NEW PROTEIN-MINERAL SUPPLEMENTS FOR FEEDS – A SOURCE FOR INCREASING PRODUCTIVITY OF FARM ANIMALS

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Key words: compound feeds, protein-mineral supplements, pigs, weight gain, feeds expenditure, quality of products

Introduction

Development of industry-based animal husbandry created the problem of provision of a feed base that would meet the requirements of the animals in nutritionally and biologically valuable substances. The problem of production of feeds, balanced over proteins, carbohydrates, lipids, micro-and macroelements, vitamins and other biologically active substances has been difficult in terms of satisfying the requirements of animal husbandry in nutritional substances, that would allow to provide high productivity in fattening of the animals and low expenditure of feeds per unit of the products. The solution to this problem at the present state of animal husbandry on the basis of use of the wastes of inedible raw materials as feeds supplement seems to be a most promising direction at the present time. A necessity arose to find and study the most promising kinds of inedible raw materials that can be competitive when used in the production of feeds. A problem of conversion of cellulose containing different wastes of plant growing looks attractive. When processing the cereals for food purposes , particularly when decorticating the grains large amounts of wastes that wouldn't be used for food purposes are accumulated. First of all , we speak about shells. During one year at the enterprises of agro-industrial complex up to 140 thousands tons of rice, buckwheat and millet shells is accumulated. At the present time some amounts of these wastes are used for fuel, insulating materials, concrete blocks production and for other technical purposes, however the major part of shells is not used at all and goes to dumping ground that leads to environment pollution. The shells of cereals contain organic compounds –sugar, nitrogen, aminoacids, organic acids and inorganic substances – calcium, phosphorus, magnesium, manganese, zinc, iron and copper. Presence of rich carbohydrate complex in the shells, vitamins makes it possible to use it as a feed component for animals.

Objective

The purpose of the work was the development of biologically valuable feed supplements as components of compound feeds for farm animals from the wastes of meat and cereal-processing industry possessing high producing properties.

Methods

During experiments the following indices were determined: total chemical and aminoacid composition, pH, digestibility, total bacterial count, presence of coliforms, salmonellas, toxicogenic anaerobes. All these characteristics were determined according to commonly accepted laboratory practice and regulated by corresponding State standards (GOSTS).

Results and discussion

A process technology for protein-mineral supplements based on bone or meat-bone meal with the incorporation of previously hydrolyzed rice or buckwheat, or millet hulls in the ratio 4:1 has been developed.

Protein-mineral supplements are intended for use as a component in compound feeds for agricultural animals. The laboratory investigations of experimental lots have shown that protein-mineral supplements meet the requirements of GOST for the feed meal of animal origin.

Chemical composition of protein-mineral supplements is presented in Table 1. The supplements contain not less than 30% of crude protein, 4.5% fat, not more than 44% of ash (for pigs and calves) and not more than 30% (for poultry), not more than 16% of calcium and 8% of phosphorus.

Protein-carbohydrate supplements contain all the essential aminoacids necessary for wholesome nutrition of agricultural animals. Such essential aminoacids, as lysin, methionine+cystin, tryptophane and other aminoacids determining the feed value of proteins are found in large amounts in the protein-carbohydrate supplements and this is a good reason for their use in the diets of the animals.

To study possibility and efficiency of use of new protein-carbohydrate supplements in compound feeds for pig youngsters, scientific experiments were carried out at husbandries Results of scientific experiments at husbandries (per one animal on the average) are presented in Table 2.

Use of protein-mineral substances as components of compound feeds had a favorable influence on live weight increase of pigs. Generally , during the experiment the intensity of growth of gilts of the experimental groups receiving compound feeds with new protein-carbohydrate supplements was higher.

As a result of the investigations carried out it was found that animals of all the experimental groups had high average daily gains of live weight (715-757 g).

Growing pigs receiving a new feed supplement with treated rice shells have higher indices (by 18%) of average daily gains of live weight as compared to the control group; the animals having in their diets supplements with previously treated buckwheat or millet shells exceeded the indices of weight gain as compared to control group by 8.7 and 7.9%, respectively.

The consumption of compound feeds per unit of pigs live weight gain of the experimental groups decreased by 8.1-16.6% as compared to the animals of control groups and constituted 4.0 kg of compound feed per 1 kg of live weight gain in the experimental group, receiving the supplement with rice shells, 3.5 kg of PMS with buckwheat shells and 3.7 kg - PMS with millet shells.

Table 1

Chemical composition of protein-mineral supplements (PMS)

Indices	Samples		
	PMS with rice shells	PMS with buckwh. shells	PMS with mill. shells
Moisture, %	10.1±0.6	9.4± 0.8	9.6±0.8
Protein, %	34.7±1.4	35.5 ±1.2	35.0±1.1
Fat, %	7.7±0.6	6.9±0.8	7.2±0.7
Ash, %	18.9±0.9	20.5±0.7	19.8±0.7
ellulose + NFES*, %	28.6±1.1	27.7±1.0	28.4±1.1

*NFES – nitrogen free extraction substances

Table 2

Results of scientific experiments at husbandries

Characteristics	Groups of animals		
	PMS with rice shells	PMS with buck. shells	PMS with millet shells
On average during the experiment			
Average daily increase, g	715±21.3	757±20.9	754±25.2
In % to the control	118.8	108.7	107.9
Consumed compound feed per 1 kg of weight increase, kg	4.0	3.5	3.7
In % to the control group	83.40	91.90	92.90

As the introduction of new protein-mineral feed supplements with the wastes of cereals production did not have any negative influence on the appetite of the animals and eating of compound feeds by them, their expenditure per 1 kg of weight gain for the period of the experiment was in agreement with the weight gain in the groups. The data obtained show that the use of protein-mineral supplements in compound feeds for pigs favors the increase of average daily weight gain due to better use of the feed by the animals. For the evaluation of meat quality a physico-chemical composition of L.dorsi was determined. It was established that the use of new feed supplements did not have marked influence on chemical composition of m. L.dorsi. Judging from such indices as moisture-binding capacity and the protein quality index, the meat of pigs fed on experimental diets had high quality, was juicy and tender.

Conclusions

Use of resources of rice, millet and buckwheat shells will allow to obtain about 120 thousand tons of high quality protein-mineral feed supplements. Use of these supplements in compound feeds will allow to obtain additionally 35 thous. tons of pigmeat in live weight due to improvement of the diet and increase of the average daily weight gain. Use of new biologically valuable feed supplements in the diets will allow to increase the productive effect of compound feeds, increase the production volume of ecologically clean animal products, increase their quality and also to solve the problem of environment pollution.

Table 3

Physico-chemical characteristics of m. L. dorsi, %

Characteristics	Protein-mineral additives		
	Meat-bone meal + rice shells	Meat-bone meal + buckwheat shells	Meat-bone meal + millet shells
Moisture	71.43	72.73	70.40
Fat	8.59	5.32	7.05
Protein	19.00	20.92	21.40
Ash	0.98	1.03	1.15
Active reaction of the medium (pH)	5.6	5.4	5.6
Intensity of color (coefficient of extinction x 1000)	163.9	166.0	165.7
Moisture-binding cap.% : To meat	51.38	52.03	51.84
To moisture	71.90	72.15	72.56
Protein quality index	5.97	5.71	5.43

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