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Variability of Nutrient Content of Oyster Mushroom (*Pleurotus florida*) Grown on Different Substrates

P Harikrishna, R Lakshmipathy and R Subhash Reddy
Department of Agriculture Microbiology and bio-energy, College of Agriculture, Rajendranagar, Hyderabad-500030

ABSTRACT

An experiment was conducted to study the variability in nutrient content of mushrooms when cultivated on maize and sorghum straw. The experiment was under taken with three substrates *viz.,* – paddy, maize and sorghum straw. Oyster mushrooms were cultivated with the following substrate combinations *i.e* 100% maize straw,100% sorghum straw,100% paddy straw, 50% maize straw + 50% paddy straw, 50% sorghum straw + 50% paddy straw, 50% maize straw + 50% sorghum straw with three replications. Proteins, total sugars and ash content were more in the mushrooms cultivated using 100% maize straw, amino acid content was more in the mushrooms harvested from 50% sorghum straw + 50% paddy straw, phenolic content were more in the mushrooms harvested from 100% sorghum straw and crude fibre content was more in the mushrooms harvested from 100% paddy straw. This study showed variability of nutrients in oyster mushrooms when cultivated on different substrates.

Key words : Maize straw, Nutrient contents, Oyster mushroom, Paddy straw, Sorghum straw.

Mushroom cultivation is a profitable agri-business and oyster mushroom is an edible mushroom having an excellent taste and flavour. It belongs to the class Hymenomycetes, subclass Holobasidiomycetidae and order Agaricales. Mushrooms are considered as efficient means for conversion of worthless agro wastes into valuable protein rich food. Edible mushrooms are regarded as the world's untapped resources of the nutritious and palatable food from nature.

Oyster mushroom derives its nutrition from cellulose, hemicelluloses and lignin which are abundantly available in cereal straws. Oyster mushrooms (*Pleurotus* spp.) in particular, are valuable mushrooms with good marketability and are relatively easy to grow. Identification of suitable substrate material, both biologically and economically, is critical for successful cultivation. *Pleurotus* can be easily grown in tropical climates by utilizing lingo-cellulosic crop residues (Santos *et al.,* 2000; Silveira *et al.,* 2006).

Maize is one of the food crop grown all over Andhra Pradesh. The maize stalks are rich source of cellulose (44%) and lignin (14.50%). Sorghum stalks are also rich in lignin and cellulose and can be utilized for mushroom cultivation instead of paddy straw. This study was conducted to know the variation in nutrient content of mushrooms when cultivated using maize and sorghum stalks over the regular practice of growing mushrooms on paddy straw.

MATERIAL AND METHODS

A mushroom production experiment was conducted in Post Harvest Technology Center, Agriculture College, Bapatla, to study the feasibility of enhancing the nutrient content of mushrooms when cultivated on maize and sorghum stalks for mushroom growing. Oyster mushroom cultivation was carried out as per the method prescribed by Desai (1982) with the substrate combinations of 100% maize straw,100% sorghum straw,100% paddy straw,50% maize straw + 50% paddy straw, 50% sorghum straw + 50% paddy straw and 50% maze straw + 50% sorghum straw with three replications.

Estimation of nutrient content in mushroom

Total protein content of mushroom was determined by Micro-kjeldahl method (Thimmaiah, 2009). Total amino acid content of mushroom was determined by Ninhydrin reagent method

colorimetrically (Thimmaiah, 2009). Total sugars content of mushroom was determined calorimetrically by Anthrone method (Thimmaiah, 2009) using following formula.

$$\text{Total Sugars (\%)} = \frac{\text{Sugar value from graph (mg)} \times \text{Total volme of extract (ml)}}{\text{Weight of sample (mg)} \times \text{Aliquot sample}} \times 100$$

Phenol content in the mushroom was determined by the modified Folin-Ciocalteu method (Wolfe *et al.*, 2003) by directly referring the standard graph .

Crude fibre content of mushroom was determined by a method described by Thimmaiah (2009) and using following formula.

$$\text{Percent of crude fibre content} = \frac{\text{Weight of treated sample(W2)- Dry weight of treated sample (W3)}}{\text{Weight of sample (W1)}} \times 100$$

Total ash content was estimated following the method described by (Raghuramulu *et al.,* 2003). One gram of sample was weighed accurately into a crucible. The crucible was heated first over a low flame till all the material was completely charred, followed by heating in Muffle furnace for about 6 h at 600^0C. It was cooled and weighed.

$$\text{Ash content \%} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

RESULTS AND DISCUSSION

Protein content in mushroom

Effect of different substrates on nutrient content of oyster mushrooms is presented in Table 1. Total protein content of oyster mushroom grown on different substrates varied between 22.75% and 26.83% and minimum was recorded from 100% paddy straw while maximum from 100% maize straw. The difference in protein content of mushroom on different substrates may be due to differences in lingo cellulosic and nutrient contents of the substrates. Quinn *et al.* (1989) reported that protein content of *P. sajor-caju* greatly differed when cultivated on different cereal straws and 41.26% was reported on rice straw while 29.00% on wheat straw.

The results of the present study are in agreement with the earlier investigations. Patil *et al*. (2010) in their study on bajra straw recorded a protein content of 23.40% in oyster mushroom which was similar to the present study. Shyam *et al.* (2010) recorded a protein content of *Pleurotus ostreatus* grown on different lignocellulosic wastes in the range of 20.33% to 24.66%. Chang *et al*. (2003) recorded a protein content of oyster mushrooms grown on paddy straw in the range of 26.6-37.2% and 14.06-22.15% was reported by Dunder *et al.* (2009) when *Pleurotus* spp. was grown on different substrates. Crude protein content of different *Pleurotus* spp. on different lignocellulosic wastes ranged between 15.70-29.40% (Mandeel *et al*., 2005)

Total Amino acids in mushroom

Total amino acid content of oyster mushrooms grown on different straws varied from 20.83 mg/g to 22.63 mg/g. It was more when grown on 50% sorghum straw + 50% paddy straw (22.63mg/g) and it was least in case of 100% sorghum straw (20.83mg/g). Results obtained are comparable to the results of Pornariya and Kanok-Orn (2009) with total amino acids of 21.11 and 20.12 mg/g respectively in *P. ostreatus* and *P. sajor-caju*. There are various factors like nature of the substrates, their combinations and other amendments to the substrates contributes to the variations in total amino acid content of the mushrooms. Tshnyangu (1996) reported that nutritional value of mushroom largely depends on the chemical composition of compost which causes variation in the amino acid content within the same species of mushroom.

Total Sugars in mushroom

Total sugars of oyster mushrooms grown with different substrates varied from 41.27% to 46.13%. Mushrooms grown on 50% maize stalk + 50% paddy straw contained more sugars and was found least with 100% paddy straw. The results of present investigation are comparable with study conducted by Mandeel *et al.* (2005), who noticed that total carbohydrates of different *Pleurotus sps.*

Table1. Nutrient content of oyster mushroom grown on different substrates.

Treatment	Protein content (%)	Total amino acids (mg/g)	Total sugars (%)	Total phenols (mg/g)	Crude fibre content (%)	Total ash content (%)
T_1	26.83 (31.19)	21.33	45.133 (42.206)	0.54	9.67 (18.11)	7.93 (16.35)
T_2	24.79 (29.86)	20.83	41.400 (40.047)	0.59	9.10 (17.56)	7.43 (15.82)
T_3	22.75 (28.49)	22.06	41.267 (39.970)	0.50	10.83 (19.22)	7.10 (15.45)
T_4	23.62 (29.08)	22.06	45.600 (42.475)	0.54	9.33 (17.79)	7.43 (15.82)
T_5	24.04 (29.36)	22.63	45.200 (42.245)	0.55	10.33 (18.75)	7.36 (15.74)
T6	25.96 (30.63)	22.50	44.667 (41.938)	0.58	9.70 (18.15)	7.80 (16.22)
SEm±	0.4063	0.572	1.198	0.11	0.244	0.12
CD (P=0.05)	1.25	1.763	3.69	0.03	0.752	0.35
CV (%)	2.87	4.525	4.94	3.38	4.534	2.79

Note: Values in the parenthesis are arcsine transformed

T_1 –100% maize stalk
T_2 –100% sorghum stalk
T_3 –100% paddy straw
T_4 –50% maize stalk + 50% paddy straw
T_5 –50% sorghum stalk + 50% paddy straw
T_6 –50% maze stalk + 50% sorghum stalk
The values in Parentheses are Arcsine transformed values

were in the range of 23.5-47.0% when they were grown on different lignocellulosic wastes. However, Vimala and Sudesh (2009), reported a total carbohydrates content of 52.34% and 50.52% on wheat and brassica straw respectively. But, slightly higher carbohydrate contents were recorded by Olufokunbi and Chiejina (2013), who reported the total sugars of *Pleurotus tuberregium* in the range of 59.03-65.41% when grown on different substrates.

Total phenolic content

Total phenolic content of oyster mushrooms grown with different substrates varied from 0.50mg/g (100% paddy straw) to 0.59mg/g (100% sorghum straw) and similar to earlier reports of Marcelo *et al*. (2012) who recorded phenolic content of *Pleurotus sajor-caju* with in the range of 0.56 to 2.05 mg/g when grown on different lingo cellulosic wastes. Tshnyangu (1996) reported that nutritional value of mushroom largely depends on chemical composition of the substrate resulting variation in the composition of same mushroom species.

Crude fibre in mushroom

Total crude fibre content of oyster mushrooms was significantly high when grown on 100% paddy straw (10.83%) and least when grown on 100% sorghum straw (9.10%) .

The variation in the crude fibre content among the mushrooms grown on different substrates in the present investigation was similar to the results of Vimala and Sudesh (2009), where crude fibre content varied between 11.59 to 11.78% when oyster mushroom was grown on wheat straw and

brassica straw. Similar results were also reported by Kurtzman (2005).

Total Ash content in mushroom

Total ash content of oyster mushrooms grown with different substrates varied between 7.10% to 7.93% and these values varied significantly among the treatments.

Oyster mushrooms grown on 50% maize straw + 50% sorghum straw (7.1%) contained lowest ash content and highest was recorded on 100% maize straw (7.93%).

Results of the present investigation are similar with the results of Vimala and Sudesh (2009), where ash content of oyster mushroom grown on wheat and brassica straw varied between 8.89 and 8.73%. While, lower ash content was recorded by Kutrzman (2005) in his study with *Pleurotus* sp. that ranged from 4.0 to 9.6%. However, 6.4 to 8.0% ash content was reported in *P.florida* (Ahmed *et al.,* 2009). Olufokunbi and Chiejina (2013) reported total ash content of *P. tuberregium* grown on different substrates in the range of 5.00-6.75%. The reasons for the variation in ash content could be the mushroom species, different substrates and probably also contributed by water used in the cultivation (Tshnyangu, 1996).

CONCLUSION

This study conclusively showed a variation in nutrient content of oyster mushroom when grown on different substrates and indicated that proteins, sugars and phenols can be enhanced by use of maize and sorghum straw. Also, this study showed the possibility of replacement of paddy straw with maize and sorghum straw for oyster mushroom cultivation.

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