

**NUTRITIONAL EVALUATION AND PROCESSING OF OYSTER MUSHROOM,  
PLEUROTUS SAJOR**SHASHI GOUR, A.K.GOUR<sup>1</sup> AND \*NITIN SONI

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**Received** : 26.02.17; **Accepted** : 24.04.17**ABSTRACT**

Nutritional points of view, *P.sajor* had high content of all the proximate principles like protein, fat, carbohydrates, ash and fibre in as compared to *P.florida* and *P. sapidus* in both fresh or dry weight basis. The drying process for extension of shelf-life indicates that hot air oven drying method took less time (4hrs) in comparison to sun drying method (12hrs). The weight loss was, more rapid in hot air drying method. Before drying of mushroom, 0.5% kms treatment with blanching was essential for controlling the browning reaction of the product. Better rehydration ratio was observed in sundried mushroom than the hot air oven dried mushrooms. Blanching of mushroom carried out during drying also reduced the rehydration ratio in both the processes.

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KEY WORDS : Mushroom, Nutritional evaluation, Processing

**Introduction**

Mushrooms are a good source of food protein for human consumption as reported<sup>10</sup>. Modern mushroom culture produces more protein per unit area of land than any other form of agriculture<sup>10</sup>. On the basis of the protein content on dry weight basis, mushrooms are positioned well above most foods including animal products such as milk<sup>6,7</sup>. It has been reported that mushrooms are quite a well-balanced source of essential amino acids except for sulphur containing amino acids. The literature reveals that availability of the amino acid in the fruit bodies of *Pleurotus* spp. grown on paddy straw<sup>3</sup>. The mineral content particularly calcium and phosphorus are remarkably higher in mushrooms than any fresh vegetables<sup>10</sup>. Glucose is present but in a very low concentration.

**Material and Methods**

The present research work was carried out at Live Stock Farm, College of Veterinary Science & Animal Husbandry and Department of Food Science & Technology, Jawaharlal Nehru Krishi

Vishwa Vidyalaya Jabalpur. Three varieties of oyster mushroom viz; *Pleurotus sajor caju, florida* and *sapidus* were collected from Department of Plant pathology, College of Agriculture, Jabalpur.

**Nutritional evaluation**

Only one variety of oyster mushrooms viz., *Pleurotus sajor caju* was used for nutritional evaluation in the form of fresh material and dried powder. The moisture, protein, oil, ash and fibre content in the sample was estimated according to the method described<sup>2</sup>. Total carbohydrate was estimated by the acid hydrolysis process in which polysaccharides were broken down into hexose sugars, by utilizing its reducing action. It was estimated by titrating against a mixture of Fehling solutions A and B<sup>8</sup>.

**Sun drying**

Sun drying a traditional method for the drying of oyster mushroom, was performed on black polyethylene sheet to get advantage of heat energy absorbed by black surface. 250 g of mushroom weighing 250 g was spread on black sheet,

**TABLE-1: Nutritional evaluation of oyster mushroom (*P.sajor caju*) On fresh weight basis (%) (Results are average of three determinations)**

S.No	Species	Composition in 100 g					
		Dry matter	Protein	Carbohydrates	Fat	Ash	Fibre
1	<i>P. sajor caju</i>	9.94	2.52	5.32	0.20	0.78	1.12
2.	<i>P. florida</i>	6.24	1.72	3.15	0.10	0.55	0.72
3.	<i>P. sapidus</i>	8.34	2.21	4.43	0.15	0.75	0.80

covered with muslin cloth and dried directly in the sun. The dried sample was weighed on plate form balance. The initial moisture content of each samples were receded using oven drying method as described earlier.

#### Hot air oven drying

Mushroom weighing 250 g was taken and dried an oven (mechanical dehydrator) at 60° c. Some quantity of dried sample was used for rehydration test while the rest was used to make powder for further analysis<sup>20</sup>.

#### Rehydration test

Rehydration test was performed in both the samples ie. Sundried and Oven dried sample by the procedure as described below<sup>1</sup>. Dried mushroom weighing 50g was placed in 500 ml of beaker containing 150 ml of boiled distilled water for 5min on electric heater and then removed the material. Excessive amount of water was removed by suction on Buchner Funnel till the drip from the funnel has almost stopped.

Rehydration ratio = a: b

- Weight of the dehydrated sample
- Weight of rehydrated sample

### Results and Discussion

Nutritional evaluation of fresh mushroom and dried mushroom powder

The data (Table-1) indicates that the proximate composition of three varieties of mushroom species on fresh weight basis. The obtained results revealed that the percentage dry matter content ranged from 6.24 to 9.94, protein from 1.72 to 2.52, carbohydrates 3.15 to 5.32, fat

from 0.10 to 0.20, ash from 0.55 to 0.78 and fibre from 0.72 to 1.12 in the varieties understudy. The nutritional composition of *P.sajor caju* was highest in terms of all proximate constituents as compared to *P. florida* and *P. sapidus* Hence, *P.sajor caju* was used for further study.

The data (Table-2) reveals that the proximate composition of dried powder of *P.sajor caju*. The results indicates that the values for various constituents viz, protein ranged from 22.90 to 24.50, fat 1.91 to 1.92, carbohydrates 50.61 to 50.71, ash 5.50 to 6.50, fiber 8.30 to 8.50 and total energy 311 to 318. These values were slightly lowered in six months stored powder due to the absorption of moisture. The above results were in agreement with the work of other investigators<sup>4,16,17,20</sup>.

#### Effect of drying methods

Two methods for drying of *P.sajor caju* were undertaken (sun drying and hot air oven drying) involving blanching methodology with and without 0.5% kms treatment. The effect of drying methods and treatments on dry matter content and drying time has been presented (Table-3). Dry matter content in sun drying and hot air oven drying methods with and without kms treatments after blanching did not differ significantly. However, there was a significant difference in drying time. The drying time was more in sun drying method. It was 720, 660 and 600 min for sun drying while 200, 180 160 min for hot air oven drying with and without 0.5% kms treatments after blanching.

#### Effect of drying method and blanching on weight loss

The data (Table-3) shows the weight loss as influenced by drying method. The results reveal

**TABLE - 2 : Nutritional evaluation of dried powder of oyster mushroom (*P.sajor caju*) (Results are average of three determinations)**

Constituents (%)	Fresh powder	Six months stored powder
Moisture	8.80	9.78
Protein	24.50	22.90
Fat	1.92	1.91
Carbohydrates	50.71	50.61
Ash	5.50	6.50
Fibre	8.50	8.30
Total energy (Kcal)	318	311

that the percentage of weight loss in the sun dried samples was ranged from 7.39 to 89.68 percent during 12 hours of drying period. The decrease in weight loss was more during 1 hour to 6 hours thereafter it was less . However, weight loss in hot air oven dried samples was varied in the range of 17.65 to 89.99 percent during 240 min of drying period. This indicates that weight loss was more rapid in hot air oven drying method than the sun drying method. These results were statistically significant at 5% level, the weight loss as influenced by 0.5% kms treatment with blanching. The results also reveal that untreated samples on drying took slow weight loss as compared to 0.5% kms treated blanched samples. Both the drying methods showed the significant differences with a rapid loss of weight in hot air oven dried samples. The weight loss of blanched mushroom was comparatively more than the 0.5% kms or untreated samples. The above results indicate that sun drying took more time than hot air oven drying method. These findings were in agreement with the findings of other workers<sup>11,13,14,15,18</sup>. Inactivation of poly phenoloxides which causes browning of the product during drying could be checked by the process of blanching<sup>6,9</sup>.

#### **Rehydration behaviour of dried mushroom made by different drying methods and treatments**

The shape and size of the dehydrated mushrooms were remarkable differed from those of the fresh ones due to shrinkage resulting from the removal of large quantities of water. The rehydration behaviour was analyzed in terms of the

ability of the final product to regain its original volume. This characteristic was expressed in terms of rehydration ratio.

The data (Table-5) represents the rehydration behaviour of mushroom made by different drying methods and treatments. The results showed that the rehydration ratio varied in the range of 2.03 to 3.24 with a higher values in sun drying method (2.73 to 3.2). However, these values were low in hot air oven drying method (2.03 to 2.45). This indicates that sundried mushroom showed better rehydration ratio than the hot air oven dried mushroom. Blanching of mushroom carried out during drying also reduces the rehydration ratio in both the processes. The above results were in conformation with in findings of other workers<sup>9,12,15,21</sup>.

The rehydrated weight compared to initial weight showed, a significant differences between sun dried and hot air oven dried mushrooms i.e. 0.36 and .26, respectively with a significant change in rehydration ratio i.e. 2.93 and 2.28, respectively in both the samples dried by different drying methods.

#### **Sensory evaluation of dehydrated mushroom processed by different drying methods and treatments.**

The data (Table-6) represents the mean score values of various sensory attributes of dehydrated mushrooms. The results showed that the mean score for appearance of dehydrated products were 6.84, 6.92 and 7.46 in control, 0.5%

**TABLE-3 : Effect of drying method and treatment on the dry matter content and drying time of oyster mushroom (*P.sajor caju*)**

Method of drying	Treatments	Dry	
		Matter (%)	Time(min)
Sun drying	Control	10.4	720
	Water blanched	10.3	660
	0.5%kms blanched		
Hot air oven drying at (60°C)	Control	10.0	200
	Water blanched	10.0	180
	0.5%kms blanched	10.0	160

kms and water blanched samples dried by sundrying method and 6.82,7.46 and 7.91 respectively for products dried by hot air oven drying method. The appearance of the product was better in hot air oven dried samples. There was also significant differences in the treatments and the good results were in blanched samples than 0.5% kms and control samples. Blanching enhances the score values due to the controlling of browning reactions.

The mean score values for colour of dehydrated products were 5.70,6.92 and 7.46 in control, 0.5% kms and water balanced samples dried by sun drying method and 6.38,7.38 and 7.61, respectively for the product dried by hot air oven drying method. Better results were in hot air oven dried method and blanching treatments and the values were significant at 5% level.

The mean score value for flavor of dehydrated products were 6.31,5.98 and 7.11 in control, 0.5% kms and water balanced samples dried by sun drying method and 7.20,7.32 and 7.82 respectably for product dried by hot air oven drying method. The values were better in hot air oven dried and blanched samples and significant at 5% level.

The mean score values for taste of dehydrated products were 6.05,6.42 and 6.0 in control, 0.5% kms and water balanced samples

dried by sundrying method and 7.35,7.99 and 7.62 respecting for product dried hot air oven drying method. The values were better in hot air oven dried samples. However, 0.5% kms treatment given to the samples gave good taste in both the processes involved for drying.

The mean score values for overall acceptability of dehydrated products were 6.67,7.00 and 7.20 in control, 0.5% kms and water balanced samples dried by sundrying method and 7.29,7.82,7.12, respectively for products dried by hot air oven drying method. The values of overall a acceptability were better in hot air oven dried and blanched samples and significant at 5% level. On the basis of above results, it was concluded that hot air oven drying method and 0.5% kms treatment given to the samples before drying could be recommended for dehydration of the mushrooms.

#### **Sensory evaluation of rehydrated mushroom processed by different drying methods and treatments**

The results shows that the mean score values for appearance were 6.42, 6.52 and 7.70 in control, 0.5% kms and water blanched samples for sundried samples and 7.36, 7.05 and 7.32, respectively for hot air oven dried products. Drying methods did not affect the appearance of the product as the values were non significant (Table-6).

TABLE-4 : Weight loss (%) of mushroom processed by different drying methods and treatments

Methods/ Treatment	Weight loss (%) Duration hour/Min.											
	1.0 hr 20 Min.	2.0 hr 40 Min.	3.0 hr 60 Min.	4 hr 80 Min.	5 hr 100 Min	6 hr 120 Min	7 hr 140 Min	8 hr 160 Min	9hr 180 Min	10 hr 200 Min	11 hr 220 Min	12 hr 240 Min
Sundrying Hot air	7.39	16.17	26.38	37.83	49.17	62.90	73.26	79.25	83.98	87.37	89.68	89.68
Oven drying	17.65	26.64	36.58	47.78	9.60	71.11	80.98	87.30	89.92	89.99	89.99	89.99
SE <sub>M</sub> ±	0.09	0.10	0.08	0.08	0.13	0.35	0.08	0.07	0.07	0.05	0.08	0.03
CD 5%	0.27	0.31	0.27	0.24	0.40	1.08	0.26	0.20	0.24	0.16	0.26	0.10
Control	10.78	18.39	27.03	36.83	46.70	58.36	70.76	78.60	85.23	87.30	88.90	89.79
0.5 %	12.42	21.44	31.80	42.82	54.48	68.00	77.59	85.15	87.36	88.86	89.84	89.84
Kms Blanching	14.37	24.40	35.60	48.77	61.98	74.66	83.01	86.08	88.27	88.27	86.86	89.86
SE <sub>M</sub> ±	0.11	0.12	0.10	0.09	0.16	0.43	0.10	0.08	0.09	0.06	0.10	0.04
CD 5%	0.33	0.38	0.31	0.30	0.49	1.32	0.39	0.25	0.29	0.19	0.32	0.12

TABLE- 5 : Rehydration behavior of oyster mushroom (*Pleurotus sajor caju*) processed by different drying methods and treatments

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Drying Method	Treatments	Weight( g)					Rehydration Ratio
		Initial	Dehydrated	Rehydrated	Rehydrated to initial wt		
Sundering	Control	51.84	5.82	18.83	0.36	3.24	
	0.5%kms	51.52	6.37	18.63	0.36	2.93	
	Blanching	52.62	6.70	18.26	0.34	2.73	
	Mean	51.99	6.30	18.57	0.36	2.93	
Hot air oven drying	Contro	50.35	5.10	12.48	0.26	2.45	
	10.5% kms	50.56	5.21	12.26	0.24	2.35	
	Blanching	50.63	6.83	13.86	0.27	2.03	
	Mean	50.51	5.71	12.87	0.26	2.28	
SE <sub>M</sub> ±		0.93	1.14	0.09	0.11	0.26	
	CD 5%	NS	NS	0.28	0.34	0.77	

TABLE - 6 : Mean score values of various sensory attributes of dehydrated and rehydrated mushroom (*P.sajor caju*)

Products	Treatments	Colour	Flavour	Appearance	Taste	Overall acceptability
Dehydrated mushroom	Sundried					
	Control	5.70	6.31	6.84	7.05	6.67
	0.5% Kms	6.92	5.98	6.92	6.42	7.00
	Blanching	7.46	7.11	7.46	6.00	7.20
	Hot air oven dried					
	Control	6.38	7.20	7.82	7.35	7.29
	0.5% Kms	7.38	7.32	6.46	7.99	7.82
	Blanching	7.61	7.82	7.91	7.62	7.12
	SE <sub>M</sub> ± (D)	0.07	0.06	0.06	0.14	0.06
	CD%	0.21	0.19	0.18	0.44	0.19
	SE <sub>M</sub> ± (T)	0.08	0.08	0.07	0.17	0.08
	CD	0.26	0.23	0.21	NS	0.23
	Sundried					
RehydratedMushroom	Control	5.12	6.12	6.42	6.93	6.89
	0.5% Kms	6.18	6.20	6.52	6.27	6.86
	Blanching	7.20	6.69	7.70	6.40	6.90
	Hot air oven dried					
	Control	6.21	6.89	7.36	7.00	7.00
	0.5%Kms	7.92	6.72	6.05	7.67	7.49
	Blanching	7.20	6.82	7.32	7.27	7.28
	SE <sub>M</sub> ±(D)	0.22	0.06	0.14	0.58	0.08
	CD5%	0.67	0.18	NS	0.17	0.26
	SE <sub>M</sub> ±(T)	0.27	0.07	0.17	0.07	0.10
	CD 5 %	0.83	0.22	0.54	NS	NS
	Method(D) Treatment (T)					

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However, effect of treatment showed significant differences and the better results were in blanched samples in comparison to the 0.5% kms treated and control samples.

The mean score values for colour were 5.12, 6.18 and 7.20 in control 0.5% kms and water blanched samples for sundried products and 6.21, 7.92 and 7.20 respectively for hot air oven dried products. The better results were in hot air oven dried and blanched products.

The mean score values for flavour were 6.12, 6.20 and 6.69 in control 0.5% kms and water blanched samples for sundried products and 6.89, 6.72 and 6.82 respectively for hot air oven dried products. The above observations show that oven dried samples had better results in comparison to the sun dried sample. Flavour of control and 0.5% kms treated samples did not differ significantly.

The mean score values for taste of rehydrated products were 5.93, 6.27 and 6.40 in

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control, 0.5% kms and water blanched samples for sundried products and 7.00, 7.67 and 7.27 respectively for hot air oven dried products. Effect of hot air oven drying method gave better taste and the values were significant at 5% level. However, no significant differences were observed in 0.5% kms and water-blanched samples.

The overall acceptability of the rehydrated products reveals that the values for overall acceptability were 6.89, 6.86 and 6.90 for control, 0.5 % kms and water blanched samples on sundrying and 7.00, 7.49 and 7.26 respectively on hot air oven drying method carried out for processing of the mushrooms. Hot air oven drying method gave good results. However, treatments given to the mushrooms did not affect the overall acceptability of the product.

On the basis of above observations, it was concluded that hot air oven drying method with 0.5% kms treatment could be recommended for processing of the mushroom.

### References

1. ANON, (1944) Vegetables and fruit dehydration. US, Dept. *Agr, Misc. publ.* P-540.
2. AOAC, (1992) Official method of analysis, Association of the official analytical chemist 8<sup>th</sup> edn. Vol. I minnesta UAS.
3. BISARIA, R., MADAN, M., BISARIA, V.S. AND MUKHOPADHYAY, S.N. (1987) Amino acid composition of the mushroom, *Pleurotus sajor caju* cultivated on different agro residues. *Biological wastes* **20** : 251-259.
4. CHANG, S.T. AND HAYES, W.A. (1978) The Biology and cultivation of edible mushrooms, *Aca*
5. CHANG, S.T., LAN, O.W. AND CHO, K.Y. (1981) The cultivation and nutritional value of *Pleurotus sajor caju*. *Eur. Appl. Microbio. Biotechnol* **12** : 58-62. demic press New York 819 pp.
6. DANG, R.L. AND SINGH, R.P. (1978) Preservation of mushroom. In: Atal. C.K. Bhat, B.K. Kaul, T.N. (eds). *Indian Mushroom Science. Proceedings of first symposium on survey and cultivation of edible mushrooms in India.* Regional Research Laboratory Jammu PP. 215-223.
7. FOOD AND AGRICULTURE ORGANISATION (1968) Food composition, table for use in East Asia. Food Policy and Nutrition Division, Food Agricultural Organization, UN. Rome.
8. HASSID, AND ABRAHAMI, (1973) Method in enzymology. *Ind. Engg. Chem, Ana Ed*, **9**:288.
9. KAR, A. AND GUPTA, D.K. (2003) Air-drying of osmosed button mushroom. *J. Food Sci. Technol.* **40** (1): 23-27.
10. KAPOOR, J.N. (1999) Paddy straw mushroom. *Mushroom cultivation* page 66.
11. KOHLII, M.S. (1991) Post harvest technology of mushroom and prospects of opening up new avenues through processing units for popularising mushrooms cultivation, paper presented at the National Symposium on mushrooms. Tiruanantpuram 22-24 January.
12. MEHTA, K.B. AND JANDAIAK, C.L. (1989) Storage and dehydration studies of fresh fruit bodies of dhangari mushrooms *Pleurotus sapidus*. *Indian J. Mushroom* **15** :17-22.



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13. MARIMUTHU, T., KRISHNAMOOARTHY, A.S., SIVAPRAKASAM, K. AND JOHN, R. (1989) Oyster mushroom production. Tamil Nadu Agriculture University coimbatore PP 6-8.
14. MUDAHAR, G. S. AND BAINS, G.S. (1982) Pretreatment effects on colour of dehydrated *Agaricus bisporus* mushroom. *Indian food Packer* **36** (2): 19-27.
15. PRUTHI, J.S., GOPALAKRISHNAN, M. AND BHAT, V. (1978) Studies on the dehydration of tropical paddy straw mushroom. *Indian. Food. Packer* **36**: 19-27.
16. RAI, R.D. AND SOHI, H.S. (1988) How protein rich are mushroom. *Indian Horticulture*. **33** (2): 2-3.
17. RAI, R.D. AND ARUMUGANATHAN, T. (1997) Nutritive value of mushrooms Advances in Mushroom Biology and Production (Rai, Dhar and Verma eds), MSI Solan.20-29.
18. SAXENA, S. AND RAI, R.D. (1989) Post harvest technology of mushroom technical bulletin 2. National center on mushroom production and Training solan.42-45.
19. SINGH, M.S., VERMA, R.N. AND BILGRANI, K.S. (1991) Nutritional and toxicological evaluation of pleurotus spp. *J. Food. Sci. Technol.* **28** (4): 259-260.
20. SU, O.T. AND SETH, L.N. (1940) Cultivation of the straw mushroom. *Indian Farming* (1): 332-333.
21. SUGUNA, S., USHA, M., SREENARAGYAMAN, V.V., RAGHPATHY, R. AND GOTHAANDAPANI, J.L. (1995) Dehydration of mushroom by sundrying. This layer drying Fluidized bed drying and solar cabinet drying. *J. Food Sci. Technol.* **32** (4):284-288.