5 : 11

THE BIOSTIMULATING EFFECT OF FEEDING RATIONS CONTAINING PRODUCTION WASTES OF SOME MEDICINAL PREPARATIONS

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SUMMARY

Experimental results are presented on laboratory animals feeding with feather meal containing calculated amounts of some wastes derived from medicinal production, as biostimulating additives. The incorporation of these wastes to the feeding meal was found to significantly increase (by 19.5% as compared to controls) the level of protein, perfect in its amino acid profile, in the finished product. Experiments on male rats with the initial weight of 115±5 g indicated that the addition of 9% of the test and control meals to the standard ration ensured weekly gains of 20.48±0.59 g and 10.83±2.47 g, respectively, within a 4-week feeding period. It was noted that test rats needed 9.06 g of feed per gram gained, as compared to 15.3 g for control animals, this evidencing a higher nutritive value of the suggested feeding additive and its pronounced biostimulating activity. Histological studies of the internal organs and tissues as well as calculations of the integral index of chronic intoxication did not reveal any toxic reaction of the animals to the incorporation of biostimulating additives to the feeding rations.

INTRODUCTION

One of the most important problems in the meat inductry is complex and efficient processing of slaughter inedible products for feeding purposes, particularly, the development of feeding mixtures and additives having biostimulating properties. In this connection, most actual is the problem of developing progressive technologies which involve the maximum utilization of animal protein. There are data available on the use of proventrivulus contents and blood (1), hide wastes (2,3), manufacture wastes of endocrine preparations (4), keratin-containing materials (5,6) for cattle feeding. The latter, i.e. feather, bristle, hair, is a valuable source of the feeding protein. However the meal prepared from such raw materials is known to be poor in the essential amino acids and hence to be of a low biological value (7). Besides, nonsolubilized hair in the feed may cause infectious deseases which have often the lethal outcome for animals and poultry (8).

MATERIALS AND METHODS

The aim of the work was to study the proximate chemical and amino acid compositions of the meal prepared from enzyme-treated poultry feathers and enriched with a high-protein additive, viz., production wastes of some medicinal preparations. The meal prepared by the traditional technology served the control. Moisture, fat, ash, protein and crude fiber were determined with known methods. The amino acid profile of the samples was studied after their complete acid hydrolysis in a Beckman I9CL automatic amino acid analyzer (USA). Tryptophane was found after the alkali hydrolysis of a test portion according to Wierbicki and Deatherage (9). The design of biological tests are reported in the paper.

RESULTS AND DISCUSSION

From Table 1 it is clear that the test meal is characterized with a lower ash and a higher (by 19.5%) contents as compared to the control meal. It is important to emphasize that test meal solubility is 1.4 times and digestibility in vitro 1.96 times as high as compared to control samples, which can be explained by keratin molecule degradation into lower molecular components, available to the digestion by the proteolytic enzymes of the gastro-intestinal tract, during enzymic treatment. There is a significant, 1.7-fold increase of the total amino acids in the test product, it testifying meal high biological value. The feeding value of test and control meals was comparatively studied by means of incorporating them into the standard ration of rats (at the level of 9%). For the 4-week experimental period weekly gains of every test and control animal; feed consumption, calculated as the proportion of the amount consumed to the weekly gain; protein utilization efficiency (PUR) estimated as the proportion of the protein consumed to the weekly gain, were registered (Table 2).

Fig.1 shows curves characterizing rats' body weight changes durint the feeding period; they indicate a greater gain for animals maintained on the test ration, as compared to those on the control ration. So, it can be stated that the test feather meal additives incorporated into the standard ration had pronounced biostimulating properties.

Table 1. Chemical composition and digestibility of test and control meals (%)

Characteristics	Test	Control
Water	3.0	3.0
Fat	16.7	19.5
Ash	20.8	38.0
Protein	54.5	35.0
Crude fiber	5.0	4.5
Amino acids,% of the protein		
total essential amino acids	46.81	27.31
lysine	9.63	1.98
histidine	0.60	0.45
methionine	1.88	1.44
proline	6.30	9.80
valine	6.56	5.20
glutamine	10.63	10.44
leucine	10.52	7.14
glycine	6.63	6.46
isoleucine	4.91	3.92
alanine	4.20	4.50
phenyl-alanine	7.65	3.96
tyrosine	2.72	2.32
tryptophane	-	-
arginine	9.12	7.52
threonine	5.66	3.67
serine	3.50	1.88
Digestibility,% of the control	95.3	-
Solubility	22.58	16.15

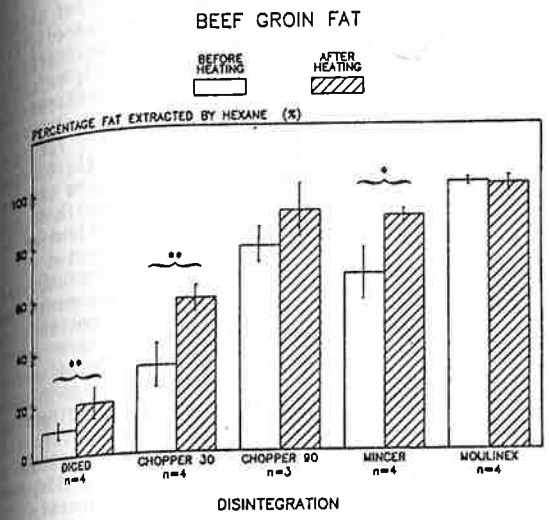

Figure 5. Fat instability measured as the fraction of fat extracted by hexane for beef groin fat raw and heated to 75°C and disintegrated in five different ways.

This seemingly contradictory behaviour might be explained by introducing some concepts of failure mechanics. The basic principles of the current theories of failure appearance are based on the likelihood of the propagation of cracks in the sample (Jowitt, 1979). Crack propagation can be very much reduced if the stress applied to the fat raw material during comminution is reduced by viscous dissipation of energy. Therefore, with an increasing amount of released fat the energy applied during comminution dissipates more and more as viscous energy (heat), leading to a less efficient chopping of the so far non-disintegrated fat material. This is in accordance with the observed behaviour of the pork back fat during comminution, i.e. being less comminuted but having more released fat.

We have also studied the fat instability after heating the differently comminuted fatty tissues to 75°C, the results of which can also be seen in Figures 4 and 5. In accordance with the investigations of Evans & Ranken, 1975 we too found the highest fat instability after cooking in the harder fat, which in our case is the beef groin fat. Furthermore, in this investigation we have found that heating causes, in general, further instability, which for all degrees of comminution (except for the chopping in the Moulinex) is more severe for beef groin fat than for pork back fat.

The course of heating for the differently comminuted samples has also been followed under the light microscope. In this paper only the course of heating for the least damaged sample of beef groin fat will be presented, i.e. the one diced by hand. In Figure 6 the structure of the beef groin fat can be followed at 23, 48, 60 and 80°C. In general, it was noted that the fat melting region, as observed by disappearing birefringence (seen at 23°C in Figure 6) occurs between 35 and 45°C. The most striking event, however, during heating of the fatty tissue is the contraction of the connective tissue, starting in general at 50-55°C and being most severe after 65°C. This is clearly seen for the beef fat sample in Figure 6 and this contraction of the connective tissue is generally greater for the beef fat than for the pork fat. This observation could be one of the reasons for the larger fat instability caused by heating in the beef groin fat, compared to the pork back fat. The contraction of the connective tissue does not occur, however, in the Moulinex sample, which could be due to a completed disintegrated connective tissue in those samples.

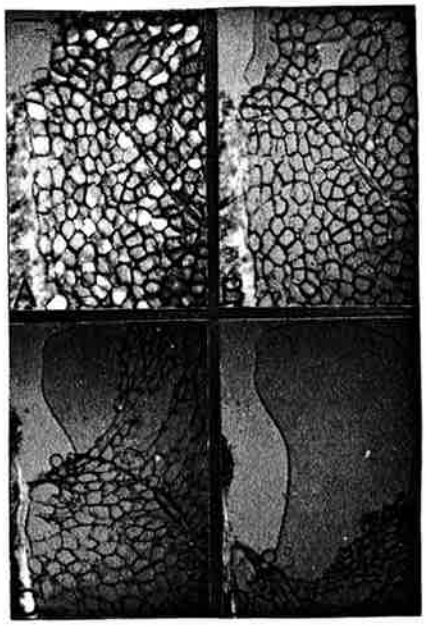

Figure 6. Transverse sections of beef groin fat diced by hand and heated to 23°C (A), 48°C (B), 60°C (C) and 80°C (D). ⟼: 100 µm.

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