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Original Research Paper

Polysaccharides, Proteins and Lipids from Basidiomycetous Fungi

J. Vinaya Sagar Goud, Kandukuri Vasu and M. A. Singara Charya
Department of Microbiology, Kakatiya University, Warangal, A.P. India-506 009

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ABSTRACT

Fruiting bodies of 40 Basidiomycetes species were screened for the presence of polysaccharides, proteins and lipids. Maximum amounts were observed in *Fomes fomentarious* (187.2 mg/g), *Grifola berkely* (265.4 mg/g) and *Strobilomyces* sp. (4.1 mg/g) respectively. High amounts of polysaccharides and proteins are recorded in six species and lipids in nine species. The study forms the basis for selection of potent species of medicinal importance.

INTRODUCTION

Basidiomycetes are considered as edible and medicinal resource. A number of bioactive molecules have been identified in many Basidiomycetes. Higher Basidiomycetes represent an unlimited source to cure different human ailments with their biomolecules such as polysaccharides, proteins and lipids (Wasser 2002). Potent polysaccharides and proteins are widespread among higher Basidiomycetes. Most of them have unique structure in different species. Medicinal mushrooms have been intensively investigated for medicinal effect *in vitro* and *in vivo* model systems. Many new antitumour immunomodulatory polysaccharides have been identified and put into practice **(**Wasser 2002).

MATERIALS AND METHODS

Forty species of Basidiomycetes were collected from forests of Andhra Pradesh. The fruiting bodies were dried in shade and packed in airtight containers. They were identified based on the Friesian classification system. Estimation of biomolecules were done according to standard procedures (Folch et al. 1957).

RESULTS AND DISCUSSION

The identified Basidiomycetes species and their biomolecular content i.e., proteins, polysaccharides, and lipids are depicted in Table 1. Maximum polysaccharides content was recorded in *Fomes fomentarius* (187.2 mg/g), followed by *Lenzites sepoiaria* (171.6 mg/g) and *Lepiota* sp. (168.4 mg/g). Minimum amount (8.3 mg/g) was observed in *Clavatia cyathiformis.* Out of the 40 species studied, six species are with high polysaccharide content, two with moderate amount, and 32 with low polysaccharide amount. A vide range of polysaccharides of different chemical from in Basidiomycetes has been investigated (Kiho 1992). These are the best known and most potent mushroom derived substances with antitumour and immunomodulating properties (Mizuno 2000). *Grifola frondosa* is one of the most popular medicinal mushrooms. Fruiting bodies of this mushroom contain B-(1→6)-glucan (Mizuno 1996). *Fomes fomentarious* has antibacterial, antiviral properties (Brandt & Piraino 2000). *Grifola frondosa* has antibacterial, immunomodulatory, antitumour properties (Altshul 2001).

Grifola berkely (265.4 mg/g) was recorded with high amount of protein followed by *Bovista* sp. (252.4 mg/g), *Lenzites sepiaria* (252.0 mg/g). The least protein was recorded in *Nidularia* sp. (1.3 mg/g). Mushrooms are an important source of edible protein for human consumption. More than 2000 species of mushroom exist in nature but only around 22 species are intensively cultivated for commercial purposes on soil or wood utilizing particular environmental and nutritional conditions. Mushrooms are rich in protein and can be a good food supplement. They offer themselves as potential protein source; the great advantage is that mushrooms have the capacity to convert less nutritional value substances in to high protein food (Yudiz et al. 2005). In ancient times, the Indian, Greek

Table 1: Polysaccharides, proteins and lipids (mg/g) in the fruiting bodies of higher Basidiomycetes.

Macro-fungi	Polysaccharides	Protein	Lipid
Amuroderma rugsom	32.7	113.1	3.9
Armillaria mellea	13.5	169.2	0.9
Bolbitius vitellinus	158.0	102.5	0.4
Bovista sp.	15.6	252.4	2.4
Ceripora viridans	26.0	96.1	2.4
Clavatia cynthiformis	8.3	57.2	1.4
Coriolopsis occidentalis	21.8	37.7	0.7
Daedalea flavida	30.1	99.8	2.6
Dichomitus squalens	29.6	133.3	1.5
Fistulina sp.	26.0	169.2	2.9
Fomes fomentarius	187.2	251.6	1.4
Geaster sp.	13.5	242.0	0.6
Geastrum sp.	10.2	42.0	1.1
Grifola berkely	135.2	265.4	1.2
Innotus sp.	18.7	91.5	0.7
Lactarius volemus	26.0	96.0	1.5
Laetiporus sulphuerus	31.7	74.5	2.2
Lentinus edodes	11.4	85.5	0.6
Lenzites betulina	31.7	155.0	3.4
Lenzites sepiaria	171.6	252.0	1.8
Lepiota sp.	168.4	89.2	0.9
Lycoperdon perlatum	166.4	67.4	1.5
Merulius sp.	18.7	97.0	2.4
Mycena chlorophanus	62.4	105.9	0.3
Nidularia sp.	20.8	1.3	0.8
Oxyporus populnus	42.6	155.2	1.9
Phalous sp.	10.4	86.1	1.3
Phellinus ignaaricus	20.8	47.3	0.8
Pleurotus ostreatus	11.4	208.8	1.2
Podaxis pistillaris	39.5	158.2	1.3
Polyporus squalosas	47.8	115.9	1.6
Poria oblique	24.9	67.4	0.9
Pycnoporus cinnabarinus	79.0	65.7	1.4
Russula sp.	10.4	46.0	1.0
Schizophyllum commune	26.0	169.2	1.4
Scleroderma	52.0	76.1	1.2
Strobilomyces	35.3	127.4	4.1
Trametes versicolar	36.4	77.2	1.5
Tulostoma sp.	82.3	36.1	1.9
Tyromyces sp.	12.4	1.4	1.2

and Roman mushrooms have been described as sophisticated delicacies associated with royal class (Manju et al. 1995).

Maximum amount of lipids was recorded in *Strobilomyces* sp. (4.1 mg/g) followed by *Amauroderma rugosam* (3.9 mg/g), *Lenzites betulna* (3.4 mg/g), and minimum amount in *Mycena Chlorophanus* (3.0 mg/g). Overall, high amount of lipids was recorded in nine species, moderate in 20 species and less in 11 species. In general, fruiting bodies have been found to contain much higher proportion of lipids compared to vegetative mycelia. Lipids could help Basidiomycetes adapt to low growth temperature. These unsaturated fatty acids also may have a role in lignin degradation (Ana Gutierrez et al. 2002).

Among the higher Basidiomycetes, thoroughly studied organisms may be around 10%. The number of mushrooms with known pharmacological qualities by their biomolecules is much lower. Recently, development in biotechnology can be applied to transfer genes encoding bioactive molecules from unculturable species into culturable species. If utilized substantially, the Basidiomycetes containing pharmacological important molecules can be a treasure for every economy.

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