The Pharma Innovation Journal 2023; 12(2): 2076-2078

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(2): 2076-2078

www.thepharmajournal.com
Received: 24-12-2022
Accepted: 26-01-2023

Suhani Sajad
Division of Food Science and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Jagmohan Singh
Division of Food Science and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Neeraj Gupta
Division of Food Science and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Sushil Sharma
Division of Agriculture engineering, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Manish Sharma
Division of Statistics and computer sciences, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Vikas Sharma
Division of Biochemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Uma Shankar
Division of Entomology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Corresponding Author:
Suhani Sajad
Division of Food Science and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir, India

Physico-chemical, color profile and total phenol content of freeze dried (Oyster mushroom) *Pleurotus ostreatus*

Suhani Sajad, Jagmohan Singh, Neeraj Gupta, Sushil Sharma, Manish Sharma, Vikas Sharma and Uma Shankar

Abstract
In this study, the physicochemical properties of freeze dried oyster mushroom powder were analyzed. The proximate composition result showed that oyster mushroom contains moisture content 4.98%, protein content 22.97%, crude fat 3.17%, total ash 7.54%, fiber content 25.44% and carbohydrate content was found to be 61.34%, respectively. The bulk density which is an important functional parameter was found to be 0.59 g/ml and the total phenol content was found to be 35.46 mgGAE/g. The color profile of freeze dried oyster mushroom i.e; L* value found to be 82.42, a* value of 1.49 and b* value 12.42. By virtue of having high fibre, protein with low fat and high phenol content, oyster mushroom powders can be considered as a functional food, which can provide health benefits.

Keywords: Physico-chemical, phenol content, freeze dried, oyster mushroom, *Pleurotus ostreatus*

Introduction
With an increase in the world population, interest in the cultivation and subsequent consumption of mushrooms as a food source has increased. Since 1990, the world started focusing on the mushroom industry, and it resulted in a rapid increase in its production. Mushrooms have become one of the most important sources of functional food and medicines in recent years (Fogarasi *et al*., 2018) [5]. The demand for edible mushrooms has increased due to their taste, flavor, and nutrient content. Oyster mushrooms are edible fruiting fungi associated with the genus *Pleurotus* and are popularly known as dhingri in India. Oyster mushroom belongs to class Basidomycetes and family Agaricaceae. The Pleurotus genus is comprised of about 40 species but *Pleurotus ostreatus, Pleurotus florida, Pleurotus eryngii, Pleurotus tuberegium* and *Pleurotus sajor-caju* are common ones (Kues *et al*., 2017) [7]. However, the presence of large amount of moisture in *Pleurotus* mushrooms makes them highly susceptible to spoilage with a shelf life of only 2-3 days. Dehydration is a traditional method of food conservation, based on the principle that the reduction of the water activity during drying inhibits microbiological and physicochemical changes responsible for spoilage (Diamantopoulou *et al*., 2015) [3]. A number of methods can be employed for drying of oyster mushrooms, sun and solar drying being traditional ones. The sun and solar drying have disadvantages of fluctuating temperature, uncontrolled humidity and unhygienic conditions resulting in poor quality food products (Inyang *et al*., 2017) [6]. Quick and effective drying techniques that can reduce the nutritional loss have acquired considerable interest. The conventional oven drying is one of the economical and controlled ways of drying, but at a higher temperature, it may lead to deterioration of colour and heat labile nutrients like vitamin C. When compared to the air drying technique, freeze drying or lyophilization is a better technique of moisture removal with higher-quality finished products. When compared to heat-treatment procedures, freeze-drying has been recognised as an excellent approach for drying by-products with low degradation of available food nutrients (Maisnam *et al*., 2017) [9]. It is based on principle of sublimation employs low temperature and vacuum thereby preserving natural colour, maximum nutrients, original flavour, texture and aroma of food products. Freeze drying minimizes lipid oxidation and degradation of bioactive components and is therefore, applied for long-term storage of foods on industrial scale (Kumar *et al*., 2015) [8].

Materials and Methods
Freshly harvested oyster mushrooms (*Pleurotus ostreatus*) were obtained from the Division of Plant Pathology, SKUAST-Jammu Chatha.

Fresh mushroom samples, free from blemishes, were washed thoroughly under running tap water to remove adhering soil particles. oyster mushroom slices were frozen in a conventional freezer, and then left in the freeze-drier for 24 h at a temperature -80 °C, followed by grinding using a grinder.

Proximate composition

The moisture, crude protein, crude fat, crude fiber, total ash content and total carbohydrate of sample were determined according to (AOAC 2012) [1] method. The moisture content was measured by hot air oven method at 105 °C. Crude protein content (N ×4.38) was determined by Kjeldahl method. Crude fat was calculated by extracting sample using petroleum ether as solvent in Soxhlet apparatus. Crude fibre was measured by digesting fat free sample with dilute sulphuric acid and sodium hydroxide followed by filtering through Whatman filter paper no. 4 and ash content was calculated by incinerating in a muffle furnace at 600±10 °C for 8 hours. Carbohydrate content was estimated by the difference method by subtracting the total sum of moisture, crude fat, crude protein, and ash contents from 100.

Total carbohydrate (%) = 100-(moisture %+ crude fat %+ crude protein % +total ash content %)

Color measurement

The Colour of the sample was determined by Color Flex Spectrocolorimeter (Hunter Lab D-25, Ruston, USA) which was calibrated using a white reference tile. The L*, a*, b* values are tristimulus values. '' L*'' denotes lightness-to-darkness from 100 to 0 units, respectively; '' a*'' represents redness (+a) to greenness (-a), and '' b*'' represents yellowness (+b) to blueness (-b).

Bulk density

Bulk density was determined by known method (Maninder *et al.*, 2007) [10] with slight modifications. Flour sample (10 g) was measured in a graduated cylinder (25 mL) after tapping the cylinder on a laboratory bench several times until no visible decrease in volume was noticed. The bulk density based on the weight (g) and volume (mL) was calculated.

$$\text{Bulk density (g/ml)} = \left(\frac{\text{Weight of sample (g)}}{\text{Volume of sample after tapping (ml)}}\right)$$

Total phenol content

Determination of total phenolic content was based on the Folin-Ciocalteau assay as described by (Elmastas *et al*., 2007) [4] using gallic acid as standard. Each extract (1 mL) was mixed with 1 mL of saturated sodium carbonate solution and 0.4 mL Folin-Ciocalteau reagent. Incubate at 27 °C for 1h and absorbance was recorded at 765 nm.

Statistical analysis

All experiments were carried out in triplicates. The results were presented in the form of mean ± standard deviations. All the statistical analyses were conducted using R (4.2.2) software. At the 95 % confidence level (p<0.05), the mean values were considered as significantly different

Result and Discussion

Proximate composition

Table 1 shows the proximate composition of freeze dried oyster mushroom powder i.e. moisture content, crude protein, crude fat, crude fibre and ash content were found to be 4.98, 22.97, 3.17, 25.44 and 7.54 percent. Carbohydrate content was found to be 61.34 percent, respectively. These values were in accordance with the results of (Das *et al.*, 2020) [2] who reported moisture content of 12.21 percent, 20.21 percent crude protein, 3.28 percent crude fat, 27.0 percent crude fibre, 3.24 percent ash content and 56.9 percent carbohydrate content in *Pleurotus sajor-caju* powder. The bulk density of oyster mushroom powder was found to be 0.59 g/ml because of high molecular weight β-glucan present in oyster mushroom powder. Similar results were also observed by (Oluwafemi *et al.*, 2016) [11] who reported the bulk density of 0.60 g/ml oyster mushroom. One of the most important quality parameters of dried products is color. The drying methods had significant impact on colour profile of mushrooms. The decrease in lightness (L ∗ value) or an increase in yellowness (b ∗ value) is regarded as the important indicator of colour deterioration for mushrooms as it can be related to the sensitivity of mushrooms to high temperature The color values (L*, a*, b*) of oyster mushroom powder were found to be 82.42, 1.49 and 12.42, respectively which were in accordance with the findings of (Ucar *et al.*, 2019) [12] who reported L*, a* and b* values of 84.72, 1.66 and 14.84, respectively in freeze dried *Pleurotus ostreatus.* The phenol content of oyster mushroom was found to be 35.46 mgGAE/g, this is because during freeze drying the formation of ice crystals in cells of sample may disrupt the cellular structure allowing easy access of solvents and enhanced extraction of phenolic compounds leading to the better retention of phenolic content.

Table 1: Physico-chemical composition of freeze dried oyster mushroom powder

Raw Material	Oyster Mushroom
Proximate components	Mean±S.D
Moisture (%)	4.98±0.05
Crude protein (%)	22.97±1.87
Crude fat (%)	3.17±0.52
Crude fibre (%)	25.44±1.01
Total ash (%)	7.54±0.87
Available Carbohydrate (%)	61.34±2.22
Techno-functional properties	
Bulk density (g/ml)	0.59±0.06
Total phenol content (mg GAE/g)	35.46±1.01
Colour Measurement	
L*	82.42±2.1
a*	1.49±0.08
b*	12.42±1.30

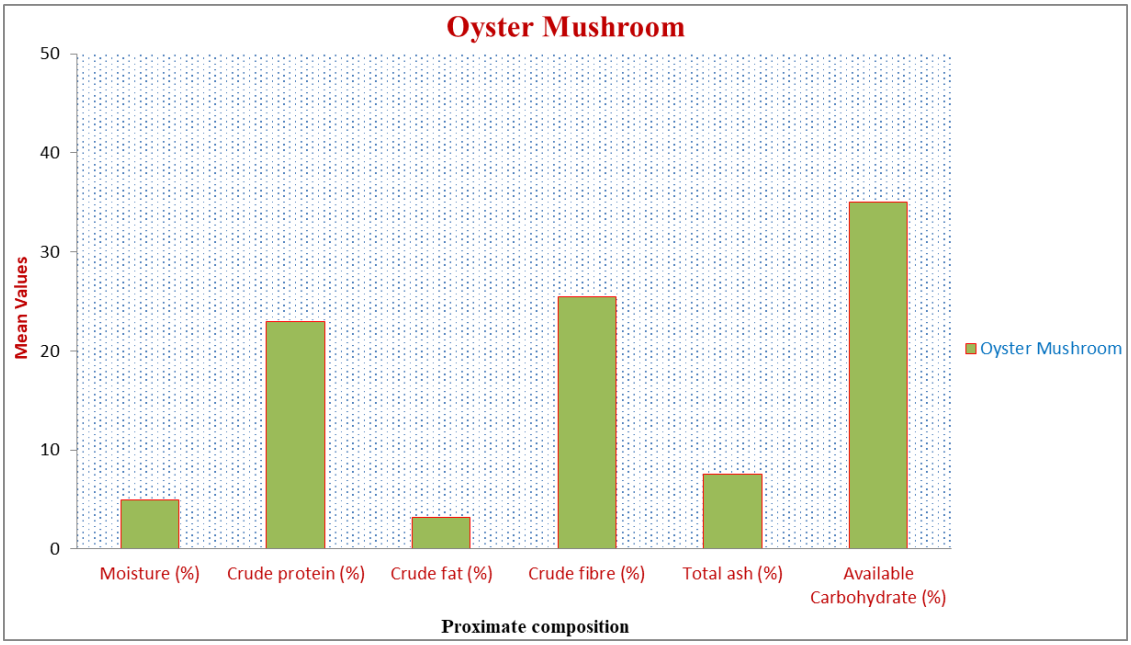

Fig 1: Bargraph of proximate composition with respect to mean

Conclusion

These results indicate that freeze dried oyster mushroom could be very beneficial to be used in food formulation as it retains nutrients without affecting the quality. The freeze drying employs low temperatures and vacuum resulting in lesser nutrient loss and as a potential source of natural antioxidants for food supplements as well as in the development of nutraceuticals. Thus, freeze drying can be highly recommended as the best drying method resulting in better retention of the nutritional content and bioactive compounds.

References

1. AOAC. AOAC official methods of analysis (18th ed.): AOAC international, Gaithersburg, USA; c2012.
2. Das R, Sarker M, Lata MB, Islam MA, Al Faik MA, Sarkar S. Physicochemical properties and sensory evaluation of sponge cake supplemented with hot air and freeze dried oyster mushroom (*Pleurotus sajor-caju*). World Journal of Engineering and Technology. 2020;8(04):665.
3. Diamantopoulou P, Philippoussis A. Cultivated mushrooms: preservation and processing. Handbook of vegetable preservation and processing. 2015. p. 495-525.
4. Elmastas M, Isildak O, Turkekul I, Temur N. Determination of antioxidant activity and antioxidant compounds in wild edible mushrooms. Journal of Food Composition and Analysis. 2007;20(3-4):337-345.
5. Fogarasi M, Socaci SA, Dulf FV, Diaconeasa ZM, Fărcaș AC, Tofană M, *et al*. Bioactive compounds and volatile profiles of five Transylvanian wild edible mushrooms. Molecules. 2018;23(12):3272.
6. Inyang U, Oboh I, Etuk B. Drying and the different techniques. International Journal of Food Nutrition and Safety. 2017;8(1):45-72.
7. Kües U, Badalyan SM. Making use of genomic information to explore the biotechnological potential of medicinal mushrooms. Medicinal plants and fungi: recent advances in research and development. c2017. p. 397-458.
8. Kumar SS, Manoj P, Shetty NP, Giridhar P. Effect of different drying methods on chlorophyll, ascorbic acid and antioxidant compounds retention of leaves of *Hibiscus sabdariffa* L. Journal of the Science of Food and Agriculture. 2015;95(9):1812-1820.
9. Maisnam D, Rasane P, Dey A, Kaur S, Sarma C. Recent advances in conventional drying of foods. Journal of Food Technology and Preservation, 2017, 1(1).
10. Maninder K, Sandhu KS, Singh N. Comparative study of the functional, thermal and pasting properties of flours from different field pea (*Pisum sativum* L.) and pigeon pea (*Cajanus cajan* L.) cultivars. Food chemistry. 2007;104(1):259-267.
11. Oluwafemi GI, Seidu KT, Fagbemi TN. Chemical composition, functional properties and protein fractionation of edible oyster mushroom (*Pleurotus ostreatus*). Annals Food Science and Technology. 2016;17(1):218-223.
12. Ucar TM, Karadag A. The effects of vacuum and freeze-drying on the physicochemical properties and *in vitro* digestibility of phenolics in oyster mushroom (*Pleurotus ostreatus*). Journal of Food Measurement and Characterization. 2019;13:2298-2309.