# Effect of Different Substracts on the Nutritional Composition and Protein Profiling of Oyster Mushroom, *Pleurotus florida* (Mont.) Singor

Asha D. V. Bensy and G. Johnsi Christobel

[1]Research Scholar, Register No. 18213112142012, Department of Botany, Nesamony Memorial Christian College, Marthandam 629 165, Kanyakumari District

[2]Department of Botany, Nesamony Memorial Christian College, Marthandam 629 165, Kanyakumari District

Affiliated to Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli 627 012, Tamilnadu, India.

***Abstract*:** Cultivation of oyster mushroom, *Pleurotus florida* is highly economical, and is also useful for waste recycling and utilization of low cost waste as substrate. It produced protein rich food and reduced environmental pollution. In the present study of *P. florida* grown on different substrates including, seaweeds. The nutrient contents such as, protein, carbohydrate, fat and sugar fruiting bodies of *P. florida* were analysed. Results showed that there was variation in the nutritional content of fruiting bodies of *P. florida* cultivated on various substrates. The protein content was higher in *P. florida* cultivated in *V. pachynema* substrate. The reducing sugar content of *P. florida* was almost similar in all the substrates utilized in the study. Sodium dodecyl sulphate polyacrylamide gel electrophoresis analysis of protein extract of *P. florida* cultivated in *V. pachnema* substrate showed high density protein bands.

**Keywords:** Oyster mushroom, *Pleurotus florida*, substrate, seaweed, protein.

## I. INTRODUCTION

Mushrooms are defined as macrofungi which belongs to the class Ascomycetes with a distinctive fruiting body that may be above or below ground and can be seen with our naked eye. They are considered to as nutritious food and used for the prevention and treatment of diseases. Oyster mushroom is a macrofungi and it is fast growing fungi belonging to the genus *Pleurotus*. It degrades dead woods and largely cultivated on lignocellulosic waste (Oei and Nieuwenhuijen, 2005). It grows in tropical and temperate regions of forest and grows in 20 – 30 ºC temperature. Oyster mushrooms are valuable health food, low in calories and proteins (Yashvant et al., 2012). *Pleurotus florida*, one among the oyster mushroom belongs to the family Pleurotaceae and it is commonly called as Dhingri in India. This mushroom is an edible mushroom having excellent flavor and taste. Its productivity is maximum in a short time providing more protein per unit area. It is more advantages in terms of easiness in cultivation, plays critical role in bio degradation and bio-remediation.

*Pleurotus florida* is naturally grow on the trunks,leaves and roots of the trees and decaying wood part (Iwalokun et al., 2001). The substrates supported mycelical growth and development of fruiting bodies of the fungus. It is usually cultivated on rice, wheat straw substrates. It can be grown on lignocellulosic wastes like straw of sorghum and maize, cotton stalk, pea shells, banana leaves, ground nut shells, sugarcane bagasse, chopped cocoa pods, sunflower husks etc. (Siddhant et al., 2013; Abeha et al., 2015; Wenjie et al., 2013; Bandopadhyay., 2013). The nutrient constituent of the substrate utilized for mushroom cultivation has an effect on the growth of mushroom quality of crop yield (Kues and Liu, 2000). Limited studies were performed on the use of sea weed as substrates for mushroom cultivation. So the present study was carried out to find out the nutrient content of *P. florida* cultivated in different substrates such as, *G. corticata*, *S. tenerrium*, *V. pachynema* and *E. crassipes*.

Mushroom contains 20.35% of protein, which is higher than vegetables and fruits. It also contains most of the amino acids. Mushrooms are considered as “poor man’s protein” and it can be used for the food to solve the malnutrition in human population. The quantitative analysis of proteins revealed great intra and inter species differences. This variety can also be seen from their different nutritional values (Petrovska and Ilievska, 2000; Stankeviciene and Urbonas, 1988). In the present study, protein profile of *P. florida* which was grown on various substrates were analyzed using sodium dodecyl sulphate polyacrylamide gel electrophoresis.

## II. MATERIALS AND METHODS

The experiment was carried out at the mushroom culture house located in the campus of Department of Botany, NMCC, Marthandam, Kanyakumari District, Tamilnadu, India. The edible oyster mushroom species, *Pleurotus florida* was selected for the present study. The spawn was purchased from University Agricultural College, Vellayani, Trivandrum. In the present study, eight different substrates including agricultural wastes, aquatic weed and seaweed biomass were used for mushroom cultivation. The substrates were prepared the method proposed by Diriba et al. (2013). Mushroom beds were prepared and the inoculated bags were incubated for 18 days at 28-31 ºC in mushroom cultivation room. After full growth of mushroom species on each substrates the basidiocarps were collected and analyzed the proximate composition of nutrient viz., crude fat, carbohydrate, soluble protein and reducing sugar.

### Nutritional Analysis

The harvested fruiting bodies of *P. florida* were air dried at room temperature and powered. The powered fruiting bodies were analysed for total carbohydrate, total fat content, soluble protein and reducing sugar by the standard procedure. The reducing sugar content was estimated by the method proposed Duboise et al. (1956). The carbohydrate content was analysed by the method

of Duboise et al. (1956). The fat content was estimated by the method of Folch et al. (1956). The total soluble protein content was analysed the method of lowery et al. (1951).

**SDS- PAGE analysis**

SDS- PAGE analysis of samples was carried out by the method of Laemmli (1970). The molecular weight of proteins was determined by comparison with standard molecular marker proteins (Promega Corporation USA). The protein samples of *P. florida* grown on different substrates were subjected to SDS- PAGE analysis. The gel was stained, destained and documented.

## III. Results and Discussion

The nutritional content of fruiting bodies of *P. florida* cultivated on different substrates are presented in Table 1 and Figure 1. The nutrient content varied based on the substrate used for culture. Table 1 showed that the fruiting body of *Pleurotus florida* cultivated in paddy straw contains high fat (0.92±0.04 g%) and carbohydrate (2.66 ±0.16 g%) content. However, the *Pleurotus florida* cultivated in *V. Pachynema*, a green seaweed contains high protein content (55.66± 5.35 g%) and low fat and carbohydrate content (0.31±0.01 g% and 1.06±0.02 g%, respectively). When *P. florida* cultivated in *Eichhornia crassipes* as the substrate, equal quantity of all the nutrients were present, compared with other substrates. Total protein content of *P. florida* was low (15±1.73 g%), when this was cultivated in *Sargassum tenerrium*, a brown algae as the substrate. More or less equal quantity of reducing sugar was present in *P. florida* cultivated in all the substrates used (0.132 to 0.137± 0.001 g%) (Table 1).

**Table 1. Nutritional content of fruiting bodies of *P. florida* cultivated on different substrates**

| Sl No: | Substrate Used | Fat ($100g^{-1}$) | Total Carbohydrate ($100g^{-1}$) | Soluble protein ($100g^{-1}$) | Reducing Sugar ($100g^{-1}$) |
|---|---|---|---|---|---|
| 1 | *Paddy Straw* | 0.92±0.04 | 2.66±0.16 | 45.33±1.45 | 0.135±0.001 |
| 2 | *Eichhornia crassipes* | 0.46±0.02 | 1.11±0.06 | 20.16±0.60 | 0.137±0.001 |
| 3 | *Sargassum tenerrium* | 0.46±0.01 | 1.49±0.02 | 15±1.73 | 0.133±0/001 |
| 4 | *Gracilaria corticata* | 0.76±0.03 | 1.34±0.03 | 24.33±0.88 | 0.137±0.001 |
| 5 | *Valoniopsis pachynema* | 0.31±0.01 | 1.06±0.02 | 55.66±5.35 | 0.132±0.00. |

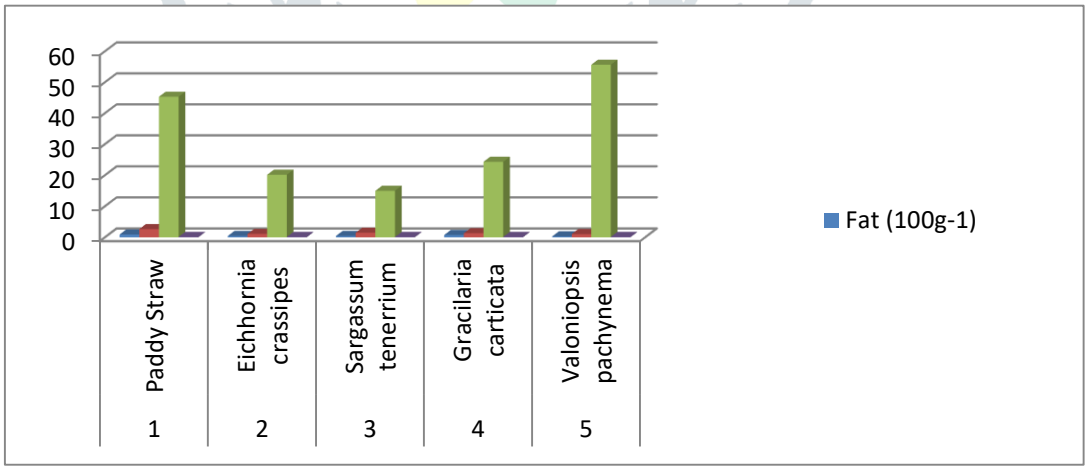


**Fig.1. Nutritional content of fruiting bodies of *P. florida* cultivated on different substrates**

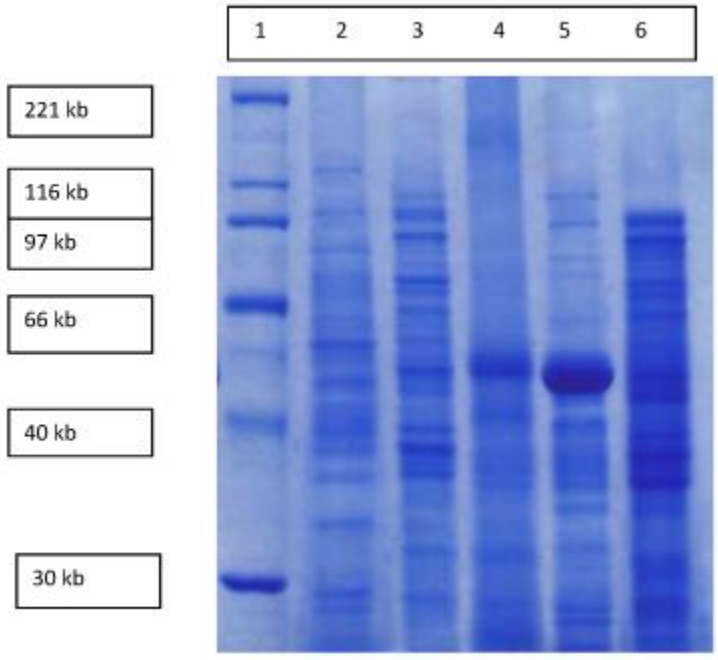


**Fig. 2. Protein profile of *P. florida* cultivated on different substrate (Lane 1 : Marker, Lane 2 : Paddy Straw, Lane 3 : *V. Pachynema*, Lane 4 : *S. tenerrium*, Lane 5 : *G. corticata substrate* and Lane 6 : *E. crassipes substrate*).**

**Table 2. SDS – PAGE pattern of Quantitative analysis of protein from *P. florida* cultured using Paddy Straw.**

| Band | Rf Value | Raw volume | Molecular Weight |
|---|---|---|---|
| 1 | 0.148 | 982 | 137 |
| 2 | 0.22 | 935 | 109 |
| 3 | 0.315 | 1153 | 82 |
| 4 | 0.436 | 681 | 60 |
| 5 | 0.466 | 777 | 56 |
| 6 | 0.534 | 716 | 49 |
| 7 | 0.68 | 1049 | 38 |
| 8 | 0.706 | 707 | 37 |
| 9 | 0.819 | 910 | 33 |
| 10 | 0.923 | 913 | 30 |

**Table 3. SDS – PAGE pattern of Quantitative analysis of protein from *P. florida* cultured using *V. Pachynema*.**

| Band | Rf Value | Raw volume | Molecular Weight |
|---|---|---|---|
| 1 | 0.197 | 794 | 117 |
| 2 | 0.249 | 918 | 100 |
| 3 | 0.284 | 541 | 90 |
| 4 | 0.345 | 745 | 76 |
| 5 | 0.42 | 888 | 63 |
| 6 | 0.452 | 448 | 58 |
| 7 | 0.533 | 830 | 49 |
| 8 | 0.614 | 583 | 42 |
| 9 | 0.643 | 612 | 40 |
| 10 | 0.722 | 921 | 36 |
| 11 | 0.855 | 892 | 32 |

**Table 4. SDS – PAGE pattern of Quantitative analysis of protein from *P. florida* cultured using *S. tenerrium*.**

| Band | Rf Value | Raw volume | Molecular Weight |
|---|---|---|---|
| 1 | 0.562 | 847 | 50 |
| 2 | 0.871 | 1082 | 31 |

**Table 5. SDS – PAGE pattern of Quantitative analysis of protein from *P. florida* cultured using *G. corticata*.**

| Band | Rf Value | Raw volume | Molecular Weight |
|---|---|---|---|
| 1 | 0.198 | 842 | 117 |
| 2 | 0.265 | 1122 | 95 |
| 3 | 0.308 | 1019 | 84 |
| 4 | 0.416 | 1495 | 63 |
| 5 | 0.509 | 993 | 51 |
| 6 | 0.631 | 853 | 41 |
| 7 | 0.753 | 971 | 35 |
| 8 | 0.831 | 608 | 32 |
| 9 | 0.959 | 609 | 29 |
| 10 | 0.985 | 509 | 28 |

**Table 6. SDS – PAGE pattern of Quantitative analysis of protein from *P. florida* cultured using *E. crassipes*.**

| Band | Rf Value | Raw volume | Molecular Weight |
|---|---|---|---|
| 1 | 0.232 | 1206 | 105 |
| 2 | 0.279 | 490 | 91 |
| 3 | 0.331 | 552 | 79 |
| 4 | 0.361 | 422 | 73 |
| 5 | 0.413 | 598 | 64 |
| 6 | 0.525 | 618 | 50 |
| 7 | 0.581 | 333 | 45 |
| 8 | 0.672 | 434 | 39 |
| 9 | 0.739 | 440 | 35 |

Protein extracts of *P. florida* cultivated on different substrates were separated by SDS- PAGE analysis as shown in Fig. 2. The results of quantitative densitometric analysis present in Table 2 and Fig. 2. It showed that great heterogeneity between protein samples of *P. florida* cultivated on different substrates. From the figure 2, it could be noticed that maximum number of protein sub units (11 band) were separated in the protein of *P. florida* cultivated in *V. pachynema* substrate and the molecular masses ranged from (137 - 39 kDa). Followed by, 10 bands of protein subunits were detected in *P. florida* cultivated on paddy straw, and *G. corticata* substrate showed protein subunits with molecular weight ranges from 137 to 30 kDa and 117 to 28 kDa. The number of protein sub unit was 9 bands in *P. florida* cultivated in *E. crassipes* substrate and molecular masses ranged from 105-35 kDa. Very less number of protein sub units was identified in *P. florida* cultivated using *S. tenerrium* as the substrate. The Rf value and the corresponding molecular weight of protein from *P. florida* which was cultured using various substrates were described in Tables 2-6.

## IV. Discussion

Recently there has been a renewed interest in improving health through the use of more natural products (Souza et al., 2005). The nutritional contents of *P. florida* cultivated on different substrate enhanced protein content. Fat and carbohydrate content were higher in *P. florida* cultivated in paddy straw substrate. It was mainly due to the nature of nutrient in the paddy straw, which is a lignocellulosic material which increased the carbohydrate and fat content of *P. florida* compared with other substrates used (Wang et al., 2001). But *V. pachynema* a green seaweed, which increasesd the protein content of *P. florida*. The fat and total carbohydrate content of *P. florida* cultivated in the same substrate was less. So *V. pachynema* can be used to increase the protein content of edible mushroom (Kaaya et al., 2012). The different in crude protein content of *P. lorida* was also due to the different in the nitrogent content of growth substrate and efficiency of mushroom species for utilization and nitrogen fixation by pleurotus species. In the present study more number of proteins was separated in *P. florida* cultivated in *V. pachynema* substrate. These results were coincided to a certain degree with the results of Miletic et al. (1990), revealed the protein profile of mushroom cultured with various natural substrates.

## V. Conclusion

Nutrient content of *P. florida* cultivated on different substrates varied widely. The nutrient content such as fat and carbohydrate content were found to be high in fruiting bodies of *P. florida* cultivated in paddy straw as substrate. The aquatic weed, *E. crassipes* and seaweeds such as, *S. tenerrium, G. corticata* and *V. pachynema* are easily available in enormous quantities in the study area. These substrates are alternate for the cultivation of *P. florida* to replace paddy straw.

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