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Nutrient and antinutrient composition of *P*leurotus ostreatus grown on different substrates

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Nutrient and antinutrient composition of *Pleurotus ostreatus* grown on different substrates

Pleurotus ostreatus spawn

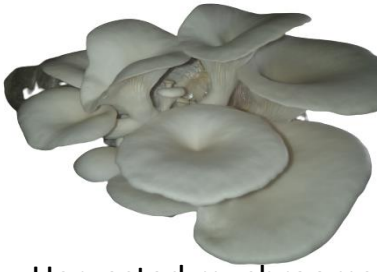
Substrates

Ramified substrate bag

Emergence of Primordial heads

P. Ostreatus grown on saw dust + rice bran (1:2)

P. Ostreatus grown on banana leaves



Harvested mushrooms

Nutritional Analysis
Protein
Ash
Vitamins B_1,B_2 and B_3
Vitamin D
Mineral composition
Calcium (Ca)
Iron (Fe)
Potassium (K)
Sodium (Na)
Antinutrient
Oxalate
Phytate
Tannins

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Abstract

The effect of the COVID-19 on meat supply chain has increased the need for alternative sources of high-quality, protein-rich foods to combat rising food insecurity and malnutrition. First cultivated for food in Germany during World War I, *Pleurotus ostreatus* (Oyster mushroom) is reported for its numerous nutritional and health-benefits. This study compared the nutrient and anti-nutrient composition of mushrooms grown on different substrates. A mixture of the substrates (rice bran + saw dust (Ms/r) (1:2) or ground banana leaves (Mb)) with water containing $CaCO_3$ were first sterilized for 15 minutes at 121^{o}C and 15 psi in heat-resistant, transparent polythene bags before aseptically inoculating with the stock culture (spawn). The bags were then transferred into the growth room (relative humidity 75-85%) 20 days post-inoculation after total colonization with fungi hyphae. Ms/r had significantly higher yield (1250g) as well as carbohydrate (14.16%), Na (79.35mg/100g), and Cl (121.86mg/100g) contents compared to Mb (250g, CHO (8.01%), Na (70.15mg/100g), and Cl (108.28mg/100g) respectively). On the other hand, protein (8.43%), K (574.48 mg/100g), vit B1 (0.1480mg/100g), and vit D (134.83IU) contents of Mb were significantly higher when compared to Ms/r (protein (2.75%), vit B1 (0.0750 mg/100g), and vit D (104.07IU)). The anti-nutrient analysis of the mushrooms revealed higher oxalate (78.93 mg/100g) and significantly lower phytate (42.41 mg/100g) contents in Ms/r when compared to oxalate (42.5) and phytate (59.88 mg/100g) contents of Mb. The result indicated that banana leaves may be a good substrate for nutritionally beneficial mushrooms.

Keywords: Food insecurity; Protein; Oyster mushroom; Nutrition

Introduction

- The negative effects of a constantly changing climate, and more recently, the negative impact of the COVID-19 pandemic on meat supply chain further highlights the urgent need for alternative sources of high-quality, protein-rich foods to combat rising food insecurity and malnutrition in many resource-poor settings.

- To combat the rising issues in food security and nutrition, especially, on the African continent, an efficient, economic, and technology-based approach is required.
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Introduction cont'd

- Recent advances in biotechnological processes take advantage of the adaptive characteristics of microorganisms to breakdown lignocellulosic agro-industrial wastes that would otherwise have constituted environmental nuisances.

- Coupled with their high nutritional quality, Oyster mushrooms (*Pleurotus ostreatus*) cultivation presents with the advantage of less growth requirement including growing on agricultural wastes, requiring less space and water compared to other crops as well as their short growth time.

Introduction cont'd

- The nutritional composition of mushrooms depends largely on the type and nutrient composition of the substrate.
- This is as a result of the variation in nutritional value of oyster mushrooms when cultivated on different substrates such as cotton seed hulls, perilla stalks, rice and wheat bran, etc.
- This study therefore, investigated the nutrient and anti-nutrient composition of mushrooms grown on different substrates.

RESULT

Table 1: Yield and biological efficiency

Mushroom Sample	Yield (g)	Biological efficiency (%)
Ms/r	1250.00	50
Mb	250.00	10

RESULT

Table 2: Proximate composition of Ms/r and Mb

Parameters (%)	Carbohydrate	Protein	Fat	Moisture	Fiber	Ash
Ms/r	14.16 ± 0.23^{b}	2.75 ± 0.29^{C}	2.96 ± 0.06^{W}	72.22 ± 0.09^{a}	4.93 ± 0.08^{K}	3.00 ± 0.04^{M}
Mb	8.01 ± 0.02^{a}	8.43 ± 0.23^{D}	2.87 ± 0.02^{W}	73.98 ± 0.19^{b}	4.61 ± 0.08^{K}	2.12 ± 0.16^{N}

Data represent means ± standard deviations (n = 3); values marked by the same letter within the same column are not significantly different ($p < 0.05$). Ms/r= mushroom grown on saw dust and rice bran (1:2), Mb = mushroom grown on banana leaves.

RESULT

Table 3: Mineral contents of Ms/r and Mb

Mineral (mg/100g)	Ca	Fe	Na	K	Zn	Cl
Ms/r	47.00±9.52^{a}	1.67±0.26^{a}	79.35±1.63^{b}	459.42±1.37^{a}	0.29±0.04^{a}	121.86±1.64^{b}
Mb	53.04±2.35^{a}	1.61±0.04^{a}	70.15±1.63^{a}	574.48±0.74^{b}	0.32±0.00^{a}	108.28±2.51^{a}

Data represent means ± standard deviations (n = 3); values marked by the same letter within the same column are not significantly different ($p < 0.05$). Ms/r= mushroom grown on saw dust and rice bran (1:2), Mb = mushroom grown on banana leaves.

RESULT

Table 4: Vitamin content of Ms/r and Mb

Vitamin (mg/100g)	Ms/r	Mb
Vit.B1	0.0750 ± 0.0200^{a}	0.1480 ± 0.0042^{b}
Vit. B2	0.1855 ± 0.0007^{w}	0.2355 ± 0.0404^{w}
Vit. B3	0.1450 ± 0.0212^{x}	0.3900 ± 0.1131^{x}
Vit D (IU)	104.07 ± 22.96^{m}	134.83 ± 25.22^{n}

Data represent means ± standard deviations (n = 3); values marked by the same letter within the same row are not significantly different ($p < 0.05$). Ms/r= mushroom grown on saw dust and rice bran (1:2), Mb = mushroom grown on banana lea

RESULT

Table 5: The anti-nutrient content of Ms/r and Mb

Anti-nutrient (mg/100g)	Ms/r	Mb
Phytate	42.41 ± 3.53^{a}	59.88 ± 0.01^{b}
Oxalate	78.93 ± 1.52^{q}	42.5 ± 3.54^{r}
Tannins	198.04 ± 3.16^{g}	203.32 ± 4.43^{g}
Hemagglutinin	NIL	NIL

Data represent means ± standard deviations (n = 3); values marked by the same letter within the same row are not significantly different ($p < 0.05$). Ms/r= mushroom grown on saw dust and rice bran (1:2), Mb = mushroom grown on banana le

Conclusions

This investigation has demonstrated that *Pleurotus ostreatus* is a good source of nutritional factors, especially proteins, however, cultivation of the macro-fungi on banana leaves yields mushrooms with higher protein content.

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