NEW TECHNOLOGY OF MANUFACTURE OF BIOLOGICALLY VALUABLE FEED ADDITIVE FROM NON-TRADITIONAL RAW MATERIAL

Vitrenko O.N., Faivishevsky M.L.

All-Russian Meat Research Institute named after V.M. Gorbatov, Talalikhina 26, 109316 Moscow, Russia

Key words: contents of rumens, stomach contents, cellular tissue, biotechnological processing, lactic-acid bacteria

Background

At present domestic swine breeding experiences serious difficulties caused by deficiency of feed protein. In this connection search of new non-traditional raw material sources for manufacture of protein feeds is actual and stipulates solution of technological aspects connected with their processing. Among perspective kinds of raw materials making possible in many respects reduction of deficiency in protein feeds are the contents of cattle rumens averaging 8-10 % of the animal live weight. High humidity, bacterial contamination, low protein level with high cellular tissue content made it unclaimed or processed in small quantities for feed purposes [1, 2]. In most cases the contents of rumens (stomach contents) are taken out the enterprise and used as organic fertilizer after natural biothermal holding.

The existing technologies of feed products from stomach contents do not guarantee destruction of cellular tissue. The latter remaining non-digested becomes ballast for animals with a single-chamber stomach and poultry. Some technologies aimed at rising the protein level in the finished feed provide for processing, together with stomach contents, of almost 50 % of protein-containing inedible wastes from cattle slaughter (blood, bones, collagen- and keratin-containing raw materials), which, being processed by traditional technologies, permit to obtain valuable animal feed necessary for manufacture of high-quality mixed feeds [3].

Objective

The objective of this study was to develop technology of feed additive made from stomach contents, more reach in biologically valuable protein, but more poor in cellular tissue.

Methods

Stomach contents, as well as the final product resulting from their processing, served as an object of investigations. Stomach contents were thermally heated at moderate temperature action, during which their sparing hydrolysis took place, and were fermented with the use of lactic-acid bacteria. Due to screening of lactic-acid bacteria on the prepared substrate during the found time of treatment, accumulation of protein mass and organic acids promoting preservation of the final moist product took place [4].

Chemical composition both of the initial stomach contents and the manufactured final product was determined. Amino acid composition of proteins of the initial and processed stomach contents was determined by gas-liquid chromatography. Total bacterial contamination, availability of coliform bacteria, anaerobic and facultative-anaerobic microorganisms, pathogenic microorganisms of *Salmonella* genus were determined by microbiological investigations.

Results and Discussion

Chemical composition of the initial stomach contents and the feed additive manufactured from them by the above method is given in Table 1.

Table 1. Chemical composition of stomach contents and feed additive

Sample	Content, %					
	moisture	protein	fat	ash	cellular tissue	NFE*
Stomach contents	88.5±2.1	2.3±0.2	0.5±0.1	1.6±0.2	5.4±0.4	1.7±0.1
Feed additive	84.9±2.6	8.4±0.5	1.6±0.2	1.3±0.1	2.5±0.2	1.3±0.1

*NFE – nitrogen-free extractives.

Comparison of chemical composition of the initial stomach contents with that of the feed additive manufactured from them points to the fact that the protein content is nearly 3.5 times as high , that of the cellular tissue, is 2.1 times as low, and the fat content is 3 times as high in the additive. It should be noted that on a 9 % moisture basis the protein content in the final product exceeds 50%, and the fat content is not more than 10 %. According to the above indices, the manufactured product corresponds to requirements of the standard for meat-bone flour, grade I. By the cellular tissue content (15 %), it is considerably lower, as compared to the values, established by the acting normative documents for dry vegetable-protein feed (not more than 20 %).

Amino acid composition of stomach contents proteins and that of the product manufactured from them is given in Table 2.

The above data show that protein in the final product is valuable, as it includes the whole complex of essential amino acids. Here it is necessary to point out that the content of limiting amino acids among essential ones in the final product protein is much higher, than that in the primary raw material. The data of amino acid composition confirm biological value of the product manufactured according to the proposed method. All this testifies to efficiency of biotechnological treatment of the cattle rumens contents.

Table 2. Amino acid composition of stomach contents proteins and feed additive (g/100 g of protein)

Amino acid	Primary raw material	Feed additive	Amino acid	Primary raw material	Feed additive
Irreplaceable			**Essential**		
Valine	4.04	5.51	Asparaginic	7.69	6.25
Lysine	4.95	8.40	Serine	2.61	4.86
Leucine	5.13	6.42	Glutamic	11.21	18.21
Isoleucine	3.30	4.03	Proline	1.69	5.74
Phenylalanine	3.68	1.79	Glycine	4.30	5.06
Methionine	0.13	0.28	Alanine	4.13	4.51
Threonine	3.7	4.12	Tyrosine	3.10	1.75
Tryptophan	Not determined		Histidine	4.07	10.85
			Ornithine	0.40	0.43
			Arginine	3.35	3.65
			Cystine	Not determined	
Total	**24.93**	**30.55**	**Total**	**45.55**	**61.31**

As microbiological investigations showed, the manufactured wet feed product remained satisfactory, according to sanitary requirements, during 7-10 days of storage at the room temperature.

It is safe to assume, that the manufactured feed product, thanks to availability of a great amount of valuable protein, as well as the presence of live microorganisms, will be well assimilated by animals being fattened.

Conclusions

The developed method of two-staged processing of cattle rumens contents, involving thermal heating at moderate temperatures and fermentation by lactic-acid bacteria, guarantees manufacture of a biologically valuable feed product, containing at least 50 % of protein and not more than 15 % of cellular tissue at 9 % moisture, what is 3.5 times as high and 2.1 times as low, compared to the primary raw material, correspondingly.

By amino acid composition the manufactured feed product may be characterized as biologically valuable for feeding of pigs.

Application of the offered technology provides manufacture of a feed product stable at storage during 7-10 days in wet condition.

The offered technology permits to effectively use available resources of stomach contents for manufacture of a valuable feed additive for pigs.

References

1. Faivishevsky M.L., Dorofeeva O.N. Contents of rumens of ruminants for production of feeds// "Agrarnaya nauka". 1998. No. 8. P. 18-19.
2. Faivishevsky M.L. Low-waste technologies at meat packing plants// M.: "Kolos". 1993. 205 p.
3. Snitsar A.I., Ivashov V.I., Dudin M.V. Reference book for foreman of technical manufactured goods works // M.: "Myasnaya industriya". 1996. 192 p.
4. Gracheva I.M., Ivanova L.A., Kantere V.M. Technology of microbe protein preparations and bioenergy// M.: "Kolos". 1992. P.147-150.