NEW ANIMAL FEED

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Traditional methods of processing contents of cattle rumens cannot guarantee in full measure the production of feed adequate for normal growth, and development of animals, because rumens contained low level of protein and high volume of cellular tissue. The aim of the present study was to work out new technology guaranteeing the production of animal feed of higher biological value using this raw material.

Experimental methods. Contents of cattle rumens and keratin-containing material (horns and hoofs) from Black and White bulls were used in experiments. At first, keratin-containing material was subjected to the alkali hydrolysis; then the obtained hydrolyzate was used for processing rumens contents including the process of drying. At the same time the dry feed product (feed enriching component) was also produced from rumen contents by traditional methods. Samples of experimental and traditional feed prepared in similar equipment were chosen for the investigations.
In the experiment, Large White gilts (62 kg L.W.) and Black and White bulls (272 - 277 kg L.W.) were used with the purpose to analyze feed value of the experimental feed product and feed enriching component.
All gilts were divided into five groups: one - control and four - experimental (20 animals in each). They received the main feed ration including: feed concentrates (65%), succulent feed (20%), milk waste (10%), and roughage (5%). In addition to the main feed ration, animals in control group received the feed enriching component (300 g/head) and animals in experimental groups received new feed product (300 g/head). The period of fattening was 117 days.
Bulls were divided into three groups one - control and two - experimental (10 animals in each). Feed ration of control animals contained green feed (78%), roughage (2%), feed concentrates (20%); experimental animals received green feed (75%), roughage (5%), feed concentrates (10%). In additon to the main feed ration, experimental animals received new feed product mixed with feed concentrates (1 kg/head) and control animals received feed enriching component (1 kg/head). The experimental period was 40 days. When experiments were completed, the live weight of animals was determined, slaughter was carried out and meat quality was evaluated.

Results. To provide conditions for the higher level of hydrolysis and prevent decomposition of aminoacids, optimal parameters for the alkali hydrolysis of keratin-containing raw material were determined. Analytical dependence of the generalized hydrolyzate quality factor on processing parameters was expressed in the following equation:

$$F_{gen.} = 14.01 - 4.53P - 3.01C - 0.6\tau + 0,8P^2 + 0.43C^2 + 0.045\tau^2,$$

where P is pressure (10 MPa),
C is solution concentration (%),
τ is time (hours).

The hydrolyzate as obtained under optimum conditions was a polydispersed solution of products formed in the process of keratin proteins decomposition. It had the following characteristics: dark brown colour, specific smell, density - 1150 kg/m^3, boiling temperature - 107.5° C, freezing temperature - -5° C, refraction - 1.376, pH 10, dry matter content - 31-32%, calcium oxide content - 1.2%, nitrogen content - 3.4-3.5; moreover it contained more than 20 trace elements and a complex of essential aminoacids. Yield of hydrolyzate was considerebly higher than the initial mass of keratin-containing raw material.
Chemical composition of new animal feed as obtained by processing the contents of cattle rumens by hydrolyzates is showed in Table 1.

Table 1. Chemical composition of feeds.

Feeds	Contents, %							
	Water	Dry matter	including					
			Protein	Ash	Cellular tissue	Fat	Reducing substances	Exstractives free of nitrogen
New feed product (NFP)	10.0	90.0	35.0	18.6	22.9	6.7	4.7	2.1
Feed enriching component(FEC)	10.0	90.0	21.1	17.3	27.6	5.3	1.2	17.5

As seen in the table, new feed product (NFP) contained by 13.9% more protein comparing

to feed enriching component (FEC), that was the result of effect of keratin-containing hydrolyzate added to the raw material. NFP contained higher level of reducing substances, due to lower level of cellular tissue and extractives free of nitrogen. It was evident from the chemical composition that NFP had the higher feed value. Comparative results of fattening of gilts receiving rations with new feed product and traditional feed are summarized in Table 2.

Table 2. Changes in live weight and feed conversion of gilts in the period of fattening

Indices	Control group	Experimental groups			
		I	II	III	IV
Average live weight, kg:					
- at the beginnig of experiment	61.5±1.5	62.7±2.1	60.8±1.5	63.0±2.5	61.9±1.3
- at the end of experiment	114.3±2.5	135.7±3.5	131.6±2.9	135.2±4.0	132.7±3.9
Average daily gain, gram	460.0±5.2	625.0±4,5	605,0±3,7	617,0±2,9	613,0±5,1
% to control animals	-	135.8	131.5	134.1	134.6
Feed conversion, per 1 kg of gain	4.64	3.73	3.67	3.66	3.63
% to control animals	-	80.4	79.1	78.9	78.2

Average daily gain of gilts that received new feed product increased by 33.7%; feed intake decreased by 21,1% per 1 kg of live weight gain.
Comparative results of using of NFP and FEC in feed rations of bulls are showed in Table 3.

Table 3. Changes in live weight of bulls in the period of fattening.

Indices	Control group	Experimental groups	
		I	II
Average live weight, kg:			
- at the beginning of experiment	275.0 ± 2.1	272.4 ± 3.0	277.0 ± 2.9
- at the end of experiment	305.4 ± 1.8	308.6 ± 4.6	313.3 ± 5.1
Average daily gain, gram	760.0 ± 5.2	904.0 ± 4.8	906.7 ± 8.5
% to control animals	-	118.9	119.2

The data received have showed that average daily gain of experimental bulls was by 19.1% higher comparing to control animals in spite of the fact that bulls in control group received by 10% more feed concentrates.
When evaluating carcass quality, it became evident that the yield of flesh from animals in experimental groups was by 16.3 - 20.6% higher and the factor of meatiness - by 9.3 - 17.5% higher comparing to control bulls.
Conclusions. New feed product (NFP) made of the contents of cattle rumens and alkali hydrolyzate of keratin-containing material had the higher feed value. It secured considerable gain of live weight for gilts and bulls fattened and lower feed intake per 1kg of gain.
New technology provides conditions for complex and effective use of cattle slaughter waste containing high level of cellular tissue and almost indigestible protein. It offers new potentialis for meat processing plants:
- to apply all raw materials,
- to obtain new feed products,
- to organize wasteless production,
- to improve ecological conditions and increase production volumes of valuable animal products.