Mushrooms have been used as food and medicine since time immemorial. They are a valuable source of health foods, which are low in calories, and rich in essential amino acids, fiber, important vitamins and minerals. In the last two decades, there has been an upsurge on the use of mushrooms as nutraceuticals and many edible species have been investigated for their therapeutic effects. The active constituents found in mushrooms are polysaccharides, dietary fiber, oligosaccharides, triterpenoids, peptides and proteins, alcohols and phenols, mineral and vitamins etc. (Mizuno, 1995; Matilla et al., 2001; Manzi et al., 2004; Lakhanpal and Rana, 2005; Barros et al., 2007). Mushrooms are a potential source of dietary fiber due to the presence of non-starch polysaccharides. Total dietary fiber in mushrooms is sum of intrinsic and non-digestible carbohydrates, mainly chitin (Vetter, 2007).

Increasing consumer awareness about the potential therapeutic role of the dietary fiber has prompted the search of new dietary fiber sources. Nemours fibers have been isolated and characterized from different sources and incorporated into different food products (Abdul-Hamid and Siew Luan, 2000; Chau et al., 2006). Beneficial roles of the dietary fiber in health and nutrition pertaining to reduction in chronic ailments like cardiovascular disease, diabetes, certain forms of cancer and gastrointestinal disorders have been reported (Schaafsma, 2004; Larion et al. 2005). The insoluble fraction of fiber has been related to the intestinal regulation, whereas soluble fiber is associated to the decrease in cholesterol levels and the absorption of intestinal glucose (Rodriguez et al. 2006). These physiological functions of the dietary fiber are often attributed to their physico-chemical properties viz., water holding capacity, swelling, rheological and fat-binding properties and susceptibility to bacterial degradation or fermentation. The beneficial effects exerted by soluble fiber, lower the cholesterol and the rate of glucose absorption and post-prandial plasma glucose concentrations have been associated to their viscosity (Dikeman et al. 2005).

A considerable portion of mushroom carbohydrates occur in the form of polysaccharides as glycogen and indigestible forms such as dietary fiber, cellulose, chitin and glucans (Manzi and Pizzoferrato, 2000). A number of polysaccharides have been isolated from mushrooms and their chemical structures have been determined.
Commercial importance of fungal polysaccharides has attracted attention in the field of functional foods. Therefore, the present investigation was undertaken to determine the fiber profile mushrooms and to study the fat-binding and swelling capacities of isolated fiber fractions from *Calocybe indica*.

**MATERIALS AND METHODS**

**Procurement of sample:** *Agaricus bisporus* was procured from local market of Anantapur. *Calocybe indica* (Food grade) was procured from Haritha Mushroom Cultivation Center, Kerala. Wild edible mushrooms viz., *Lentinus sp.* and *Agaricus sp.* were harvested from the ‘Western Ghats’ of Coorg district during rainy season. They were identified up to the species level.

**Sample preparation:** The fresh fruiting bodies of the mushroom samples were washed, sliced, oven dried at 40°C for 12 hours, finely powdered to 20 mesh and stored at -4°C until analyzed.

**Fiber profile:** Crude fiber was estimated in the sample by AOAC (1995) method. Van Soset and Wines (1967) method was employed for determining different fibers viz., neutral detergent fiber, acid detergent fiber and hemicelluloses content was calculated as the difference between the neutral detergent fiber and acid detergent fiber. Pectin was determined by the method of Ranganna (1986).

**Fat-binding and swelling capacity of crude fiber isolate:** Crude fiber was isolated from *Calocybe indica* by AOAC (1995) method. Fat-binding and swelling capacities of the isolated fiber from *Calocybe indica* were estimated by the method of Allen et al. (2004).

**RESULTS AND DISCUSSION**

The crude fiber content analyzed in studied mushrooms was found to range from 15.5 in *Agaricus sp.* to 18.6 g/100g in *Calocybe indica* on dry weight basis. The crude fiber content of *Calocybe indica* was significantly (p<0.01) higher than that observed for other three mushrooms (Table 1). The crude fiber content analyzed in *Agaricus bisporus* compared well with the reported values of 14.8 and 17 g/100g in *Agaricus sylvaticus* and *Agaricus bisporus*, respectively (Barros et al. 2008; Sadiq et al. 2008).

The content analyzed in *Lentinus sp.* was also found to be similar with the reported range of 13 to 15.5 g/100g in *Lentinus ciliates*, *Lentinus edodes* and *Lentinus tirrirus* (Adejumo amd Awosanya, 2005; Manjunathan and Kaviyarasan, 2011). The observed level of crude fiber content in *Calocybe indica* was found to be slightly higher than the reported value of 13.4 g/100g in *Calocybe gambosa* (Alam et al. 2008).

Various fractions have been isolated from dietary fiber viz., β-glucans, oligofructans, galactooligosaccharides, cellulose, hemicellulose, pectins, gums, mucilages, arabinoxylan and inulin (Southgate, 1990). The levels of neutral detergent fiber, acid detergent fiber, hemicelluloses and pectin contents in the studied mushroom samples ranged from 40.7 to 49.8, 22.3 to 28.2, 15.1 to 22.8, 7.9 to 9.4 g/100g, respectively (Table 1). The fiber profile analyzed in mushroom samples compared well with reported range of 46.4 to 50.5 per cent for neutral detergent fiber, 20 to 24.7 per cent for acid detergent fiber, 29.9 to 38.4 per cent for hemicelluloses and 5.9 to 9.1 per cent for pectins (Breene, 1990).

**TABLE 1:** Fiber profile of selected mushrooms.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Crude fiber</th>
<th>Neutral detergent fiber</th>
<th>Acid detergent fiber</th>
<th>Hemicellulose</th>
<th>Pectin</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Calocybe indica</em></td>
<td>18.6 ± 0.32</td>
<td>49.8 ± 2.41</td>
<td>28.2 ± 1.11</td>
<td>21.6 ± 1.03</td>
<td>9.4 ± 0.24</td>
</tr>
<tr>
<td><em>Agaricus bisporus</em></td>
<td>15.6 ± 0.08</td>
<td>40.7 ± 1.99</td>
<td>25.6 ± 1.72</td>
<td>15.1 ± 1.76</td>
<td>7.8 ± 0.16</td>
</tr>
<tr>
<td><em>Lentinus sp.</em></td>
<td>16.6 ± 0.25</td>
<td>46.2 ± 1.67</td>
<td>23.6 ± 2.30</td>
<td>22.6 ± 1.34</td>
<td>8.2 ± 0.19</td>
</tr>
<tr>
<td><em>Agaricus sp.</em></td>
<td>15.5 ± 0.25</td>
<td>45.1 ± 2.27</td>
<td>22.3 ± 1.29</td>
<td>22.8 ± 2.10</td>
<td>7.9 ± 0.25</td>
</tr>
<tr>
<td>Feal</td>
<td>13.4</td>
<td>22.0</td>
<td>7.04</td>
<td>9.23</td>
<td>10.1</td>
</tr>
<tr>
<td>Sem</td>
<td>7.4</td>
<td>14.1</td>
<td>2.59</td>
<td>3.34</td>
<td>4.67</td>
</tr>
<tr>
<td>CD*(p&lt;0.05)</td>
<td>0.87</td>
<td>3.92</td>
<td>1.11</td>
<td>1.59</td>
<td>0.60</td>
</tr>
<tr>
<td>CD (p&lt;0.01)</td>
<td>1.32</td>
<td>4.04</td>
<td>1.43</td>
<td>2.68</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Values are mean ± SD of three replicates on dry weight basis
*Critical Difference*
Values bearing different superscripts (a, b, c and d) differ significantly (p<0.01).
soluble and insoluble fiber content in eight samples of *Boletus* sp. were found to range from 4.2 to 9.2 per cent and 22.4 to 31.2 per cent on dry weight basis, respectively (Manzi et al. 2001).

Isolated soluble fiber and soluble fiber based foods have been shown to effectively bind fat. It is believed that the bound fat has less absorption in vivo and is excreted in feces (Allen et al. 2004). The ability of fiber to directly bind fat may contribute to its overall hypolipidemic activity. The crude fiber isolate extracted from *Calocybe indica* was assessed for its therapeutic effects on fat-binding and swelling capacity. The responses of mushroom fiber were compared with positive control standard i.e., *psyllium husk* and negative control sample i.e., cellulose. The tested fibers from *Calocybe indica* exhibited a fat-binding capacity of 1392 g oil/g for mushroom sample and 1548 g oil/g for *psyllium husk* sample. The fat-binding capacity with cellulose was extremely low i.e., 68.4 g oil/g (Fig. 1). Swelling capacity has been shown to predict the cholesterol-lowering efficacy of dietary fibers (Allen et al. 2004). The swelling capacity was measured as swelling volume. The samples exhibited swelling volume of 7.9 ml/g for mushroom fiber and 12.6 for *psyllium husk*. Cellulose showed very low swelling capacity (Fig. 2).

**CONCLUSIONS**

*Calocybe indica* was found to contain good profile of carbohydrates with higher content of acid detergent fiber, neutral detergent fiber, hemicellulose and pectin. The functional efficacy of mushrooms fiber was found equivalent to soluble fiber sample. However, the use of mushroom fiber nutraceutical has still not been commercialized.

**REFERENCES**


