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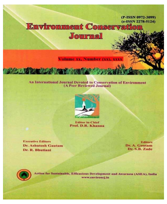

Effect of agricultural waste on nutritional composition of oyster mushroom (*Pleurotus ostreatus*)

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ABSTRACT

The oyster mushroom (*Pleurotus ostreatus*) was cultivated on diverse substrates, encompassing wheat straw (T_1), paddy straw (T_2), groundnut leaves and straw (T_3), sugarcane bagasses (T_4), cotton stalk (T_5), coconut husk (T_6), pigeon pea straw (T_7), and banana pseudostem (T_8). The study comprised of the estimation of proximate composition, antioxidants, and mineral content of the sun-dried mushrooms during the initial two harvests. The average values of nutritional parameters were as follows: moisture (90.93 to 85.18 %), ash (7.62 to 4.86%), carbohydrates (37.57 to 20.10%), crude protein (45.45 to 23.10%), crude fiber (29.08 to 19.29%), crude fat (2.68 to 1.63%), total phenol (14.23 to 9.12 mg/g) and ascorbic acid (11.58 to 8.72 mg/100g). The average mineral content exhibited the trend K>P>Mg>Ca>Zn>Fe>Cu. Upon consideration of average values from both harvests, the groundnut leaves and straw had the highest crude protein (45.45 %), total phenol (14.23 mg/g), ascorbic acid (11.58 mg/100g), phosphorous (0.43 %), iron (7.12 mg/100g) and zinc (12.43 mg/100g). The paddy straw resulted in the highest crude fiber (29.08 %) and crude fat (2.68 %), while the wheat straw resulted in the highest potassium (1.52 %) and calcium (179.65 mg/100g). The various substrates had an impact on nutritional parameters as seen by either an increase or decrease in various parameters which can be reflected in turn by the composition of the substrates itself. In conclusion, groundnut leaves and straw (T_3) along with paddy straw (T_2) and wheat straw (T_1) resulted in significant improvement of nutritional composition compared to other treatments. This study underscores the environmentally friendly utilization of nutrients from agricultural waste for mushroom production.

Introduction

A substantial portion of the world's waste is produced by the agriculture industry. For example, the residues such as stalks, husks, molasses etc. The nutritive value of these wastes, in particular, is an interesting attribute that draws their utilization in directions that have significant positive effects on the economy and society. Because they promote the growth and development of mycelia into mushroom fruit bodies, agricultural wastes have long been regarded as a good source of nutrients for the production of mushrooms. Therefore, mushroom cultivation is the most effective and financially feasible biotechnology to solve the environment-related problems using agricultural wastes as a raw

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material. It is an interesting approach to use agricultural wastes as a bioconservation for the controlled cultivation of edible mushrooms (Wei *et al.*, 2022). By using waste from the agricultural and agro-based industries as raw materials, production costs can be lowered and waste can be recycled, contributing to an eco-friendly environment (Sadh *et al.*, 2018).Oyster mushrooms, also known as *Pleurotus ostreatus* (white-rot fungi), are members of the *Pleurotaceae* family. With 99% of the world's production and consumption of *P. ostreatus* mushrooms coming from Europe, Africa, and Asian countries (especially India, South Korea, China, Taiwan, Japan, Thailand, and Vietnam), it is one of the most widely cultivated mushroom species and the second-largest commercially produced mushroom after the *Agaricus bisporus* (Lesa *et al.*, 2022). The total production of oyster mushroom in India during the year 2016 was 21, 272 metric tonnes. The states involved in oyster mushroom production in India are Odisha, Tamil Nadu, Maharashtra, Punjab, Bihar, West Bengal, Uttrakhand, Gujarat and Andhra Pradesh (Sharma *et al.*, 2017). There are many benefits for cultivating *P. ostreatus* over other edible mushrooms. These are listed below: (1) has the potential for high yields, high nutritional value and medicinal importance; (2) grows rapidly in a broad range of temperatures (10°C to 30°C) and pH (6–8); (3) has the ability to degrade ligno-cellulosic biomass of substrates; (4) requires minimal environmental control; (5) can colonise substrates more quickly; and (6) does not require composting of its substrate. Additionally, they can frequently be grown simply and economically, and their cultivation only needs pasteurisation, which is affordable and does not require a more expensive method like sterilization. Additionally, diseases or pests do not frequently attack their fruiting bodies (Lesa *et al.*, 2022).Mushrooms are highly valued for their distinctive flavour and delectability, as well as the fact that they are high in protein, low in fat, high in fibre, low in carbohydrates and sodium, and high in vitamins (thiamine, riboflavin, folic acid, and niacin), which are uncommon in vegetables. Due to their high availability of lysine, tryptophan, and other amino acids typically lacking in cereals, they are an ideal choice for patients with hypertension, diabetes, and obesity (Carel *et al.*, 2013). Agricultural wastes can be effectively degraded by *Pleurotus* species which can grow in a variety of temperatures. Compared to other edible mushrooms, they need less time to grow. Carbon, nitrogen, and inorganic substances are among the nutritional sources required by *Pleurotus* species. Materials containing cellulose, hemicellulose, and lignin (such as rice and wheat straw, cotton seed hulls, sawdust, waste paper, leaves, and sugarcane residue) can be used as substrates for growing mushrooms because the main nutrients for mushrooms are more carbon and less nitrogen. Oyster mushrooms can grow on a variety of substrates, but the yield and quality of oyster mushrooms are influenced by the chemical and nutrient content of the substrates (Hoa *et al.*, 2015). With this context, this study was conducted to determine the nutritional value of oyster mushrooms grown on various types of agricultural waste.

Material and Methods

The mushrooms were grown, and their nutritional composition was analyzed at the Department of Biochemistry, Junagadh Agricultural University, Junagadh, from September 2022 to March 2023.

Mushroom material and spawn preparation

The oyster mushroom was collected from the Department of Plant Pathology, Junagadh Agricultural University, Junagadh and the mother culture was maintained. Sorghum grains were used for spawn preparation and the grains were filled in autoclavable polypropylene bags and autoclaved at 121°C for 20 minutes. Around 5 g of grains from master spawn were inoculated in mother spawn bags under the laminar airflow with the help of the sterile spatula. All the bags were incubated at 28± 2°C in incubator. After few days mycelia growth cover the surface of sorghum grain and such bags were used for further experiment (Kotadiya, 2021).

Substrate preparation

Different substrates used in this experiment were T_1 Wheat straw, T_2 Paddy straw, T_3 Groundnut leaves and straw, T_4 Sugarcane bagasses, T_5 Cotton stalk, T_6 Coconut husk, T_7 Pigeonpea stalk and T_8 Banana pseudostem. The chopped substrates were soaked in water to the extent that it contains 68 to 70 % moisture. The soaked substrates were chemically treated with 40% formaldehyde solution (13.50 ml/10 litres of water) and 50% carbendazim wetable powder @10g/10 litres of water for a 24-

hour period. After 24 hours, water and chemical mixture was removed. The excess solution was removed from treated substrates by placing them on a sieve for an hour. The bag was sterilized in autoclave (Kotadiya, 2021).

Mushroom bag preparation

Polythene bag was taken and kept inverted. The end of the bag was secured with a plastic thread. Then, the bags were reverted. After the substrates were compressed, it was layered into autoclavable polythene bags (60 x 30 cm, 80 gauge). Layer spawning (3%) was done at periphery of the bag between 2 layers of substrate. Strings were used to tie bags. Bags had tiny holes made for gaseous exchange and effective aeration. Bags were kept in the room where the room temperature was 20^0c to 25^0c and 80 to 90% humidity. The packed blocks or bags were incubated in a well-ventilated, dark environment until the mycelium had completely reached the substrate's base. Bricks were used to support the bags, which increased their height and kept the bags away from water and pests (Kotadiya, 2021).

Harvesting

The mature fruits were picked before their margins began to inwardly fold. The nutritional parameters were analyzed during 1^{st} and 2^{nd} picking.

Fruiting body analysis

The nutritional composition was estimated using the sun-dried mushroom powder.This dry powder was used for the analysis of ash, crude protein, crude fat, crude fiber, total phenol, carbohydrate, ascorbic acid and minerals. The standard analytical techniques were utilized to ascertain the moisture and ash content (AOAC, 2000). The crude protein, crude fat, and crude fibre were determined using the automatic digestion-distillation unit, the Soxtherm unit, and the Fibretherm extraction unit, respectively, by employing the method of AOAC (2000). The carbohydrate and total phenol content were determined spectrophotometrically, whereas the ascorbic acid content was estimated using the titration method given by Sadasivam and Manickam (2008). For estimation of minerals, the sample extraction was done by microwave digestion system. The minerals i.e. calcium, magnesium, copper, iron, and zinc in the mushroom sample were estimated using MP-AES. Potassium was determined using flame photometer whereas phosphorus content was estimated spectrophotometrically (AOAC, 2000).

Statistical analysis

The analysis of the nutritional parameters studied was done in three replications. Statistical data analysis was carried out as per Completely Randomized Design. Using the standard statistical methods outlined by Panse and Sukhatme (1985), analysis of variance was calculated.

Results and Discussion

Effect of different substrates on the nutritional composition of the fruiting body

Moisture content is one of the major constituents of fresh mushroom and it can vary depending on the substrate used (Table 1). In the first picking, the significantly least moisture content was found in cotton stalk (84.29 %) whereas in the second picking, banaana pseudostem resulted in significantly least moisture content (82.32 %). The average moisture content ranged from 90.93% in wheat straw to 85.18% banana pseudostem. Previous works of Iqbal *et al.* (2016) and Patil *et al.* (2010) had shown similar results of moisture content in oyster mushroom grown on different substrates. The age of the mushrooms, the growing conditions, the types of mushrooms used, and the postharvest conditions all had an impact on the moisture content (Hoa *et al.* 2015). The ash content during the two pickings is as shown in Table 1. During the first picking, maximum ash content was found in paddy straw (9.31%) which was at par with wheat straw (8.64 %), sugarcane bagasses (8.34 %) and banana pseudostem (8.08 %) while in the second picking maximum ash content was in coconut husk (7.84%) which was at par with groundnut leaves and straw (7.47 %) and banana pseudostem (7.17 %). The average data revealed that maximum ash content was recorded in banana pseudostem (7.62 %) while minimum ash content recorded in pigeon pea straw (4.86 %). According to a study by Patil (2012), the ash content of mushrooms varied between 5.90% and 7.00%, which is in line with the outcomes of the current experiment. The results of the experiment are is agreement with the findings of Ashraf *et al.* (2013) who found that the ash content of oyster mushroomwas recorded maximum in wheat straw (9.08 %) and minimum in cotton waste (6.76 %).

Table 1: Effect of different substrates on the nutritional composition of the fruiting body

Treatment	Moisture (%)*			Ash content (%)			Carbohydrate (%)			Crude protein (%)		
	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average
T_1	92.73	89.14	90.93	8.64	4.81	6.72	35.46	33.42	34.44	28.65	26.25	27.45
T_2	92.86	85.47	89.16	9.31	4.68	6.99	29.11	37.37	33.24	23.77	22.44	23.10
T_3	87.59	87.25	87.42	7.69	7.47	7.58	27.10	19.49	23.29	46.27	44.63	45.45
T_4	91.74	88.16	89.95	8.34	4.53	6.43	43.53	31.61	37.57	25.57	24.69	25.13
T_5	84.29	88.03	86.16	6.82	3.87	5.34	30.89	25.84	28.36	35.88	28.38	32.13
T_6	91.56	86.53	89.04	7.24	7.84	7.54	26.43	21.05	23.74	32.40	26.55	29.47
T_7	88.30	87.99	88.14	6.41	3.32	4.86	31.95	28.31	30.13	33.89	28.64	31.26
T_8	88.05	82.32	85.18	8.08	7.17	7.62	22.14	18.07	20.10	33.36	28.43	30.89
S.Em.±	0.53	0.97		0.40	0.30		0.98	1.02		0.98	0.91	
CD at 5 %	1.60	2.94		1.23	0.91		2.97	3.09		2.97	2.75	

*** fresh weight basis**

Table 2: Effect of different substrates on the nutritional composition of the fruiting body

Treatment	Crude fiber (%)			Crude fat (%)			Total phenol (mg/g)			Ascorbic acid (mg/100g)		
	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average
T_1	29.85	28.17	29.01	2.43	2.00	2.21	14.78	10.63	12.70	11.13	09.09	10.11
T_2	28.96	29.21	29.08	2.47	2.90	2.68	11.63	10.19	10.91	11.70	09.15	10.42
T_3	21.78	19.69	20.73	2.30	1.50	1.90	14.39	14.07	14.23	10.89	12.27	11.58
T_4	26.77	30.20	28.48	1.68	1.69	1.68	14.47	10.27	12.37	08.72	08.73	08.72
T_5	26.25	22.94	24.59	1.77	1.53	1.65	11.04	9.56	10.30	09.06	08.72	08.89
T_6	18.89	19.69	19.29	1.78	1.76	1.77	9.23	9.02	9.12	09.60	10.81	10.20
T_7	21.44	22.45	21.94	1.68	1.77	1.72	13.60	8.43	11.01	10.03	10.22	10.12
T_8	24.45	28.88	26.66	1.70	1.56	1.63	13.85	7.77	10.81	09.96	10.64	10.30
S.Em.±	0.56	0.83		0.03	0.03		0.23	0.23		0.33	0.31	
CD at 5 %	1.69	2.50		0.11	0.10		0.70	0.71		1.00	0.95	

T_1= Wheat Straw **T_2= paddy Straw** **T_3= Groundnut leaves and Straw**

T_4= Sugarcane Bagasses **T_5= Cotton Stalk** **T_6=Coconut Husk**

T_7= Pigeon Pea Straw **T_8= Banana Pseudo Stem**

This study shows that oyster mushroom fruiting bodies grown on all substrate types are rich in protein, carbohydrates, and fibre and have a low fat content, making them excellent foods that can be used in low-calorie diets (Hoa *et al*., 2015, Raman *et al*., 2021). The cell wall of a mushroom is typically made up of carbohydrates. The two primary polysaccharides of the cell wall are mannan and glucan. Mannan has a radio-protective effect, while glucan as food has a positive impact on lowering serum cholesterol, a risk for cardio-vascular disease (Maftoun *et al.,* 2015). In first picking, carbohydrate content was significantly higher in sugarcane bagasses (43.53 %) followed by wheat straw (35.46%). In second picking, carbohydrate content was significantly higher in paddy straw (37.37 %) compared to the other treatments (Table 1). The average data indicated that the maximum carbohydrate content was found in sugarcane bagasses (37.57 %) while the lowest carbohydrate was in banana pseudostem (20.10%). The carbohydrate content of oyster mushroom cultivated on different substrates was reported in range from 30.24 to 42.26% (Sharma *et al*., 2013; Ashraf *et al*., 2013). For vegetarians in particular, the genus *Pleurotus* can be regarded as a reliable source of palatable proteins (Raman *et al.,* 2021). The average crude protein content in mushroom harvested from different substrates ranged from 23.10 % to 45.45 % (Table 1). Irrespective of picking stages, significantly highest crude protein content (46.27 % and 44.63 %) was found in treatment T_3 (groundnut leaves and straw). The lowest crude protein content was found in treatment T_2 (paddy straw) 23.77 and 22.44% respectively which was at par with treatment T_4 (sugarcane bagasses) 25.57 and 24.69% respectively in both the pickings. Protein content of oyster mushroom grown on different substrates ranging from 22.89% to 25.97% was reported in previous studies (Sharma *et al.,* 2013; Tirkey *et al*., 2017). The varying nitrogen content of the substrates may be the cause of the difference in the protein content of the oyster mushrooms grown on various substrates (Hoa *et al*., 2015). Mushroom protein content is influenced by a number of variables, including the type and quantity of additive nutrients in the substrate, pileus size, cultivation time, and strain (Jeznabadi *et al*., 2016).

Mushrooms are excellent sources of valuable food compounds for humans and contain edible dietary fibre. Chitin and polysaccharide in the cell walls of mushrooms make up the majority of their dietary fibre (Raman *et al*., 2020). The average fibre content across all substrates showed that paddy straw produced the highest fibre content (29.08%), while coconut husk resulted in the lowest fibre content (19.29%). Based on the data from Table 2, it is evident that the fibre content was higher in wheat straw (29.85 %) which was statistically at par with paddy straw (28.96 %) in first picking. In the second picking, higher amount of fibre was found in sugarcane bagasses (30.20 %) which were at par with paddy straw (29.21%), banana pseudostem (28.88%) and wheat straw (28.17 %). The results of this study is close to the values reported by Ashraf *et al*. (2013) who found the fibre content of 26.28 % in wheat straw and 24.53 % in cotton waste from oyster mushroom. Among the different substrates used for growth of *Pleurotus ostreatus*, rice straw resulted in the highest fibre content, and the overall fibre content ranged from 12 to 14% (Sharma *et al*., 2013).

All lipids, free fatty acids, mono-, di-, and triglycerides, sterols, sterol esters, and phospholipids are included in the crude fat of edible and therapeutic mushrooms (Raman *et al.,* 2021). The average values indicated that the paddy straw resulted in the highest amount of crude fat (2.68 %) while the least amount of crude fat (1.63 %) was reported in the banana pseudostem (Table 2). In the first picking, paddy straw had the highest fat content which was at par with wheat straw (2.47 and 2.43 % respectively). Paddy straw had significantly higher fat content (2.90 %), which was followed by wheat straw (2.00 %) during the second picking. A fat content in the range of 2.46 to 2.85%; 2.28 to 2.60 % and 0.77 to 2.26% was reported in *Pleurotus sajor-caju, Pleurotus florida*, and *Pleurotus djamor* cultivated on different agro-wastes (Patil, 2012; Ahmed *et al*., 2009; Vega *et al*., 2022).

The phenolic component in *Pleurotus* species is variable and they are most related to antioxidants and phytonutrients (Raman *et al.,* 2020). Data of phenol content depicted in Table 2 demonstrates that the wheat straw resulted in the highest phenol content (14.78 mg/g) which was statistically at par with sugarcane bagasses (14.47 mg/g), and groundnut leaves and straw (14.39 mg/g) during the first picking. In the second picking, phenol content was significantly higher in groundnut leaves and straw (14.07 mg/g) than other treatments. Upon considering theaverage values, groundnut leaves and straw exhibited highest phenol content (14.23 mg/g) whereas the coconut husk resulted in the least amount of phenol (9.12 mg/g). The phenol content declined during the second picking in all the treatments. According to Mishra *et al*. (2013), the total phenol content of various oyster mushroom species ranged from 3.94 to 21.67 mg/g. Our results are consistent with their findings. The phenolic content of pink oyster mushroom grown on paddy straw ranged from 5.60 to 6.75 (mg/g) (Raman *et al*., 2020).

The average data revealed that the groundnut leaves and straw resulted in the highest amount of ascorbic acid (11.58 mg/100g), while the sugarcane bagasses resulted in the lowest amount of ascorbic acid (8.72 mg/100g) (Table 2). During the first picking, the highest amount of ascorbic acid was found in mushroom from paddy straw (11.70 mg/100g) which was statistically at par with wheat straw (11.13 mg/100g), and groundnut leaves and straw (10.89 mg/100g). In second picking, among all the treatments, the amount of ascorbic acid content was significantly higher in groundnut leaves and straw (12.27 mg/100g). Ascorbic acid (vitamin C) is a valuable food component because the vitamin content plays a significant role in the overall nutritional value of food due to its antioxidant and therapeutic properties (Adejumo *et al.,* 2015). *Pleurotus ostreatus* grown on different lignocellulosic agro-waste resulted in ascorbic acid content of 12.52 to 15.80 mg/100g (Patil *et al*., 2010).

Effect of different substrates on mineral content of fruiting body

Calcium, potassium, magnesium, phosphorus, and sodium are known to be present in mushrooms and are essential nutrients for humans. They are necessary for rebuilding blood cells, maintaining osmotic balance, strengthening bone and teeth, and repairing worn-out cells (Adejumo *et al.,* 2015). The mushroom's adsorption and accumulation of these elements from the growth substrate may account for variations in mineral compositions (Ritota and Manzi, 2019). The average data indicated that the groundnut leaves and straw had the highest amount of phosphorous content (0.43 %) while the pigeonpea straw resulted in the lowest amount of phosphorous content (0.32 %).The data presented in Table 3 depicts that in the first picking groundnut leaves and straw recorded maximum phosphorous content (0.47 %) which was at par with cotton stalk (0.46 %). In second picking, coconut husk recorded higher phosphorous content (0.43 %) which was at par with groundnut leaves and straw (0.40 %). Ponmurugan *et al*. (2007) reported similar results, stating that the range of phosphorous content of mushrooms grown on different substrates was 0.11 to 0.25%.

Potassium plays a crucial role in a variety of mechanisms, including growth, the metabolism of carbohydrates, ionic balance, enzyme activity, and the differentiation of cap and gills (Zahid *et al*., 2020). The average value of potassium content of oyster mushroom (*Pleurotus ostreatus*) ranged from 0.94 to 1.52 % (Table 3). The wheat straw recorded significantly higher potassium content compared to other treatments in both harvests. Irrespective of the treatments, there was a decline in the potassium content in the second picking. A similar range of potassium content was observed in oyster mushrooms grown on different wastes, ranging from 1.9 to 2.1% (Yehia, 2012).

Mushrooms are an important food because they contain calcium, which is necessary for bone growth and maintenance as well as for the healthy operation of muscles and nerves in both humans and other animals (Elkanah *et al*., 2022). The data shown in the Table 3 revealed that in first picking, calcium content was significantly higher in wheat straw (236.04 mg/100g) which was followed by paddy straw (227.87 mg/100g). In second picking, sugarcane bagasses recorded maximum calcium content (129.79 mg/100g) which was at par with coconut husk (129.75 mg/100g). On an average, wheat straw led to maximum calcium content (179.65 mg/100g) whereas the pigeon pea straw resulted in minimum calcium content (104.51 mg/100g). There was a decline in the calcium content during the second harvest in all the treatments. The results of a study conducted by Yehia (2012) revealed the highest calcium content

Table 3: Effect of different substrates on the mineral content of the fruiting body

Treatment	Phosphorous (%)			Potassium (%)			Calcium (mg/100g)			Magnesium (mg/100g)		
	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average
T_1	0.38	0.31	0.34	1.66	1.38	1.52	236.04	123.27	179.65	166.72	164.16	165.44
T_2	0.38	0.30	0.34	1.57	1.04	1.30	227.87	119.84	173.85	176.90	148.62	162.76
T_3	0.47	0.40	0.43	1.02	0.87	0.94	157.52	127.63	142.57	182.92	118.64	150.78
T_4	0.36	0.37	0.36	1.34	0.97	1.15	147.14	129.79	138.46	146.89	160.31	153.60
T_5	0.46	0.38	0.42	1.37	0.87	1.12	126.00	115.16	120.58	161.74	165.56	163.65
T_6	0.39	0.43	0.41	1.02	0.86	0.94	161.60	129.75	145.67	177.41	180.49	178.95
T_7	0.36	0.28	0.32	1.28	0.82	1.05	110.50	98.52	104.51	115.66	114.60	115.13
T_8	0.37	0.35	0.36	1.44	0.67	1.05	149.38	117.59	133.49	197.06	176.48	186.77
S.Em.±	0.008	0.008		0.007	0.015		0.081	0.078		0.083	0.081	
CD at 5 %	0.025	0.027		0.024	0.046		0.246	0.236		0.251	0.245	

Table 4: Effect of different substrates on the mineral content of the fruiting body

Treatment	Copper (mg/100g)			Iron (mg/100g)			Zinc (mg/100g)		
	1st picking	2nd picking	Average	1st picking	2nd picking	Average	1st picking	2nd picking	Average
T_1	1.73	1.25	1.49	6.15	4.23	5.19	10.02	8.89	9.45
T_2	1.94	1.45	1.69	6.19	5.50	5.84	8.72	7.21	7.96
T_3	3.72	1.66	2.69	8.60	5.64	7.12	13.74	11.12	12.43
T_4	1.43	1.26	1.34	4.35	2.90	3.63	8.51	6.40	7.45
T_5	1.69	1.25	1.47	3.06	3.03	3.04	8.79	7.60	8.19
T_6	1.99	1.88	1.94	3.68	3.26	3.47	9.02	7.60	8.31
T_7	7.24	5.02	6.13	4.74	3.75	4.25	7.52	7.22	7.37
T_8	2.07	1.25	1.66	5.53	5.39	5.46	7.23	4.54	5.88
S.Em.±	0.07	0.05		0.09	0.07		0.10	0.10	
CD at 5 %	0.22	0.18		0.28	0.23		0.31	0.31	

T_1= Wheat Straw **T_2= paddy Straw** **T_3= Groundnut leaves and Straw**

T_4= Sugarcane Bagasses **T_5= Cotton Stalk** **T_6=Coconut Husk**

T_7= Pigeon Pea Straw **T_8= Banana Pseudo Stem**

was found in the wheat+ paddy straw mushroom (350 mg/100g) which was near to the values obtained by wheat and paddy straw during the first picking. Considering the overall data shown in Table 3, banana pseudostem resulted in highest magnesium content (186.77 mg/100g) while the pigeon pea straw led to the lowest magnesium content (115.13 mg/100g). The data indicates that in the first picking, amount of magnesium content was significantly higher in banana pseudostem (197.06 mg/100g) which was followed by groundnut leaves and stem (182.92 mg/100g). In second picking, amount of magnesium content was significantly higher in coconut husk (180.49 mg/100g) which was followed by banana pseudostem (176.49 mg/100g). An investigation conducted by Hoa *et al.* (2015) revealed that the magnesium content in mushrooms of the *Pleurotus* species ranged from 60.65 to 94.27 mg/100g which was slightly lower to the results obtained in our study.The data with respect to the copper content as shown in Table 4 revealed that in both the harvests pigeon pea straw resulted in significantly highest values (7.24 and 5.02 mg/100g respectively). The overall value indicates that the highest copper content was found in the pigeon pea straw (6.13mg/100g) whereas the lowest copper content was reported in the sugarcane bagasses (1.34 mg/100g). According to Hoa *et al.* (2015), oyster mushrooms cultivated in various substrates had copper contents that ranged from 0.11 to 0.35 mg/100g, which was lower than the outcomes of our study. Data from Table 4 showed that during the first picking, groundnut leaves and straw (8.60 mg/100g) had significantly higher iron content in comparison to paddy straw (6.19 mg/100g). During the second harvest, the maximum iron content was reported in groundnut leaves and straw (5.64 mg/100g) which was at par with paddy straw (5.50 mg/100g). The average data revealed that the groundnut leaves and straw gave the maximum iron content (7.12 mg/100g) while the cotton stalk resulted in least iron content (3.04 mg/100g). The results of the study are in line with those of Ahmed *et al.* (2009), who reported that oyster mushrooms had an iron content that ranged from 11.87 to 13.06 mg/100g, slightly higher than the results of our investigation. The overall average shown in Table 4 revealed that the groundnut leaves and straw gave the maximum Zn content (12.43 mg/100g) while the banana pseudostem resulted in minimum Zn content (5.88 mg/100g). The data indicates that the zinc content was significantly highest in groundnut leaves and straw (13.74 and 11.12 mg/100g respectively) which was followed by wheat straw (10.02 and 8.89 mg/100g respectively) in both the pickings. The zinc content in oyster mushroom grown on various substrates ranged from 7.61 to 11.45 mg/100g (Hoa *et al.*, 2015), which is in agreement with our results.

Conclusion

Based on the present study, it can be inferred that oyster mushrooms cultivated on substrates like groundnut leaves and straw (T_3), paddy straw (T_2), and wheat straw (T_1) exhibited a notable increase in proximate content such as carbohydrates, crude protein, and crude fiber. Additionally, there was an elevation in antioxidant content; and an enhancement in mineral content. The results suggest that agricultural waste can be effectively redirected for mushroom cultivation, offering economic advantages to farmers, contributing to environmental protection by mitigating pollution from agricultural waste burning, and ensuring nutritional security for the broader population.

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Conflict of interest

The authors declare that they have no conflict of interest.

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