

NEW ADDITIVE IN THE MIXED FEED FOR FATTENING OF PIGS

Snitsar A.I., Baburina M.I.

All-Russian Meat Research Institute, Talalikhina 26, 109316, Moscow, Russia

Kirillov M.P., Krokhina V.A., Antoshin V.V.

All-Russian Research Institute of Cattle-Breeding

The use of the feed protein remains one of the most important problems in pig-breeding. In this connection, in Russia permanent searches of protein sources to develop new feed products which would allow to cover the lack of proteins, to increase biological value of mixed feeds, and to improve assimilation of these feeds and the protein as well are being carried out.

The All-Russian Meat Research Institute developed a new mineral protein feed additive on the basis of properly processed bone meal and heat treated natural tufa.

New additive contained: raw protein – about 30%, raw fat – 8%, ash – about 46%.

So far as the feed value of this additive and its potential use for fattening of pigs were not studied in details, the laboratory of mixed feeds (All-Russian Research Institute of Cattle-Breeding) carried out some studies in order to estimate the efficiency of new additive as a component of the mixed feed designated for fattening of pigs.

Three groups of cross-breeds (White Large x Landrace) were used for the test at the experimental farm in Klionovo-Chegodaevo. Each group included 12 animals with due regard for their sex, age, and live weight. The test was carried out in two stages: 1 – two-week preliminary one; 2 – the main one. Up to the beginning of stage 2, average weight of pigs achieved 33.5; 33.5; 33.9 kg in groups I, II, and III, respectively.

The efficiency of new feed additive was estimated on the basis of cereal mixtures comparing to sunflower cake used traditionally for feeding of pigs. Comparing to the sunflower cake, new feed additive contained less raw protein (41.1% against 31.0%), sufficiently less cellulose (10.1% against 1.95%), higher level of fat (2.74% against 8.58%), and sufficiently higher level of ash (5.91% against 45.6%).

The experiment was carried out in accordance with the following scheme:

Groups of pigs	No. of pigs in each group	Feed rations
Control I	12	Complete ration with sunflower cake (13 mass%)
Test II	12	Complete ration with sunflower cake (6 mass%) and mineral protein additive (7 mass%)
Test III	12	Complete ration with mineral protein additive (13 mass%)

As seen from the scheme, control sucking pigs received mixed feed with 13 mass% sunflower cake. In feed rations for groups II and III, sunflower cake was substituted partially or completely for tested mineral protein additive. Since new feed additive contained a great quantity of ash, calcium, and phosphorus, mineral components were not added to feed rations of groups II and III unlike the control group I.

As to the content of other components - barley, wheat and wheat bran, sodium chloride, premix P 51-7, feed rations of all three groups had no differences.

Differences in the content of nutrients in control and test mixed feed were the result of the substitution of sunflower cake by test feed additive.

Conditions of feeding (distribution of feeds, their volume, frequency) and keeping of animals were identical for all groups.

To evaluate the influence of the tested additive on flavour features of the mixed feed, to determine the volume of its consumption and expenditure of the feed per unit of mass gain, the volume of feeds given to animals and their remains were registered every day. Intensity of animal growth was estimated by means of individual weighing in the beginning of the experiment and then once a month.

Studies showed that new mineral protein additive, as a component of complete rations of mixed feeds, rendered positive influence on their flavour and volume of consumption comparing to sunflower cake. As a result, average daily consumption of mixed feeds in the process of the experiment (138 days) was: in control group I – 2.09 kg, in test groups II and III – 2.42 kg (see Table 1).

Use of mineral protein additive, as mixed feed component, rendered positive effect on gain in weight. Thus, gain of animals in control group I (13% sunflower cake) was 438 g/day, in test group II (6% sunflower cake, 7% mineral protein additive) – up to 517 g/day ($P/0.05$), in test group III (complete substitution of sunflower cake for mineral protein additive – 13 mass%) – 539 g/day in average.

Thus, when the mixed feed contained 13 % (by mass) mineral protein additive, the daily gain of pigs occurred to be 101 g (23.1%) higher ($P/0.001$), than in the control group.

Indices of mixed feed consumption are shown in Table 1.

When comparing to control indices, differences occurred to be statistically reliable by values: * $P/0.05$, ** $P/0.001$.

After individual weighing of pigs, expenditures of mixed feeds per unit of gain in weight were calculated: 4.77 kg for pigs of control group I; 4.68 and 4.49 kg for pigs of groups II and III, respectively.

These data indicated that test mineral protein additive contained in mixed feeds designed for fattening of pigs promoted the increase of daily gain in weight owing rather to better utilization by animals than to greater consumption of mixed feed.

Concerning the fact that test mineral protein additive was a new and specific product, it was necessary to estimate its influence on pigs as a whole, on morphological composition of carcasses and on quality of pork products.

For this purpose, three pigs from the control group I and three pigs from the test group III were slaughtered.

Results of pig carcasses boning are shown in Table 2.



Table 1. Results of the experiment (per animal in average)

Indices	Groups		
	control	test	
	I	II	III
Protein component, mass%:			
sunflower cake	13	6	-
mineral protein additive	-	7	13
Live weight, kg:			
at the beginning of test	33.5±0.53	33.5±0.57	33.9±0.5
at the end of test	94.0±2.9	104.8±3.4*	108.3±2.9**
Daily gain of pigs, g	438±19.4	517±22.4	539±19.7**
In per cent to control group	100	118.0	123.1
Daily consumption of mixed feed, kg	2.09	2.42	2.42
Expenditures of mixed feed per kg of gain, kg	4.77	4.68	4.49
In per cent to control group	100	98.1	94.13

As shown in Table 2, carcasses of test animals were heavier, that's why the share of meat and fat (in absolute number) occurred to be 7.7 kg (per head in average) greater than in control group.

Substitution of sunflower cake for new feed additive did not influence the carcass quality. Yields of muscular, fat, and bone tissues separated from control and test pigs were practically identical.

To estimate the quality of products obtained as a result of slaughtering, chemical composition of L.dorsi muscle was determined. At the same time, indices of pH, water-binding ability, content of tryptophan, oxyproline, and qualitative protein index were estimated (Table 3).

New feed additive in composition of mixed feeds did not render any marked influence on the chemical composition of L.dorsi muscle. The only trend to decrease moisture and to increase protein contents in the pig meat of the test group became apparent.

On the basis of indices summarized in Table 3, the water-binding ability, content of tryptophan and oxyproline, as well as qualitative protein index secured a higher quality of pork and made it more juicy and tender. When two levels (7 and 13 mass%) of new feed additives were analyzed, it appeared that 13 % additive (test group III) rendered more efficient influence on pigs gain in weight and on expenditures of the mixed feed per unit of gain.

Table 2. Quantity of products and yield of muscular, fat, and bone tissues in carcasses of fattened pigs (per animal in average)

Indices	Groups	
	control I	test III
Protein component in mixed feed, mass%:		
sunflower cake	13.0	-
mineral protein additive	-	13.0
Cooled carcass weight, kg	58.8	66.5
including, kg:		
meat	37.3	42.5
external fat	13.9	16.0
bones	7.6	8.0
Tissue ratio in carcass, %:		
muscular	63.4	63.9
fat	23.7	24.1
bone	12.9	12.0

Table 3. Chemical composition and indices of qualitative evaluation of meat (average indices)

Indices	Groups	
	control I	test III
Chemical composition, %:		
moisture	73.25	72.06
protein	19.03	19.71
fat	5.92	6.45
ash	1.01	0.99
pH	5.4	5.6
Water-binding ability	39.6	48.9
Tryptophan, mg%	386.1	403.3
Oxyproline, mg%	55.46	53.63
Qualitative protein index	6.96	7.52

As a whole, results of research and economic experiments showed that new mineral protein additive can be used as mixed feed component for fattening of pigs. It promoted a higher efficiency of feed use, including such factors as assimilation of cereals and intensification of animal fattening.

Industrial production of new feed additive would allow to make the most efficient usage of meat processing wastes, to increase the assortment and total volume of the raw material for the manufacture of mixed feeds.