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CHEMICAL COMPOSITION OF MYCELIUM OF THE THERMOTOLERANT FUNGUS *Penicillium atrovenetum*

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The chemical composition of mycelium of Penicillium atrovenetum, *a highly active producer of cellulase and protein, is studied. The protein content in the mycelium is 37.6%. The highest amino-acid content occurs in the albumin fraction (18.28%).*

Key words: fungus, mycelium, protein, amino acids.

Metabolic products from fungi are used to produce enzymes, protein, antibiotics, vitamins, etc. [1-3]. We have previously studied the fractional and amino-acid composition of protein from mesophilic micromycetes [4]. The present article reports results from a study of the chemical and amino-acid composition of protein from mycelium of the cellulose-decomposing thermotolerant fungus *Penicillium atrovenetum*, which thrives at 45-47°C. The high activity of this fungus in protein synthesis can be used to produce raw feeds in warm climates.

The mycelium of *P. atrovenetum* contains N (total, protein, nonprotein), raw fat, carbohydrates (soluble and hydrolyzed), cellulose, chitin, vitamins, S, P, ash, Ca, Mg, and nucleic acids (Table 1). Table 1 shows that the fungus has a high protein content, consisting of 37.6% protein of the dry weight on the seventh day of growth.

The amino-acid composition of the mycelium protein fractions showed that the total amino acids in the albumin fraction is 18.28%; globulin, 11.28%; prolamin, 6.48%; and glutelin, 10.36% (Table 2). The quantity of essential amino acids in the albumin fraction is 7.62%; globulin, 4.02%; prolamin, 2.46%; glutamin, 4.45%. The nonessential amino acids in the above-mentioned fractions are 10.66, 7.26, 4.02, and 5.91%, respectively.

The essential amino acids in the albumin fraction are dominated by lysine, valine, isoleucine, and tyrosine + phenylalanine; the nonessential, aspartic and glutamic acids and alanine. Table 2 shows that the prolamin fraction of the mycelium protein contains the lowest quantity of amino acids. The predominant essential amino acids in this fraction are valine and leucine; nonessential, glutamic acid and alanine.

Thus, *P. atrovenetum* culture is high in protein (37.6%) and contains a significant quantity of soluble carbohydrates and vitamins.

EXPERIMENTAL

The fungus *P. atrovenetum* was isolated from soil of Tashkent district and grown in Czapek-Dox nutrient medium for 7 days at 40°C with submerged cultivation on a rocker at 220 rpm. The quantity of inoculum added was 1% of the nutrient medium volume. Mycelium (7-day) was separated from medium by centrifugation and washed twice with distilled water.

Proteinaceous N in the mycelium was determined by the Kjeldahl method [5].; total N, by the Barnshtein method [6]; protein in the mycelium, by the Romanov method [7]; carbohydrates (soluble and hydrolyzed), by the Kastel′yanos method [8]; raw fat, by the Pleshkov method [9]; P, by the Lorentz gravimetric method [5]; vitamins, by the Odintsova microbiological

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TABLE 1. Chemical Composition of *P. atrovenetum* Mycelium

Compound	Content of air-dried mycelium, %
Nitrogen:	
total	6.4
protein	2.3
nonprotein	4.1
Protein	37.6
Raw fat	2.4
Carbohydrates:	
soluble	7.9
hydrolyzed	4.5
Cellulose	2.8
Chitin	3.8
Vitamins, mg/%:	
thiamine	5.2
biotin	4.1
inosite	3.8
Sulfur	0.32
Phosphorus	0.48
Ash	3.6
Calcium	1.42
Magnesium	0.52
Nucleic acids	0.96

TABLE 2. Amino-Acid Composition of Protein Fractions of *P. atrovenetum* Mycelium

Amino acid	Protein fraction, %			
	albumin	globulin	prolamin	glutelin
Lysine	1.32	0.68	0.24	0.16
Histidine	0.94	1.32	0.16	1.36
Arginine	0.76	0.42	0.18	0.82
Aspartic	1.74	0.94	0.32	0.42
Threonine	0.68	0.42	0.34	0.48
Serine	0.52	0.44	0.36	0.48
Glutamic	3.74	2.14	1.08	0.86
Proline	0.34	0.18	0.22	0.21
Glycine	1.28	0.98	0.48	0.68
Alanine	1.34	0.84	1.22	1.08
Valine	0.98	0.62	0.56	0.33
Cysteine + methionine	0.78	0.32	0.12	0.94
Leucine	0.86	0.56	0.54	1.68
Isoleucine	1.04	0.64	0.14	0.42
Tyrosine + phenylalanine	1.96	0.78	0.52	0.44
Total amino acids	18.28	11.28	6.48	10.36
Of these:				
essential	7.62	4.02	2.46	4.45
nonessential	10.66	7.26	4.02	5.91

method [10]; S, gravimetrically [11]; ash, by combustion [11]; nucleic acids, by the Filippovich method [12]; chitin, according to the literature [13]; and cellulose, Ca, and Mg, according to the literature [11].

The amino-acid composition of *P. atrovenetum* protein fractions was determined by common literature methods [14]. Quantitative determination of amino acids was performed on an AAA-881 amino-acid analyzer.

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