essence, enzymes from basidiomycetous fungi particularly those carbohydrases involved in lignocelluloses degradation acts as pre-treatment agents to break down the cellulose to simpler molecules which Ginterova and Maxianova (1975); Wood and Leathurn (1983) confirmed that all wood rotting fungi are capable of degrading cellulose materials. Many species are also potentially useful and valuable bioactive metabolites that render them toxic, hallucinogenic or even bioluminescent. Stamets and Jeft (1983) also noted the potentials of mushrooms in organic waste management. Stamets (1994) an early

advocate of integrating a variety of mushrooms into a permaculture system noted that shaggy manes (*Coprinus comatus*) do well on manure soils and compost heaps. The King *Stropharia* or wine cap mushroom grows best outdoors and plays a key role as a recycler of wood debris. Economically, mushrooms are cultivated for export and local consumption. Ugandan mushroom growers for instance are currently selling 44 tones per year to Japan, 40 tones to U.S.A and 2 tones to the Democratic Republic of Congo (Spore, 2006). Mushrooms are income generating and in most cases fast return on investment is possible. Nutritionally, there are obvious reasons to include mushrooms in our diets. According to Bano and Rajarathnam (1983). Mushrooms are low in calories, lack cholesterol and virtually do not contain fat and sodium. Selenium and Niacin (essential minerals) that play important role in the immune system, the thyroid system and the male reproductive system and in cancer prevention are sufficiently contained in mushrooms (Hobbs, 1995). Thus, *V. volvacea* have cultural, economic and nutritional values.

Zoberi (1973) reported that many edible mushrooms existing in Nigeria are being collected from the wild. Deforestation or removal of the forests habitat in which several mushrooms thrive has gradually led to near extinction of this valuable non-timber forest resource. Improper identification of edible mushrooms has led to cases of mushroom poisoning, ailment and death. The growing of mushroom in Nigeria is still in its infancy and not encouraged, this ensures irregular and seasonal supply. To ensure regular availability and safety of mushroom species consumed and to encourage

Table 1: Fruitification of *V. voluacea* on substrates

Treatments and substrates composition*	A	B	C	D
1st Flush				
Primodia formation after inoculation (days)	30	25	33	36
Fruit body Formation from Primodia to maturity (days)	3	3	4	-
Spores discharge after inoculation (days)	34	37	35	-
No. of healthy fruitbodies formed	37	22	16	-
2nd Flush				
Primodia formation after inoculation (days)	42	47	45	-
Fruit body Formation from Primodia to maturity (days)	3	4	3	-
Spores discharge after inoculation (days)	46	47	51	-
No. of healthy fruitbodies formed	18	13	11	-
Total				
Total No. Of fruit bodies formed	55	35	27	-
Weight of fruit bodies formed	345	231	146	-

*A = palm fiber 78%, B = rice husk (78%), rice bran (20%), CaCO₃ (1%), sugar (1%). C = sawdust (78%), rice bran (20%), CaCO₃ (1%), sugar (1%). D = garden soil (78%), rice bran (20%), CaCO₃ (1%), sugar (1%).

efficient management of farm wastes for environmental safety, the cultivation of *V. voluacea* using different farm wastes is the objective of this study.

MATERIALS AND METHODS

To investigate the growth performance of *V. voluacea* on farm wastes, discarded palm fibers, rice husk and saw dust were collected from their various mills in Obubra Local government of Cross River State, Nigeria. Fifty kilograms (50 kg) each of the selected farm wastes were weighed and composted for 30-41 days using urea (1%) and lime (1%). At the end of the composting, 20% rice bran, 1% CaCO₃ and 1% sugar were added to 78% each of palm fiber (A), rice husk (B), saw dust (A) and garden soil (D) (control). The compost heaps (0.5 m³) were turned every three days. The composted materials were then filled into plastic bags (35x25 cm). Using a drum (85x55 cm), the substrates were pasteurized at 60-62°C for 3 h alternately for three days (Tyndalization process). The materials were allowed to cool overnight. Using wire loop, about 5 g of *V. voluacea* mycelium were inoculated into the bags and were tied with rubber bands, 3 cm PVC pipe and blocked with cotton wool. The bags were exposed after primodia (pinhead) formation (35 days) and subsequent fruit bodies' development. Pileus diameter, stipe height and yield (weight) data were collected for analysis. Table and bar diagram were used to present data.

RESULTS AND DISCUSSION

The result on the growth performance of *V. voluacea* on different farm wastes is presented on Table 1. The result reveals that all the substrates used in the study except the control supported the development of *V. voluacea* fruit bodies. The control substrate (garden soil) formed primodia (pinheads) but could not stimulate growth. Palm fiber, rice husk and sawdust wastes had mean pileus diameter growth of 3, 4 and 3 cm respectively, mean stipe height growth of 4, 2.5 and 1.5 cm respectively (Fig. 1) with corresponding fruiting bodies yield of 345, 231 and 146 g respectively (Table 1).

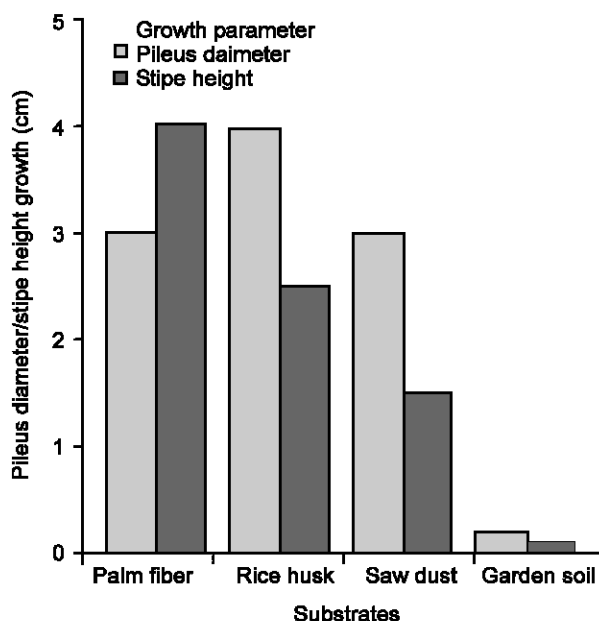


Fig. 1: Growth performance of *V. voluacea* on different farm wastes (substrates)

These substrates, as reported by Stamets (2001), contain essential macro elements for crop production (potassium, calcium, phosphorous, magnesium, nitrogen and sodium). Generally these essential nutrients combined in various substrates to stimulate fruit body formation and development of *V. voluacea*. These results compare favorably with the findings of Fasidi and Kadiri (1993) and Kadiri (2005) who obtained fruit bodies of *Lentinus edodes* and *L.subnudus* from sawdust, cotton wastes and corn cobs which are all farm wastes. Palm fiber wastes significantly influenced the growth and yield of *V. voluacea* fruiting bodies. Therefore, any attempt to produce *V. voluacea* at subsistence or commercial level can consider palm fiber wastes as substrates.

Conclusion: The chemical prosperities of the various substrates influenced the chemical endowments and growth of *V. volvacea*. Palm fiber wastes appear to have greater influence on the growth of this species. The observed differences in the substrates yield may be due to the percentages make-up or content of cellulose materials and essential nutrients. Using farm wastes as appropriate in cultivating edible mushroom (*V. volvacea*), a Non-Timber Forest Product (NTFP) is a major option or alternative to the incineration of these wastes, in order to ensure a safe and healthy environment. However, it is recommended that the use of palm fiber wastes be encouraged in *V. volvacea* cultivation. Mushroom growing should be integrated into our farming system. Adequate and regular consumption of *V. volvacea* is highly recommended due to its food value.

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