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# Enzyme profile in the basidiocarp of *Pleurotus. Spp*

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**ABSTRACT**

An *in vitro* investigation was carried out to explore the production of cellulase and xylanase enzyme in the basidiocarp of Pleurotus spp .The result of the study revealed that exo β-1,4 glucanase and β-glucosidase activities were highly pronounced in *Pleurotus ostreatus* (0.87 and 1.29 $Umg^{-1}$ enzyme protein) than *Pleurotus cornucopiae* (0.38 and 0.71 $Umg^{-1}$enzyme protein). Endo β 1,4, glucanase was expressed maximally (1.56 $Umg^{-1}$ enzyme protein) in *P.cornucopiae* than in *P.ostreatus* (1.28 $Umg^{-1}$ enzyme protein). Xylanase activity was registered at a higher level of 0.058 $Umg^{-1}$ enzyme protein in *P.ostreatus* than in *P.cornucopiae* (0.037 I $Umg^{-1}$ enzyme protein)



## Introduction

Mushroom represents a major and yet largely untapped source of potent pharmacological products. Of the approximately 10,000 known species of mushrooms, 2,000 are safe for people's consumption. In the second half of twentieth century, the mushroom producing technologies have grown enormously and the value of world mushroom production was estimated to be worth about eighteen billion US Dollar. Many pharmaceutical substances with potent and unique properties were recently extracted from mushrooms and made their way all over the world.

Mushrooms belonging to the genera *Pleurotus* are also known as 'Oyster mushrooms' because of their characteristic oyster like odor. They are characterized by the production of fruit bodies with an eccentric stalk and a wide cap shaped like an oyster shell, with the widest portion of the cap being away from the stalk. They grow over a wide range of temperatures and are able to colonize a wide spectrum of unfermented, natural, lignino-cellulosic wastes. Because of their fast mycelial growth rate, they colonize the substrates rapidly and so the yield of fruit bodies is also high.

Mushrooms secrete wide range of extra-cellular enzymes. These extra-cellular enzymes are attacking on the lignocellulosic material and convert complex organic matter into soluble substances, which can then, be absorbed by the mushrooms for the purpose of their growth and development of fruiting bodies. For the conversion of cellulose to glucose, hydrolytic enzymes viz., endo-β -1, 4 glucanase (EC 3.2.1.4), exo-β-1, 4 glucanase (EC 3.2.1.91) and β-1, 4 glucosidase (EC 3.2.1.2.1) are involved.

## Material and methods

### Collection and preparation of samples

The basidiocarp of *Pleurotus ostreatus* and *P. cornucopiae* were collected from wooden logs of Kerala and were identified based on the morphology of the pileus and stipe of the basidiocarp. The basidiocarps of the mushroom sample were shade dried and powdered. The powdered sample was used for the study.

### Preparation of enzyme assay from fungal basidiocarp (*Pleurotus ostreatus* and *P. cornucopiae*)

1.0g of powdered basidiocarp was macerated in five ml of sodium acetate-acetic acid buffer (pH 5.2) for endoglucanase assay, five ml of sodium citrate buffer (pH 5.0) for exoglucanase assay, 5 ml of sodium acetate-acetic acid buffer( pH 5.8) for β-glucosidase in a pre-chilled porcelain mortar and pestle with a pinch of acid washed sand. The homogenate was centrifuged in a refrigerated centrifuge at 10,000 x g for 15 minutes. The supernatant served as enzyme source.

## Results and discussion

### Cellulase enzyme complex (Table –I)

Among the cellulase enzyme complex, the highest exo–β–1, 4 glucanase activity recorded was 0.87 $Umg^{-1}$ enzyme protein by *P.ostreatus* and 0.38 U $mg^{-1}$ enzyme protein by *P. Cornucopiae*. The endo–β–1, 4 glucanase activity was very much pronounced in *P.cornucopiae* (1.56 $Umg^{-1}$ enzyme protein) where as β–glucosidase was registered as a least value of (0.71 $Uml^{-1}$ $mg^{-1}$ enzyme protein ).The endo–β–1, 4 glucanase and β–glucosidase activity of basidiocarp of *P. ostreatus* were on par with each other (1.28 $Umg^{-1}$ enzyme protein and 1.29 U $mg^{-1}$ enzyme protein).

The present finding is in accordance with the finding of Choudhary *et al*. (2009). They reported endoglucanase , filterpaper and cellobiase enzyme activities of 1.952, 3.36 and 4.18 IU/100ml respectively in *Volvariella volvacea* (paddy straw mushroom).

Mishra (2009) also reported the production of 0.144 $Uml^{-1}$ of endoglucanase, 0.137 IUml $^{-1}$ of filter paper activity and 0.041$Uml^{-1}$ of cellobiase enzyme activities in *Pleurotus florida* after 15 days of incubation with carboxymethylcellulose as carbon source.

### Xylanase enzyme (Table – I)

Xylanase enzymes are responsible for hemi cellulose degradation. The highest xylanase enzyme activity of 0.058 IU $mg^{-1}$ enzyme proteins was registered by *Pleurotus ostreatus* basidiocarp and 0.036 IU $mg^{-1}$ enzyme protein by *P.cornucopiae*.

The present result is in agreement with the result of Vijaya and Singaracharya (2005). They have obtained 0.094 IU $ml^{-1}$ of

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xylanase enzyme activity in *Pleurotus ostreatus* on different combination of wheat straw and wheat flour.

Choudhary (2009) obtained xylanase enzyme activity of 0.57 IU $ml^{-1}$ during the biodegradation of paddy straw by *Volcariella volvacea.* Mishra (2009) reported that *Pleurotus florida* and *P.sajor caju* showed xylanase activity of 0.059 and 0.076 IU $ml^{-1}$ after 7 days of incubation on Reese mineral medium supplemented with carboxy methyl cellulase as carbon source.

**Conclusion**

Thus, it could be concluded from the present investigation that the enzyme profile of *Pleurotus ostreatus* and *P. cornucopiae* were found to be on par with each other. So the mushroom described as "Queen of vegetables and precious pearls of cookery" can be effectively harnessed for maximum production of cellulolytic enzymes. Cellulolytic enzymes have numerous application and biotechnological potential for various industries including chemicals, fuel, food, brewery, wine, animal feed, textile, laundry, pulp and paper and agriculture (Bhat, 2000).

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**Table – I Cellulase enzyme complex and xylanase enzyme activity**

| S.No | Mushroom | Cellulase enzyme complex | | | Xylanase U $mg^{-1}$ |
|---|---|---|---|---|---|
| | | Endo–β–1, 4 glucanase U $mg^{-1}$ | Exo–β–1, 4 glucanase U $mg^{-1}$ | β–glucosidase U $mg^{-1}$ | |
| 1. | *Pleurotus ostreatus* | 1.28 | 0.87 | 1.29 | 0.058 |
| 2. | *Pleurotus cornucopiae* | 1.56 | 0.38 | 0.71 | 0.037 |
| SED | | 0.02 | 0.02 | 0.03 | .002 |
| CD (P<0.01) | | 0.08 | 0.07 | 0.10 | 0.007 |

*Unit of enzyme activity is expressed $mg^{-1}$ glucose released $mg^{-1}$ enzyme protein