UTILIZATION OF MEAT WASTES BY HYDROLYTIC METHOD FOR PRODUCTION OF BIOLOGICALLY AC SUBSTANCES FOR FOOD, MEDICINAL AND MICROBIOLOGICAL PURPOSES

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Solid and liquid wastes of comminuted animal or microbial biomass being formed during biotechnical processes and partially processed course of technological operations represent a rather difficult problem which in a number of cases becomes complicated by the insoluble components and by difficulties of their subsequent degradation [1].

The use of a method for enzymic hydrolysis of protein wastes is rather preferable since it gives the possibility for obtaining product degraded protein with a high content of free amino acids and more massive fragments such as di-, tri- and polypeptides of a high nu value.

The best results in this case can be achieved when using complex enzymic preparations with a high substrate specificity [2]. Just preparations were given much consideration while developing the method for hydrolyzing blood of the cattle. Hydrolyzing ability of enzymic preparations as protosubtilin (producent of Bac.subtilis) purified on G10, pancreas macerate and pre-autolyzed biomass of bre brewers' yeast was studied. All these enzymes hydrolyzed blood of slaughter animals, the degree of hydrolyzing blood proteins being ac 37 % for protosubtilin, 34 % for pancreas macerate and 41 % for biomass of brewers' yeast. However, after hydrolysis of soluble wo (blood) non-degradable residues are also formed which require to be processed later on.

The method of acid hydrolysis is rather unique one and allows to solve successfully the problem of such wastes by their acid degradation subsequent neutralization of mixture produced and drying a product.

Studies carried out show that 20-25 % solutions of sulphuric acid allow to obtain hydrolyzed proteins with a rather high degre degradation into amino acids under the following conditions of hydrolysis:

acid concentration	-	25 %
time	-	6 h
temperature	-	120 °C.

When increasing a temperature from 100 to 120 °C, the degree of protein conversion can be increased from 40 to 80 % in many cases. Re of acid processing of some wastes are tabulated /Table 1/.

Table 1. Conditions of protein wastes processing

The name of wastes	Protein concentration	Conditions of processing	The yield of hydrolyzate
Residuals of blood proteins	10-30 %	Acid concentration - 10 % Temperature - 120 °C Time - 4 h	75-80 %
Keratin residues	Insoluble (10 %mass in mixture with acid solution)	Acid concentration - 25 % Temperature - 120 °C Time - 6 h	75-85 %
Residues of animal tissues after recovery of heparine from lungs and mucosa	Insoluble (5-10 %mass in mixture with acid solution)	Acid concentration - 25 % Temperature - 100 °C Time - 5 h	80-90 %
Residues after recovering a recombinant protein from cell biomass of E.coli	Insoluble (5-10 %mass in mixture with acid solution)	Acid concentration - 25 % Temperature - 120 °C Time - 7 h	85-95 %

In Table 2 the data on free amino acids accumulation in hydrolyzed products of one of proteins the most difficult to be hydrolyzed keratin. It is obvious that conditions of hydrolysis above-mentioned allow to obtain a product with a high content of many essent amino acids from keratin, the latter being represented in this case by feather residues.

Table 2. The dependence of the amino acid composition of hydrolyzed keratin-containing residues on the time of acid hydrolysis (temperature - 120 oC, H_2SO_4 concentration - 25 %)

Amino acid	Amino acid content (g per 100 g protein) on the time of hydrolysis (hours)		
	2	4	6
Aspartic acid	3.642	4.625	5.547
Threonine	0.975	2.553	3.819
Serine	5.452	9.122	11.453
Glutamic acid	3.277	6.636	8.759
Proline	4.615	9.011	13.592
Glycine	3.990	5.522	6.727
Alanine	1.822	3.176	3.957
Cystein	0.711	2.805	4.525
Valine	2.259	2.766	3.781
Methionin	0.536	0.269	0.288
Isoleucine	1.096	1.674	2.745
Leucine	1.765	3.872	5.682
Tyrosine	1.207	1.376	2.123
Phenylalanine	3.723	3.438	4.155
Histidine	3.419	2.192	4.180
Lysine	0.328	0.592	0.918
Arginine	1.043	3.035	4.657
Total	39.860	62.664	86.908

The subsequent processing of acid hydrolyzed protein residues was carried out for obtaining a solid product of a nutritive value. Liquid hydrolysates produced were neutralized, desalted in an electrodialyzer and spray-dried.
As a result, acid hydrolyzed proteins were produced with the following characteristics:

amino nitrogen (N_{am}), mg% - 150 - 250
total nitrogen (N_{total}), mg% - 450 - 550
dry residue, % - 10 - 20
pH - 5 - 6,5,

what allows to use these products which contain up to 35-60 %mass free amino acids in rations of experimental and farming animals as feed additives.

References

1. Comprehensive Biotechnology: the principles of biotechnology. V.3./Ed. Moo-Young M.-N.Y.: Pergamon Press. 1985. P.1-329.

2. Nekludov A.D., Ilykhina V.P., Petrakova A.N. et al. // Appl.Biochem.& Microbiol.1996. V.32. No.2. P.231-236.