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The Technology of Producing Innovative Feed Additives for Farm Animals on The Basis of Soybeans.

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ABSTRACT

The solution to the shortage of nutrients in the basic animal diet is the use of special balancing feed additives (BFA) made on the basis of soybeans and enriched with the view of compensation for scarcity of main nutrients of the specific diet. We studied complex influence of such additives on the physiological state and meat productivity of young rabbits. As the result of the research, prototypes of four balancing feed additives were prepared. They are characterized by a combination of extruded grain base and technology of introduction of minerals into them.

Keywords: feed additive, soybean, grain mix, deficit, recipe, technology, biometrics.

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INTRODUCTION

All feed additives have a different effect on the animal's body, depending not only on its physiological state and conditions of keeping, but also on the dose of the additive. Overdoses of these substances and a large amount of fodder existing in nature can lead to undesirable consequences and even poisoning, although the term toxicity is not quite correct to use in connection with the consideration of feed and feed additives [1]. Feeding farm animals and poultry with unbalanced diets leads to a decrease in immunity, productivity, as well as to the emergence of various diseases, and as a result – the death of animals. Domestic and foreign experience clearly shows that a large role in the development of animal husbandry plays a complete feeding in accordance with modern standards [2].

The true nutritional value of feed is an indicator that consists of consumption, digestibility and efficiency of their use. In case of negative factors, these components can change grossly so that the traditional assessment of the nutritional value of food becomes meaningless. Their negative impact is characterized by a decrease in consumption and digestibility due to the deterioration of the taste of the feed, as well as the presence of anti-nutrients [3].

MATERIAL AND METHODS OF THE RESEARCH

The main role in the efficiency of feed nutrients belongs to carbohydrates. This is due to the fact that carbohydrate fractions are the main energy supplier in animal feed and have a significant effect on digestion and use of substances in the body. Carbohydrate nutrition value of feed depends on the content of different forms of carbohydrates in the feed, its digestibility in different parts of the gastrointestinal tract, the effect on metabolism and productivity of animals.

Maize as an energy source is superior to all kinds of grain feed (12.2 – 12.8 mj of exchange energy in 1 kg), but differs from them in the lowest content of crude protein. Balancing animal diets only in respect of proteins and carbohydrates is not quite effective, because there is a shortage of mineral elements. Therefore, the production of new protein feed additives enriched with minerals, taking into account the climatic and biochemical conditions of the Amur Region is relevant [4,5]. In addition to macronutrients, microelements that enter the body with food and water play a significant role in the metabolism of animals [6]. Studies have shown that the concentration of trace elements in conventional feed in many cases is insufficient and there is a need to balance the diets of animals in respect of the obviously missing trace elements. Extra nutrition enriched with microelements improves the general physiological state of animals and at the same time increases their productivity [4]. Numerous literature data indicate that iron, manganese, copper, iodine and cobalt are more important trace elements for animals [7].

To obtain a complete mineral-enriched protein feed additive based on soybeans directly at the farms, it is possible in the process of extrusion to introduce various mineral and biologically active additives into the grain base. Enrichment of feed additives with micro-macronutrients can be done by adding various chemical elements in the form of a solution of salts [8]. Enrichment of compound feeds with various additives in dry and liquid forms requires high-quality mixing.

The method of preparation of mineral-enriched soy protein feed additive includes the supply of a solution of mineral filler directly into the mouth of the extruder together with soy grain. In the extruder there is grinding, mixing of components and a continuous extrusion process under the influence of high temperature and pressure, which allows of binding the protein with mineral elements at the molecular level. The finished product is cooled and sent by the conveyor for shipment. The introduction of a solution of salts of micro-macronutrients into the barrel of the extruder during extrusion of soybeans allows of taking into account the need of animals for minerals, depending on the climatic conditions of local farms, chemical composition of the diet used in them, the type of productivity and the age group of animals. In addition, the joint extrusion of soya together with salt solution under the influence of high temperature and pressure provides enrichment of soy protein with micro - and macronutrients, which in the long run increases their digestibility.

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RESULTS AND DISCUSSIONS

The basis of the feed additives comprises the following components: extruded soybeans 61 g per 1 head daily – FA (feed additive), and extrudate of a grain mixture (soy 90% + corn 10%) – SCC (soybean-corn concentrate) 55 g per 1 head a day, and also a mixture of minerals (1,037 g per 1 head a day) – M, that compensate for the lack of macro - and micronutrients in basic diet. Using these components, 4 types of prototypes of balancing feed additives were prepared for feeding of experimental animals.

The obtained feed additives belong to two groups (2 kinds each), which differ in the main volumetric ingredient: FA – soya grain extrudate and SCC – grain mixture extrudate (soybean 90% + corn 10%). Each of the two samples of these groups of balancing additives is enriched with a mixture of minerals M, the introduction of which in the feed product was carried out by one of the two technologies:

- treatment of the extruded raw material with a solution of minerals using a special dosing device;
- mechanical mixing of crushed minerals with the obtained extrudates of pure soybean and grain mix.

As the result, four prototypes of feed products for feeding individual groups of experimental animals were obtained.

1. MFA is an extrudate of soybean treated with a solution of minerals before extrusion;
2. FA+M-soybean extrudate mixed after production with crushed minerals;
3. MSCC – extrudate of a grain mixture (soy 90% + corn 10%) treated before extrusion with a solution of mineral substances;
4. SCC+M-grain mixture extrudate (90% soy + 10% corn) mixed after production with crushed minerals.

The positive effect of the obtained balancing feed additives on the physiological state and meat productivity of animals was studied in the course of and on the materials of scientific and economic experiment (feeding of young rabbits), which was carried out by the method of groups. The experiment compares the effect of different feeding on similar animals. One of the comparison options - the basic diet (BD) is taken as a standard (control), and others – as experimental [9].

The average group data obtained are presented in the table 1.

Table 1: live weight, weight gain (absolute, relative and average daily) of rabbits (average group), g.

Indicator	Group				
	control	I experimental	II experimental	III experimental	IV experimental
Age, days	Live weight, g				
33	786	778	784	787	785
36	811	872	882	808	799
39	851	861	923	930	833
42	865	1040	1104	1036	902
45	873	979	1034	1127	980
48	880	1120	1124	1197	1044
51	900	1216	1247	1288	1074
54	971	1281	1261	1160	1078
57	911	1371	1295	1528	1113
60	911	1354	1296	1566	1142
Absolute gain in live weight, g					
30-60	125	576	512	779	357
Relative gain in live weight, %					
30-60	15,9	74,1	65,3	99,0	45,5
Average daily gain in live weight, g					
30-60	4,2	19,2	17,1	26,0	11,9
% of control	100	460,8	409,6	623,2	285,6

Production of BFA (balancing feed additives) based on soybeans in accordance with the improved recipes, that take into account the lack of nutrients of a particular diet, will provide a solution to the problem of protein deficiency in the feeding of farm animals, especially in the Far East Federal District, including the Amur Region, which is the main producer of soybeans in Russia and needs enhancement of its effectiveness in animal husbandry.

CONCLUSION

These results show that the use of the developed technology of obtaining and using innovative balancing feed additives in the diets of farm animals (rabbits) has a positive effect on their meat productivity.

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