

Short Communication

King tuber mushroom: Bioconversion of fluted pumpkin, sawdust and paper

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Received 8 November, 2013; Accepted 27 March, 2014

***Pleurotus tuber-regium* (Rumph. Ex Fr.) Singer (King tuber mushroom) was cultivated on sawdust; mixture of sawdust and waste paper and mixture of *Telfairia occidentalis* Hook.F. (Fluted pumpkin) stem and waste paper in order to examine growth of the mushroom on the test substrates. The spawn of the mushroom was used to inoculate the substrates. Mycelia ramification and sclerotia production were monitored on the substrates during the research. The sclerotia produced were analyzed for protein and crude fiber content. Mycelia ramification for paper mixed with fluted pumpkin stem treatment was significantly different from sawdust and sawdust mixed with paper at $P=0.05$. Fluted pumpkin stem and waste paper could serve as substrates for cultivation of *P. tuber-regium*.**

Key words: Fluted pumpkin stem, *Pleurotus tuber-regium*, sclerotia, waste paper.

INTRODUCTION

Pleurotus tuber-regium is found in both tropical and subtropical regions of the world (Isikhuemhen and Lebauer, 2004). It is a high valuable mushroom and researchers have reported its uses in various ways such as culinary (Chiejina and Olufokunbi, 2010), nutritional (Fasidi and Kadiri, 1993), medicinal (Oso, 1977) and nutraceutical (Afieroho et al., 2013). This fungus is also useful in solving environmental problems for remediation of polluted sites (Adedokun and Ataga, 2007; Adenipekun and Fasidi, 2005)

Cultivation of *P. tuber regium* requires a suitable substrate. A common substrate that has been in use by researchers is sawdust (Adedokun et al., 2003;

Isikhuemhen and Lebauer 2004; Chiejina and Olufokunbi, 2010). However, wood dust may have a long term hazardous effect on health (Meier, 2013). In Nigeria, information transfer is majorly paper based although a few organizations are recently going paperless. After information extraction, papers which are found as litter all over are often gathered and burnt off. This contributes to air pollution. Likewise, remains of *Telfairia occidentalis*, though a useful vegetable could be a nuisance to the environment after removal of the edible tender shoot. *P. tuber-regium* has a wide substrate range therefore growing the mushroom on the above mentioned substrates, could both assist in solving afore mentioned

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Table 1. Growth performance of *P. tuber-regium* on different treatments.

Treatment	Mycelia initiation (day)	Full mycelia run (day)	Sclerotia harvest (day)	Number of Sclerotia	Sclerotia fresh weight(g)
Sawdust	3.50 ^a	42.00 ^{ac}	117.00 ^a	1.00 ^a	4.25 ^a
Sawdust and paper	4.00 ^a	43.00 ^a	87.80 ^a	1.00 ^a	4.25 ^a
Paper and pumpkin	4.75 ^a	29.00 ^b	104.00 ^a	1.00 ^a	9.50 ^a
LSD	1.9	11.8	81.0	0.7	5.3

Mean with the same value are not significantly different, while different values are significantly different at $P=0.05$. LSD: Least significant difference between two means.

Table 2. Protein, moisture and crude fiber of harvested sclerotia on different treatments.

Sample	Protein (%)	Crude fiber (%)	Moisture (%)
Sawdust	10.063	9.639	57.778
Sawdust and Paper	8.75	38.02	41.270
Paper and Pumpkin	9.19	32.219	45.345

environmental issues as well as increasing the substrate range in the mushroom industry. To this end, the focus of this paper was to examine the mycelia run and sclerotia production as well as determine the nutritional content of sclerotia of *P. tuber-regium* grown on these test substrates.

MATERIALS AND METHODS

Source of samples and study sites

The research was conducted at the Faculty of Agriculture mushroom farm in the University of Port Harcourt, Nigeria.

Sawdust was obtained from a close-by sawmill (Rumuosi), fluted pumpkin stem was obtained from a close-by market (Choba), while mushroom spawns established on waste cotton were from Bezaleel mushroom farm in Port Harcourt. Waste papers were gathered from the University of Port Harcourt environment.

Samples preparation

Samples were prepared according to the modified method of Stamets (2000). Sawdust (S) was composted for two weeks. 200 g of sawdust was measured into transparent bottles of dimension 7.5 x 17 x 7.5 cm. The content was sterilized at 121°C for 15 min and after cooling, it was inoculated with 2.5% spawn of the mushroom. This procedure was repeated for sawdust plus paper, (SP) (four sheets of used quarto sized paper, shredded into pieces, were added to 200 g sawdust) and paper plus pumpkin stem (PSP) where four sheets of paper was added to 100 g pumpkin stem. The samples were incubated at room temperature, 28±2°C. Three replicates were prepared. The substrate bottles were observed for mycelia initiation. Mycelia run down the bottles were by visual observation. The first treatment to complete the run was recorded. Sclerotia formed on each substrate were harvested by hand. Number of sclerotia was recorded and proximate analysis conducted for each treatment.

Determination of nutritional contents

Protein and crude fiber were analyzed using the standard procedure of AOAC (2002). Data was subjected to analysis of variance (ANOVA).

RESULTS

The mycelia of *P. tuber-regium* ramified well on sawdust, sawdust/paper mixture (SP) and fluted pumpkin stem/paper mixture (PSP). Sclerotia were also observed on the three substrates (Table 1). Mycelia run was fastest in the treatment with PSP (29 days) and significantly different at $p=0.05$ from other substrates 42 and 43 days for sawdust and SP, respectively. It was also observed that the sclerotia of the treatment with PSP were weightier than those of the two other substrates. Table 2 shows result for percentage protein, crude fiber and moisture contents of sclerotia harvested on the three substrates; the sclerotia are high in each of the parameters measured with PSP were comparable to sawdust which is widely used for cultivation.

DISCUSSION

The use of sawdust for mushroom cultivation is well documented by researchers (Onuoha et al., 2009; Okhuoya and Okogbo, 1990) among others. This study confirms earlier report of the use of sawdust as mushroom substrate primarily because of its abundance and availability. Few researchers have also reported the use of waste paper as substrate for mushroom cultivation both as bulk substrate and alternative for casing soil

(Baysal et al., 2003; Sassine et al., 2005). In this study, results of SP and PSP are quite interesting for mycelia run, sclerotia formation and nutritional contents. However, report on the use of fluted pumpkin stem in mushroom cultivation is limited. The use of fluted pumpkin stem for mushroom cultivation in this study is novel and observation revealed that fluted pumpkin stem could serve well as a substrate for mushroom cultivation. When compared with other substrates, mycelia ramification was significantly different and fastest for this treatment. This is probably due to the high fiber content. Furthermore, sclerotia are weightier when compared with other substrates. This may be due to the nutritional content of fluted pumpkin stem. Akanbi et al. (2007) stated the nutritional importance of fluted pumpkin as being rich in protein (29%), fat (18%) and minerals and vitamins (20%). The use of fluted pumpkin stem as a substrate for mushroom cultivation should be encouraged in view of the observation made in this study especially considering the abundance and availability of the substrate. A number of researchers (Onyango et al., 2011; Chitamba et al., 2012; Ukoima et al., 2009) have reported the advantages of using agricultural wastes as growing substrates.

Analysis of sclerotia of mushroom for protein, crude fiber and moisture content are noteworthy. It showed that the three treatments are relatively high in the parameter analyzed. This remark tallies with observation made by Oso (1977) and Mshandete and Cuff (2007). Result of fiber content is equally exiting as fiber helps to facilitate digestion in man.

Conflict of Interests

The author(s) have not declared any conflict of interests.

Conclusion

This study shows that fluted pumpkin stem and waste paper are potential substrates in mushroom cultivation. Further research is however suggested to investigate other nutritional parameters.

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