XII. Fibre Content And Enzymatic Digestibility Of The Mycelia Of Lentinus cladopus, Lentinus squarrosulus And Collybia maculata Grown Under Submerged Conditions.

INTRODUCTION

From the available literature it is found that mushrooms contain a considerable amount of fibres in their mycelia. The fibre content perhaps provides indigestibility to human consumption. Several workers have reported the fibre contents in different mushroom species. Anderson and Fellers (1942) and Esselén and Fellers (1946) have reported 10.3% fibres in the sporophores of Agaricus campestris while Humfeld and Sugihara (1949) have analysed 6.92% fibre in the white variety of A. campestris. It has been reported by Jemmison et al. (1957) that Lentinus trigrinus and L. trabea contain 7.6% and 11.8% crude fibre when they are grown in optimal synthetic media. Bano et al. (1964) have reported 8.6% and 11.3% crude fibre to be present respectively in Lepiota sp. and Termitomyces sp. Guha and Banerjee (1973) have reported that the mycelial fibre content is variable from 4.9% - 10.8% in A. campestris. They have also pointed out that fibre content of older mycelium is higher. Lee and Chang (1975) have estimated that the fibre content (dry wt. basis) in Volvariella volvacea is 11.9%.

Ghosh and Sengupta (1977) have studied the fibre content on a comparative basis and have reported that mycelial fibre content is 1.8 times higher than that of fruit body of V. volvacea. Kostadinov and Stefanov (1977) have reported that wild variety of Pleurotus ostreatus contains quantitatively...
more fibres than that of cultivated variety of *P. ostreatus*. Nagchaudhuri (1977) has showed the fibre content in *Tricholoma gigantum* is 5.63%. Generally fresh mushrooms contain a wide range of crude fibre (3-32%). Crisan and Sands (1978) have evaluated the fibre content of several species of *Lentinus*, Collybia and *Tricholoma*. A chemical analysis of 20 edible mushrooms species has revealed that these mushrooms contain 1.49 - 8.17% (dry wt. basis) crude fibre (Garcia et al 1980). Martinez et al (1982) have determined alimentary fibres in *Lactarius deliciosus*. Kurasawa et al (1980) have estimated 5.7 as the mean ratio of crude fibre and dietary fibre in 31 wild and/or cultivated edible fungi. Kikuchi et al (1983) have estimated 0.4-1.7% fibre content in 21 species of edible mushrooms available in Sendai markets. Rao (1983) has reported that mycelia of *Agaricus trisulphuratus*, *Rhodocybe subglaiva* and *Agrocybe praecox* contain 10.4%, 11.8% and 8.5% crude fibre respectively and the digestibility varies from 50.5% to 63.2%. A detailed investigation on fibre content in *Volvariella volvacea* by Zakhary et al (1984) has revealed that it contains 17.4%.

**EXPERIMENTAL PROCEDURES**

**Test-organism:**

The tissue cultures of *Lentinus cladopus* Lew, *Lentinus squarrosulus* Mont. and *Collybia maculata* Ahl & Schw were used in the present investigation. The cultures of each test-fungus were maintained in solid agar slants.
Culture Methods:

Growth media and conditions:

To conduct this investigation both basal synthetic medium and respective optimal synthetic media (compositions given in table-28, chapter-X) were prepared by adding all the nutrients in their respective optimal concentrations on the basis of the results of physiological observations done. Maltose-yeast extract synthetic optimum medium, sucrose-peptone synthetic optimum medium, and Mannitol-yeast extract synthetic optimum medium were used respectively for *L. cladopus*, *L. squarrosulus* and *C. maculata*. The pH of the media of the test-fungi was adjusted to their respective optimal pH value with 0.2M phosphate buffer followed by sterilization at 10 lbs/sq.inch. for 20 minutes. Several 250ml Erlenmeyer flasks containing 50ml of media were then inoculated separately with 1.0ml of cell suspension of each test-fungus and incubated (stationary) for 15 days in complete darkness at their respective optimal temperatures evaluated before.

After 15 days of incubation (optimal for all three test-fungi), the harvested mycelial mat was separated from the adherent media by filtration through a tarred sintered funnel (Jena 10-3) followed by repeated washings with distilled water to remove any trace of media. The mat was then dried to constant weight in a vacuum oven at 60°C for 24 hrs., cooled in a desiccator. They dry weight of the mycelium thus obtained was taken as an index of growth.
Analytical Procedures:

The chemical methods of the Association of Official Agricultural Chemists (A.O.A.C) were followed. The methods used were those which gave the most consistent results. The mycelial material obtained from the test-fungi were ground into fine powder which was dried to constant weight in a vacuum oven at 60°C for chemical analysis of fibre and digestibility in enzymes. The submitted analytical data were always on a moisture free basis and an average of triplicate determinations.

A. Determination of Crude fibre Content:

The fibre content of the dried mycelial powder of the test-fungi was determined following the method of Horowitz (1970) which is exactly similar to the method of Anonymous (1970). A measured amount of 500mg. of dry fat-free mycelial powder was digested consecutively with boiling 1.25% (w/v) H_2SO_4 and 1.25% (w/v) NaOH solution. The undigested residual part was washed several times with 50ml portion of distilled water and 25ml of alcohol and dried to constant weight. The values so obtained were corrected for mineral contents of the sample. The results were expressed as g/100g of mycelial mat.

B. Determination of Enzyme digestibility of mycelium:

Amongst the proteolytic enzymes, pepsin and pancreatin were selected to evaluate the digestibility of the mycelial mat (dry) of the test-fungi growing in both basal and respective
optimal media. A measured amount of 500 mg of dry defatted mycelial powder was incubated with 50 ml of 2% (w/v) enzyme solution (pepsin and pancreatin separately) in citrate buffer of pH 5.0 for 16 hrs. at 37°C under constant shaking. After completion of shaking incubation period, the mixture was centrifuged for the separation of undigested mycelial residue which was washed successively with distilled water and ethanol several times to expel the solvents, dried in a vacuum oven at 110°C for 30 minutes, cooled and weighed. The dry weight of the residual part thus obtained was taken as an index of undigestible residue. The enzyme digestibility was expressed in percentage.

RESULTS AND DISCUSSION

The experimental results (data) under observations are represented in Table-33. The data on fibre content indicate that a considerable decrease in mycelial fibre content occurs at the respective optimal media in all the test-fungi. There is noticeable variations in fibre content among the fungi tested which provides a range from 9.6% to 17.7% in basal medium and 6.0% to 12.8% in optimal media. The fibre content in Lentinus cladopus is comparatively less than that of L. squarrosulus and C. maculata. The probable reasons for the decrease in fibre content of all three test-fungi in their respective optimal media might be due to some alterations in their metabolic activities. The present findings receive a strong support from the reports of several workers (Anderson and Fellers, 1942;
The data on enzymatic digestibility in Table-33 reveal that a little increase in enzymatic digestibility (pepsin and pancreatin) is observed to occur in respective optimal media for all test-fungi. The data also point out that the digestibility in pepsin is comparatively greater than that in pancreatin which put forward a probable suggestion that a relatively greater amount of pepsin-degrading (mycelial protein are present in the test-fungi. Amongst all the test-fungi under investigation maximum digestibility is observed in \textit{L. cladopus} followed by \textit{L. squarrosulus}. 

The findings of Jennison et al. (1957) in \textit{Lentinus tigrinus} and \textit{L. trabea} also strengthens the present view in \textit{L. cladopus} and \textit{L. squarrosulus}. There lies a close symmetry in between the present findings and that of Bano et al. (1964) in \textit{Lepiota} sp. and \textit{Termitomyces} sp. Besides, the report of Guha and Banerjee (1973) in \textit{A. campestris} \textit{S12}, Lee and Chang (1975) and Zakhary et al. (1984) in \textit{V. volvacea} coincide with the present experimental view. The tabulated values of fibre content in several species of \textit{Lentinus} (11.2\%) and \textit{Callybia} (14.4\%) supplied by Crisan and Sands (1978) closely resemble the findings of the present investigation. Slight lower values of crude fibre content have been reported by Nagchoudhuri (1983) in \textit{Tricholoma gigantium} (5.63\%) and by Kikuchi et al. (1983) in several species of edible mushrooms (0.4\% - 1.7\%) available in Sendai market.
and C. maculata in successive order. The data also reveal that there might be a direct co-relation in between fibre content and digestibility. It assumes that fibre content is to some extent inversely proportional to the percentage of digestibility in a word cellular fibre provides indigestibility to human consumption. So it invites further necessary investigations to lower down the fibre content by appropriate chemical medial treatments with simultaneous increase in digestibility. The findings of Rao (1983) in A. trisulphuratus, R. subgliva and A. praecox and that of Saltet (1985) closely resembles the present view.
Table 33. Data (Mean)* showing the fibre content and enzyme digestibility of the mycelia of the test-fungi grown under submerged conditions.

<table>
<thead>
<tr>
<th>Test Organisms</th>
<th>Fibre content g/100g dry wt.</th>
<th>Enzyme digestibility of dried mycelium</th>
<th>Pepain digestibility (%)</th>
<th>Pancreatin digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basal media</td>
<td>Optimum media</td>
<td>Basal media</td>
<td>Optimal media</td>
</tr>
<tr>
<td>Lentinus cladopus</td>
<td>9.6 ±0.04</td>
<td>6.0 ±0.07</td>
<td>55.6 ±0.03</td>
<td>62.6 ±0.04</td>
</tr>
<tr>
<td>Lentinus squarrosulus</td>
<td>12.4 ±0.06</td>
<td>9.86 ±0.01</td>
<td>53.7 ±0.01</td>
<td>54.2 ±0.03</td>
</tr>
<tr>
<td>Collybia maculata</td>
<td>17.7 ±0.09</td>
<td>12.8 ±0.12</td>
<td>52.0 ±0.13</td>
<td>52.2 ±0.07</td>
</tr>
</tbody>
</table>

* Mean data of three replicates conducted under identical conditions.
REFERENCES


