

STUDY OF THE QUALITY AND NUTRITIONAL VALUE OF COMPOUND FEED USING SECONDARY (BY-PRODUCT) FOOD RAW MATERIALS

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At the growth stage of young cattle (YC), high-protein (protein) nutrition is of particular importance, since the lack of feed protein, in addition to minerals, vitamins, and other biologically active substances, is still one of the main problems of animal husbandry.

Compound feeds for this group of farm animals must meet the following requirements [1, 2, 3]:

Completeness and balance in the composition of the main nutrients necessary for animals, depending on the age of the animals, their physiological characteristics, and productive direction;

Food safety, that is, the prescription components of feed mixtures should not negatively affect the animal's body;

Palatability, that is, the feed must be palatable enough to cause a conditioned reflex in animals and promote better assimilation of food, which will reduce the consumption of feed and, as a result, the cost of livestock products;

The predominance of domestic raw materials in compound feed recipes in order to reduce dependence on suppliers of raw materials and additives imported into the country.

For the rational use of various types of raw materials in the production of compound feeds, the replacement of some types of raw materials with others is allowed according to the existing recipes in order to increase the nutritional value and reduce the cost of finished products. At the same time, the main requirement for compound feeds is not their composition, but the results of the zootechnical assessment of the productivity of young cattle.

It has been established that in livestock complexes the composition of compound feed concentrates includes corn and wheat grain, as well as vitamin and mineral premix P62-1, which is not produced in Uzbekistan. Corn and wheat grain are relatively expensive raw materials, therefore, in experimental samples of compound feeds, these raw materials were partially replaced with secondary (by-product) raw materials from the production of starch, molasses, wine, and juice. [4]

The optimization of the recipe for the compound feed concentrate KK-62 START for young cattle aged from 1 to 4 months inclusive was carried out with the replacement of 50.0% of corn grain (CG) with corn gluten (CG), vitamin and mineral premix P62-1 with rice sludge (RS) and grape pomace (GP).

The nutritional value of compound feeds for young cattle with the inclusion of CG, RS and GP in their composition was studied. The object of the study was the compound feed KK-62 START with the studied additives (experiment). The object of comparison was the basic formulation of the compound feed KK-62 START without additives (control).

The recipes of the experimental compound feeds, indicators of their quality and nutritional value are shown in Tables 1–3 and in Figure 1.

"Table 1
Formulations of the control and experimental variants of compound feed
KK-62 START"

Ingredient	ME MJ	Input rate	Variants of compound feed composition, in %	
			Control	Experimental
Barley	10,9	0 - 50	45,00	45,00
Corn	11,7	30 - 50	20,00	10,00
Sunflower cake	12,8	0 - 15	12,00	12,00
Sunflower meal	10,5	0 - 15	10,00	10,00
Soybean meal	10,0	0 - 30	10,00	10,00
Corn gluten	15,0	H/H*	-	10,00
Rice sludge	5,0	H/H	-	0,50
Grape pomace	12,0	H/H	-	0,50
Premix P62-1	-	4 - 6	1,00	-
Monocalcium phosphate	-	4 - 6	0,50	0,50
Table salt	-	4 - 6	0,50	0,50
Limestone flour	-	0 - 3	1,00	1,00

Total, %	-	-	100,00	100,00
Total ME (Metabolizable Energy), MJ/kg	-	-	11,00	11,50

* N/A – Not applicable"Next, granulated compound feeds were prepared from the recipe components, and their quality characteristics (Table 2) and nutritional value (Table 3) were determined."

Table 2**Physicochemical quality indicators of the compound feeds under study**

Mass fraction of moisture, % Granule diameter, mm	Indicator values		
	Nor (ГОСТ 9268-2015)	Control	Experiment
Granule crushability, %	Не более 14,0	13,2	13,5
Passage through sieves with 2 mm holes, %	3,0 – 3,5	3,2±0,1	3,2±0,2
Density, kg/dm ³	Не более 22,0	14,2±0,3	14,0±0,1
Bulk density, kg/m ³	Не более 10,0	3,6±0,4	3,3±0,2
Shape	Не более 1,1	0,5±0,1	0,6±0,1
Feeding method	650	625	630
Compound feed consumption, in kg per 1 head/day (depending on age from 1 to 4 months)	Granules		
Mass fraction of moisture, %	In dry form		
Granule diameter, mm	From 0.30 to 1.00		

No fundamental differences were found between the experimental compound feed samples and the control samples. The resulting granules were cylindrical in shape with a matte surface, free from foreign matter and mold. The color was brown, corresponding to the color of the components included in the formulation. Toxicity and pathogenic microflora were not detected.

The main indicators of the nutritional value of the compound feeds are shown in Table 3.

Analysis of the data presented in Table 3 showed that the experimental compound feed exceeded the control in terms of the main indicators of nutritional value, with a higher content of crude protein (by an average of 31.2% (relative)), fat (by 16.7%), and calcium (by 8.3%). There was also an increase in the values for feed units and metabolizable energy by an average of 7.48 and 4.54%, respectively. It should be noted that the content of crude fiber and phosphorus in the experimental variant decreased by 24.72 and 10.00%, respectively.

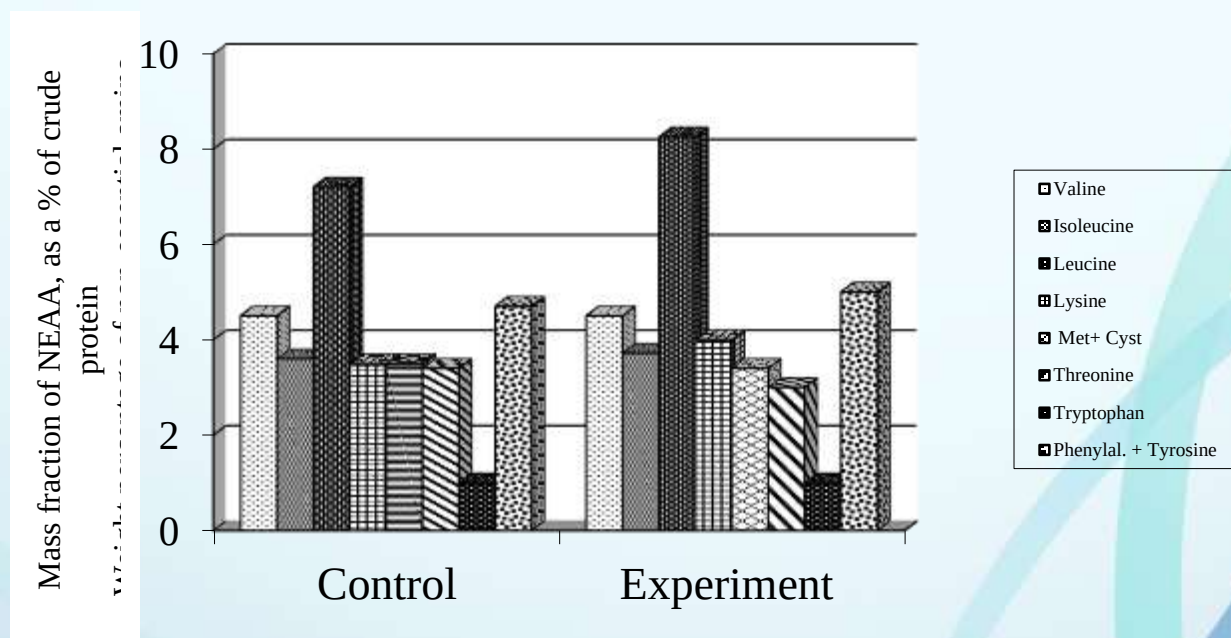
However, since the main goal of the research at this stage was precisely to increase the biological value of the compound feed, the task was achieved, which is confirmed by an increase in crude protein of almost 41.58% compared to the comparison sample, which is a very convincing argument in favor of the proposed composition of the compound feed KK-62 START.

Table 3

Nutritional value of the control and experimental variants of compound feed KK-62 START

Mass fraction of crude protein, not less than, % Mass fraction of crude fat: not less than, %	Indicator values		
	Nor (ГОСТ 9268-2015)	Control	Experiment
Mass fraction of crude fiber, not more than, %	17,00	19,40	25,45
Mass fraction of calcium, not less than, %	2,50	3,00	3,50
Mass fraction of phosphorus, not more than, %	10,00	8,90	6,70
Mass fraction of ash, insoluble in HCl, not more than, %	0,30	0,60	0,65
Mass fraction of NaCl, %	0,80	0,70	0,63
Feed units in 1.0 kg, not less than	0,70	0,65	0,66
Metabolizable energy, not less than, MJ/kg	1,00 – 1,30	0,50	0,50
Mass fraction of crude protein, not less than, %	0,95	1,07	1,15
Mass fraction of crude fat: not less than, %	9,50	11,00	11,50

The amino acid composition of the compound feeds is presented in Figure 2.



"Figure 2 – Amino acid composition of KK-62 START compound feed, in % of crude protein"

(Figure 2) showed that the amino acid lysine is deficient (3.5%, ACS = 73%). A

high level of leucine was noted (7.2%, ACS = 118%) - due to corn. The experimental feed has a high level of protein (25.45%) and good lysine availability (4.0%, ACS = 100%), but requires adjustment for methionine. Leucine (8.25%, ACS = 135%) is elevated due to corn gluten.

It was established that Σ EAA (sum of essential amino acids) in the control variant was 31.5% of the crude protein or 6.11 g/100 g of product, while in the experimental variant it was 37.1% of the crude protein or 9.44 g/100 g, that is, it exceeded the control values for these essential amino acids by almost 1.5 times.

It should be noted that the main task at this stage was precisely to increase the biological value of the feed, therefore, the task was completed, which is confirmed by the increase in crude protein relative to the comparison sample and is a very convincing argument in favor of the proposed composition of the feed KK-62 START.

Thus, it was established that the feed of the experimental variant met the requirements of GOST 9268-2015 Feed - concentrates for cattle. Technical conditions and is characterized by increased nutritional and biological value.

References

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