

EFFECT OF SUBSTRATES ON NUTRIENT COMPOSITION OF OYSTER MUSHROOM (*PLEUROTUS SAJOR CAJU*)

Vimla Dunkwal and Sudesh Jood*

Department of Foods and Nutrition,
CCS Haryana Agricultural University, Hisar-125 004, India

ABSTRACT

In the present study oyster mushroom cultivated on two substrates like wheat straw and brassica straw was used for evaluating their nutrient compositions. Moisture content of both types of mushroom was 89.68 and 88.98% on fresh weight basis which differed non-significantly. Similarly, non-significant difference was also observed in crude fibre, crude fat, ash and energy contents, whereas significant difference was noticed in crude protein (25.30 and 26.99%) and total carbohydrates (52.34 and 50.52%). Both types of mushroom exhibited good amount of vitamins, amino acids and dietary fibre. The values were reported for thiamine (1.18 and 1.13 mg/100 g), riboflavin (3.89 and 3.52 mg/100 g), lysine 6.00 and 6.25 g/100 g protein) and methionine (1.80 and 1.75 mg mg/100 g) on dry matter basis of wheat and brassica straw grown mushroom, respectively. Total, soluble and insoluble dietary fibre varied between 15.60 and 13.73, 1.63 and 1.58 and 13.97 and 12.15 g/100 g, respectively. Brassica straw grown oyster mushroom exhibited significantly higher contents of protein, riboflavin, lysine and methionine whereas wheat straw grown mushroom contained significantly higher contents of thiamine and dietary fibre. The variations in nutrient composition of oyster mushroom are likely to be due to variation in substrate composition.

Key words : Oyster mushroom, Proximate composition, Vitamins, Amino acids, Dietary fibre.

INTRODUCTION

Mushrooms are edible fungi and assume considerable importance in human diet as they are rich in non-starchy carbohydrates, dietary fibre, minerals, vitamin B and are quite low in fat value. India, like most developing countries looks forward for solving its acute protein deficiency in the diet of its increasing population. This has led food scientists to seek new sources of protein. As bioconversion of lignocellulosic agro wastes through mushroom cultivation offers the potential of converting these wastes into protein rich quality food (Gupta *et al.* 2004). The proteins of mushroom are of high quality and rich in various essential amino acids. The use of mushroom may contribute significantly in overcoming protein deficiency in the developing countries where good quality proteins from animal source are either unavailable or unacceptable for

religious beliefs (Singh *et al.* 1995; Bajaj *et al.* 1996; Chandra and Samsher, 2006). With regard to their good nutritional and high digestibility values mushrooms are gaining importance in today's healthy diet.

In India, mainly three species of mushrooms *viz.* white button mushroom (*Agaricus bisporus*), oyster mushroom (*Pleurotus sajor caju*) and paddy straw mushroom (*Volvariella valvacea*) are grown commercially. Among them, oyster (*Pleurotus sajor caju*) mushrooms possess unique nutritional and medicinal values, characteristic aroma and taste. Information on effect of substrate on nutritional composition of oyster mushroom is scanty. Therefore, in the present study, two different agro wastes like wheat and brassica straw were used as substrates for the cultivation and to evaluate their effect on nutrient composition.

* Corresponding Author : E-mail : ramjood@rediffmail.com

MATERIAL AND METHODS

Oyster mushroom (*Pleurotus sajor caju*) was cultivated on wheat and brassica straw in the Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, India. The fruit bodies of *Pleurotus sajor caju* were harvested in the month of November, 2005. The mushrooms were dried in an oven at 60° C. Moisture content of dried samples was determined to express values on dry weight basis. The dried samples were ground to fine powder and stored in air-tight containers for further analysis.

Nutritional analysis :

Proximate composition : Moisture and ash were determined by employing standard methods of analysis (AOAC, 1995). Protein, fat and crude fibre were estimated using automatic KEL PLUS, SOCUS PLUS and FIBRA PLUS, respectively by employing the method of AOAC (1995). Total carbohydrates were determined by difference method. Total carbohydrates = 100 – (crude protein + crude fat + crude fibre + ash). Total energy was calculated by using Bomb Calorimeter as given by Krishan and Ranjan (1980).

Sugars and dietary fibre : Total soluble sugars were extracted by refluxing in 80% ethanol (Cerning and Guilbot, 1973). Quantitative determination of total soluble sugars were carried out according to a colorimetric method (Yemm and Willis, 1954). Reducing sugars were estimated by Somogyi's modified method (Somogyi, 1945). Non-reducing sugars were determined by calculating the difference between total soluble sugars and reducing sugars. Total, soluble and insoluble dietary fibre contents

were determined by following the enzymatic method of Furda (1981). The sum of insoluble dietary fibre and soluble dietary fibre contents were calculated as total dietary fibre.

Vitamins and amino acids : Thiamine and riboflavin were determined by using Fluorometer according to the method of AOAC (1995). Total lysine was estimated according to the method described by Miyahara and Jikoo (1967). Methionine was determined by ion exchange chromatographic method (AOAC, 1995).

Statistical analysis : The data were statistically analysed in complete randomized design for analysis of variance (Panse and Sukhatme, 1969).

RESULTS AND DISCUSSION

Proximate composition and energy : Oyster mushroom grown on wheat and brassica straw contained 89.68 and 88.98% moisture contents on fresh weight basis, respectively (Table 1). However, wheat straw grown mushroom had slightly higher values might be due to environmental factors i.e. temperature, postharvest period and relative humidity during growth. Moisture content also varied with cropping and watering conditions and type of substrate used (Gupta *et al.* 2004) during cultivation.

Brassica grown oyster mushroom contained significantly ($P < 0.05$) higher 26.99% protein content as compared to wheat straw grown oyster mushroom. Variation in protein contents might be due to the source of cultivation substrate (Bano *et al.* 1992). Rai (1995) reported that chitin nitrogen is responsible for high protein values derived with usual 6.25 factor. Similar results were also observed by

Table 1. Proximate composition of *Pleurotus sajor caju* grown on two substrates (on dry weight basis)

Substrate	Moisture ^a (%)	Crude fat (%)	Ash (%)	Crude fibre (%)	Crude protein (%)	Total carbohydrates (%)	Energy (Kcal/100 g)
Wheat	9.68±	1.88±	8.89±	11.59±	25.30±	52.34±	412±
straw	0.65	0.14	0.30	0.50	0.10	0.23	3.12
Brassica	8.98±	1.98±	8.73±	11.78±	26.99±	50.52±	411±
straw	0.58	0.20	0.19	0.50	0.12	0.15	4.00
't' value	NS	NS	NS	NS	3.80*	4.83**	NS

Values are mean ± SD of triplicates

^aon fresh weight basis

*Significant at 5% level

**Significant at 1% level

NS = Non-significant

Table 2. Sugar and dietary fibre content of *Pleurotus sajor caju* grown on two substrates (g/100g, on dry weight basis)

Substrate	Sugar			Dietary fibre		
	Total	Reducing	Non-reducing	Total	Soluble	Insoluble
Wheat straw	3.85 ± 0.34	0.38 ± 0.01	3.47 ± 0.11	15.60 ± 1.10	1.63 ± 0.11	13.97 ± 0.08
Brassica straw	3.90 ± 0.32	0.41 ± 0.05	3.49 ± 0.13	13.73 ± 1.15	1.58 ± 0.10	12.15 ± 0.13
't' value	NS	NS	NS	7.20**	NS	4.00**

Values are mean ± SD of triplicates

**Significant at 1% level

NS = Non-significant

other workers in *Agaricus bisporus* and *Pleurotus* species (Goyal, 2002; Gupta *et al.* 2004).

The fat content of both type of mushrooms were 1.88 to 1.98%, respectively. Non-significant difference was observed in fat content. As mushrooms are recognized for their low fat contents. Other workers have also been reported varied amount of fat contents in oyster mushrooms (Raghunathan *et al.* 1996; Gupta *et al.* 2004) grown on different substrates.

The values of ash contents were 8.89 and 8.73%, respectively in wheat and brassica straw cultivated oyster mushrooms. Non-significant difference was observed in ash contents.

Wheat and brassica straw grown oyster mushrooms contained 11.59 and 11.78% crude fibre contents on dry weight basis. Non-significant difference was observed in crude fibre contents of oyster mushroom grown on two substrates. Similarly, Gupta *et al.* (2004) reported 11.72 and 13.23% crude fibre contents in oyster mushroom grown on banana leaves and paddy straw substrates.

Total carbohydrate contents determined by the difference method were 52.34 and 50.52%, respectively in oyster mushroom grown on two substrates. The results are in confirmity with those of various other workers in different mushroom

varieties (Goyal, 2002; Ekanem and Ubengama, 2002). Tshinyangu (1996) reported that nutritional value of mushroom largely depends on chemical composition of the compost which causes variation in the composition data of same species of mushroom.

Wheat and brassica straw grown mushroom contained 412 and 411 Kcal/100 g energy, respectively. Non-significant difference was observed between two substrates grown oyster mushrooms. Ekanem and Ubengama (2002) reported 412 to 686 Kcal/100 g in button and full grown oyster mushrooms which are quite comparable to the values reported in present study.

Sugars and dietary fibre : The values of total, reducing and non-reducing sugars were 3.85, 0.38 and 3.47%, respectively in wheat straw grown mushroom whereas 3.90, 0.41 and 3.49%, respectively in brassica straw grown mushroom (Table 2). Among sugars, non-reducing sugars formed the major portion of total sugars. Wahid *et al.* (1990) reported higher percentage of non-reducing sugars in *Pleurotus sajor caju* and *Agaricus bisporus*. Variations in sugars content of mushroom might be due to variation in substrate and agroclimatic conditions.

The values in terms of total, soluble and insoluble dietary fibre contents were 15.60, 1.63 and

Table 3. Vitamin and amino acid contents of *Pleurotus sajor caju* grown on two substrates (on dry weight basis)

Substrate	Vitamins		Amino acids	
	Thiamine (mg/100 g)	Riboflavin (mg/100 g)	Total lysine (g/100 g protein)	Methionine (g/100 g protein)
Wheat straw	1.18 ± 0.10	3.89 ± 0.13	6.00 ± 0.40	1.80 ± 0.20
Brassica straw	1.13 ± 0.05	3.52 ± 0.18	6.25 ± 0.30	1.75 ± 0.11
't' value	NS	5.20*	NS	NS

Values are mean ± SD of triplicates

*Significant at 5% level

NS = Non-significant

13.97%, respectively in wheat straw grown mushroom while brassica straw grown mushroom contained 13.73, 1.58 and 12.15%, respectively. Significant difference was observed in total and insoluble dietary fibre contents of oyster mushroom grown on two substrates. This might be due to the effect of substrate composition and maturity stage of mushroom. As fungal chitin [straight chain β (1-4)-N-acetylglucosamine and other hemicellulose (glucans and mannans)] a unique cell wall component not found in other plants, may have important physiological properties with report to human health (Cheung, 1997).

Vitamins and amino acids : Data regarding thiamine and riboflavin contents of oyster mushroom grown on two substrates are given in Table 3. On dry weight basis, thiamine content was 1.18 mg/100 g in oyster mushroom grown on wheat straw and 1.13 mg/100 g in brassica straw grown mushroom. The amount of riboflavin was 3.89 and 3.52 mg/100 g on dry weight basis in wheat straw and brassica straw grown mushroom. Non-significant difference was observed in thiamine contents whereas significant difference in riboflavin contents. Oyster mushroom grown on two substrates were found rich in vitamin contents. One hundred gram of mushroom seems to take care of daily requirement of thiamine of an adult, whereas, 25-

40 g of mushroom can meet the daily requirement of riboflavin of an adult (Goyal, 2002).

Total lysine contents ranged from 6.00 to 6.25 g/100 g protein in two types of cultivated mushroom. There was non-significant difference in lysine contents. Quality of mushroom protein is highly nutritious and comparable with meat, egg and milk (Aletor, 1995). Other workers reported wide variation in lysine contents of different varieties of mushroom. Variations in lysine content might be due to its protein content and maturity stage during harvesting. Methionine contents were observed 1.80 and 1.75 mg/100 g protein in wheat straw and brassica straw based mushroom, respectively. Methionine is essential amino acid present in mushroom which improves quality of mushroom protein as this amino acid is lacking in pulses.

CONCLUSIONS

It may be inferred from the present study that oyster mushroom cultivated on wheat and brassica substrate have low sugar and fat contents and high content of good quality protein, thiamine, riboflavin, lysine, methionine and dietary fibre. Therefore, they form an important constituent for a balanced food. Mushroom can serve to improve the nutritional status of Indians and help in alleviating the protein deficiency among children.

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