www.Advancejournals.org

Year: 2014; Volume: 1; Issue: 1
Article ID: PAR14 03; Pages: 1-5

Journal of Plant & Agriculture Research

Research Article

Growth and Nutritional Properties of Pleurotus sajor-caju Cultivated on Sawdust of an Exotic and Indigenous Tree Species

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Received 22 July 2014; Accepted 17 September 2014; Published 21 October 2014

Abstract

Pleurotus Sajor-caju was cultivated on the sawdust of Ceiba pentandra and Gmelina arborea with the aim of comparing the nutritional values of the mushrooms cultivated. The sawdust substrates were inoculated with mushroom spawn and the analysis of the nutritional value was carried out using the AOAC 2005 method . The result showed that the pleurotus Sajor-caju grown on the sawdust substrates of Ceiba pentandra has 23.36% protein, 70.42% fat, 3.58% crude fibre, 9.12% nitrogen, 57.02% moisture content, 59.99% organic matter and 29.98% nitrogen. While the mushroom grown on Gmelina arborea has 23.43% protein, 65.06%fat, 2.73% crude fiber, 9.15% nitrogen, 67.76% moisture content, 65.84% organic matter and 24.13% nitrogen. The result indicated that there was no significant difference in the nutritional values of Pleurotus Sajor-caju grown on the sawdust from the selected species. Also, ceiba pentandra supports the growth of pleurotus Sajor-caju more than Gmelina arborea when the total number of days it took both substrates to ramified and emerge spores.

Key word: Pleurotus Sajor-caju, Ceiba pentandra, Gmelina arborea, spawn

Introduction

Mushrooms are fruit bodies of macroscopic, filamentous and epigeal fungi and they are made up of hyphae which forms interwoven web of tissues known as mycelium in the substrate upon which the fungus feeds [1]. Mushrooms have been known internationally even before most collectors had knowledge about their biology. They grow luxuriantly in most part of the world on different substrates. Most often, their mycelia are buried in the soil around the root of trees, beneath leaf in the tissue of a tree trunk, on a fallen log of wood or in other nourishing substrates [2].

Most edible mushrooms belong to ascomycotina and basidiomycotina. Some mushrooms, such as truffles and morels are Ascomycete, but most of the others are Basidiomycetes [3]. So far about 25 species of more than 2000 edible fungi are widely accepted for human consumption, but only few of them are commercial with technical advances [2]. Edible mushrooms have been widely utilized as human foods for centuries and has been appreciated for their texture and flavour as well as some medicinal and tonic attributes [4]. However, the awareness of mushrooms as a healthy food and as an important source of biological active substances with medicinal value has only recent emerged [5]. Mushrooms are considered as healthy food because they are low in calories and fat but rich in proteins and dietary fibers [6]. Many genera of mushrooms are edible and are rich in essential nutrients such as carbohydrate, proteins, vitamins, mineral, fat, fibers and various amino acids [7,8]. Most people eat mushrooms, mostly because of its flavour, meaty taste and medicinal value [9]. It must however be emphasized that some mushroom are poisonous and may claim lives within few hours of consumption.

The materials on which mushrooms are grown are known as substrate. Although some species are very picky, others (like the oyster mushroom) can be grown on almost anything that started life as a plant. Mycelia can be expanded onto a mixed wood substrate made up of different sizes of chips and sawdust. The fungus will quickly colonize the smallest sawdust grains, while the larger chips provide for air flow and allow the fungus to form rhizomorphs that lead to big mushrooms. The objective of this research is to evaluate the growth rate, yield and nutritional values of pleurotus Sajor-caju cultivated on the sawdust of Gmelina arborea and Ceiba pentandra.

Materials and methods

Study area

The mushroom seed was produced at the Forestry Research Institute of Nigeria (FRIN). The institute lies between latitude 70 26'N and longitude 3034'E of Ibadan, Oyo State. The climate of Ibadan is tropical and characterized by two seasons every year (wet and dry seasons). The rainy (wet season) starts from late march and ends in October/November. While the dry season starts from November and ends in March. The peak of rainfall is usually in the month of September. The annual rainfall from January to December is 1322.3mm ; the total number of rainy days is approximately 120. The mean maximum temperature is 22.4oC , the mean, minimum and maximum annual relative humidity are 54% and 97% respectively. The laboratory work was carried out in the Department of Forestry and Wood Technology laboratory as well as in Animal Production and Health Laboratory, both in Federal University of Technology Akure, Ondo State, Nigeria. Akure is located on the latitude 7o17'N and longitude5010'E in the tropical rain forest zone of south western Nigeria with annual mean temperature of 25oC (minimum; 19oC and maximum 340C) and elevation 350 m above sea level with gently undulating slope. The relative humidity is between 85-100% during rainy season and less than 60% during dry season.

Materials

The materials that were used for this project are divided into two, the ones that were used for cultivation and those that were used for the analysis in the laboratory. The materials for cultivation included: the substrates (i.e. sawdust of exotic and indigenous species), wheat bran, lime, incubator, water, alcohol (methylated spirit), cotton wool, auto-clave, black and white polythene sheet, nylon bag, clean basins, ruler, measuring cylinders, inoculating stick, spirit lamp, rubber band, mushroom house and weighing balance. The materials used for the analysis in the laboratory include: oven, micro-kjeldahl apparatus, soxhlet apparatus, muffle furnace, test tubes, mortar and pestle, filter paper and electric weighing balance.

Substrate Preparation

3 kg of Ceiba pentrandra and Gmelina arborea were separately measured in a bowl while 20% of wheat brawn and 1% lime were added to the substrates. Water was added as the substrate and mixed thoroughly until they became moist after which 400g was measured, packed and tied with rubber

band firmly to disallow the passage of air into the nylon.

Pasteurization

The bagged substrates were arranged in a drum and heat source from firewood was introduced steadily for four hours; this was done to destroy any form of contaminant that may be present in substrate.

Inoculation of Substrate

After pasteurization, the substrates were packed into a basin to cool in the laboratory, after which the spawn was introduced in a process called inoculation. During this process, the laboratory slab was sterilized with methylated spirit and cotton wool and the spirit lamp was lightened up before the substrates were opened. The substrates were later transferred to the mushroom house and covered with a black polythene sheet. The substrates were left in the mushroom house till ramification process ended. After ramification, the nylon was split open to allow the emergence of spore and the fruiting body was harvested after two to three days.

Duration of the Experiment

The substrates were left in the mushroom house. The substrate from Ceiba pentandra started ramifying on the 11th day after the inoculation while the substrate from Gmelina arborea started ramifying on the 15th day after inoculation. The nylon was opened after this process and watered regularly to enhance spore emergence. The growth of the fruiting body was monitored daily and the sprouting date and fresh weight of the fruiting body were taken.

Method of Data Collection

The experiment was closely monitored and the following data were collected carefully: the number of days for ramification, the date of spore emergence and the average wet weight of the mushroom harvested from each substrate. The mushroom was later oven-dried to a constant weight at 1050c. The dried mushroom was eventually used for nutritional analysis according to [10]. The nutrients that were determined were: moisture content, ash, crude protein, fat, crude fiber, nitrogen and organic matter.

Data Analysis

Data obtained in this study were analysed using analysis of variance and descriptive statistics with the aid of statistical package for social sciences (SPSS) and Microsoft excel.

Result and Discussion

Growth Rate of the Cultivated Mushrooms

The rate at which each sawdust substrate supports the growth of Pleurotus sajor-caju is represented in figure1 below;

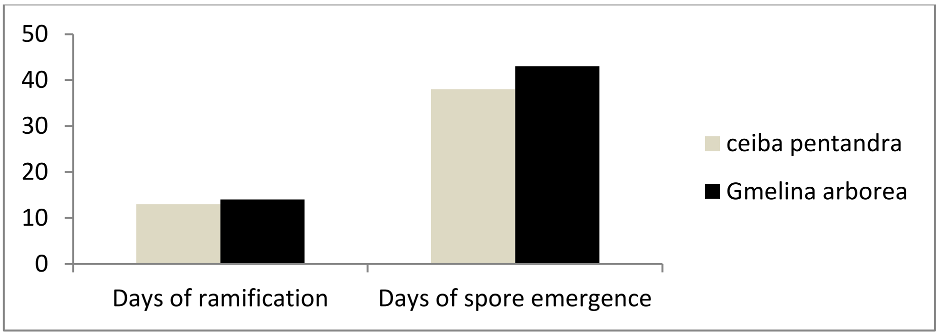

Figure 1: A graph representing the rate at which the two substrates used support the growth of pleurotus Sajor-cajo

Figure 1 indicates that the number of days for ramification in the substrates from Ceiba pentandra is less compared with the one from the substrates of Gmelina arboSrea. It took an average 43 days for the spore to emerge on the substrate from Gmelina arborea sawdust while it took 38 days on the substrates of Ceiba pentandra.

Nutritional Values of the Cultivated Mushroom

The summary of the results of the nutritional values (i.e. protein, fat, fiber, nitrogen, moisture, ash and organic matter content) of the mushroom grown separately on Ceiba pentandra and Gmelina arborea sawdust substrates is shown on Table 1. The result revealed that the protein content of Pleurotus Sajo-caju is 23.36% in Ceiba pentandra, and 23.43% in Gmelina arborea; the fat content is 70.42% in Ceiba pentandra and 65.06 % in Gmelina arborea sawdust substrates. Other results are: fiber content:3.58% and 2.73% for mushrooms grown on Ceiba pentandra and Gmelina arborea sawdust substrate, respectively; nitrogen content 9.12% and 9.15% for mushroom cultivated on Ceiba pentandra and Gmelina arborea sawdust substrate, respectively.

Table1. The nutrition values of fruiting body of Pleurotus sajor- caju grown on sawdust from different species

	Sawdust of different species	
Proximate (%)	*Gmelina arborea*	*Ceiba pentandra*
Protein	23.43	23.36
Fat	65.06	70.42
Fibre	2.73	3.58
Nitrogen	9.15	9.12
Moisture content	67.76	57.02
Organic matter	65.84	59.99
Ash	24.13	29.98

The result also revealed that the moisture content of the mushroom cultivated on Ceiba pentandra sawdust substrate was 57.02% while it was 67.76% in the mushroom cultivated on Gmelina arborea sawdust substrates; the organic matter of the mushroom cultivated on Ceiba pentandra sawdust substrate was 59.99% and for the mushroom cultivated on Gmelina arborea sawdust substrates, it was 65.84%. The ash content Sajo-cajuwas 29.98% and 24.13% for Pleurotus Sajo-caju cultivated on Ceiba pentandra and Gmelina arborea sawdust substrates, respectively. From the summary of the result, it was revealed that the fat contents and fiber contents of the mushroom from both sawdust substrates were high. Generally, there were no large differences in the nutritional values of the edible mushroom grown on both substrates. However, the organic matter and moisture content was higher in the mushroom from Gmelina arborea sawdust substrate than that from Ceiba pentandra sawdust substrate . This corresponds to [11] that the moisture contents of some of the mushrooms analyzed are high, indicating that mushrooms are highly perishable.

Conclusion

In conclusion, ceiba pentandra sawdust supports the growth of pleurotus Sajo-caju more than Gmelina arborea sawdust, which may result from the variation among the sawdust species as a result of their type: exotic or indigenous . Also, mushrooms contain the essential nutritional values for human diet. Although, its cultivation requires some technical skill for maximum output but if properly done, mushroom can be assessed both in season and off season. Based on this investigation, it can be concluded that there was no significant difference between the nutritional values (i.e. protein, fat, fiber, nitrogen, ash, moisture content and organic matter) of Pleurotus Sajo-caju grown on the sawdust substrate of Ceiba pentandra and Gmelina arborea.

References

1. Svrcek M: Mushrooms and Fungi. Hamlyn Publishing Group, London 1983

2. Ingold CT: The biology of Fungi.6th revised edition. Chapman and Hall 1993, pp. 197-206.

3. Chang, S.T.: Mushrooms and Mushroom Science. Mush.J.Tropics 1981, 1(3):2-4.

4. Manzi PA, Agguzzi A, Pizzoferrato L: Nutritional mushrooms widely consumed in Italy. Food Chem. 2001, 73: 321-325.

5. Cheung PCK: Plasma and hepatic cholesterol levels and feacal neutral sterol excretion are altered in hamsters fed straw mushroom diet. J. Nutr. 1998, 128: 1512-1516

6. Manzi I, Gambelli L, Mariconi S, Vivanti V and L Pizzoferrato: Nutrients in edible mushrooms:an interspecies comparative study. Food Chem. 1999; 65:477-482

7. Fukushima M: LDL receptor mRNA in rats is increased by dietary mushroom (Agarics bisporus) fibre and sugar beef fibre. J. Nutr. 2000, 130: 2151-2156.

8. Okwulehie IC, Odunze EI: Evaluation of the nutritional value of some tropical edible mushrooms. J. sustain. Agric. Environ. 2004., 6(2):157-162.

9. Moore D, Chiu SW: Fungal products as Food", eds. Pointing, S.B. and Hyde, K.D. in Bio-exploitation of filamentous fungi. Fungal Diversity Research Series 2001, 6: 223-251.

10. AOAC, Official Methods of Analysis, 18th ed.; Association of Official Analytical Chemists: Washington, DC 2005.

11. Adejumo, T. O. and Awosanya, O. B.: Proximate and mineral composition of four edible mushroom species from South Western Nigeria. African Journal of Biotechnology 2005, 4 (10): 1084-1088