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Comparison of nutritional value of products of soya bean processing and their use in feeding pigs

The purpose. To study nutritional value of soybean cake, expanded and extruded soya bean at feeding pigs.

Methods. On photometric Kjeldahl method they studied the content of protein in soybean cake, extruded and expanded soya bean. The chromatographic method has allowed studying their amino acid composition. Comparative assessment is made of food factor and productive action of mentioned products on an organism of pigs in mass of 65 kg.

Results. The highest average daily gain was at pigs fed with addilion of extruded soya bean. At pigs fed with expanded soya bean it was the lowest.

Conclusions. Addition of extruded soya bean can ensure daily average gains up to 1000 g, If actual quality performances of feed ingredients of a ration will be considered.

Key words: pigs, soybean cake , extruded and exponded soya bean.

Now, in many States there is developed the production of soybean products. The interest in them is primarily related to the chemical composition of soybean seeds, which is virtually unmatched among legumes and cereals in crude protein content. It is important that the protein of soybean seeds, despite the shortage of sulfur-containing amino acids, has a high feeding value because it contains all the essential amino acids in proportions close to ideal protein [3]. In addition, seeds of this crop is rich in fat-soluble vitamins, macro - and micronutrients [2]. However, the use of the farm animal feeding of soybean seeds and products of its processing requires the application of certain methods of preparation [1]. Because it is composed of a number anthopogenic substances, a list which includes dozens of titles. First of all, the enzymes that block the absorption of protein in the animal body, causing a glut of its compounds ammonia and can lead to death of the animal [8]. In second place — lectins. Proteins are able to adhere to cells, resulting in their work is inactivated. Most such exposures are the red blood cells, the cells that are involved in the transport of oxygen and are responsible for Key words: pigs, soybean meal, extruded soybean and eksponowane. the body's immunity. Protein Soin blocks the processes associated with the use of zinc and the synthesis of testosterone. In addition, the soybean seeds many antivitamins that block the use of magnesium, manganese, iron, calcium, which leads to the balancing of the hematopoietic, reference, endocrine, digestive and other functional systems of the body. The soybean seeds have saponins, antihormone that disrupt the thyroid gland [6]. Fortunately, all of these antipain substances of soybeans are neutralized during cooking, as it was known millennia ago. After all, the preparation of food from soybean seeds Chinese peasant spent most of the day. Now to carry out heat treatment of soybean seeds is not difficult, but you need to find a routine that will not lead to protein denaturation and hydrolytic processes of other nutrients. The technology used during the production of cake and meal, soybean,

eksponowane and extruded soybeans, provide clearance anthopogenic substances and the preservation of the structure of nutrients [9]. The aim was to study the nutritional value of soybean cake, eksponowane and extruded soybean in the feeding of pigs. The research material. The objects of investigation were samples of soybean products. They studied the contents of the main nutrients and biologically active substances by the photometric method for determination of nitrogen. Used the method based on the removal kislotosoderzhaschaya substances to determine the fiber, methods of using organic solvents for determination of crude fat determination of mass of residue after burning and calcining to determine the crude ash, chromatographic method for determining amino acid composition. Held carrying experience of pigs weighing 65 kg at the physiological yard of the laboratory of zootechnical evaluation of forages of the Institute of forages and agriculture of Podillya of NAAS (table. 1). Animals in the group selected on the principle of analogues, placed them in individual, specially equipped cells, which allowed to take into account the amount of the consumed their feed, a discharge of feces and urine.

Pigs were fed twice (at 7 a.m. and 19 p.m.), individually. The composition of the rations is determined by accepted practice in husbandry practices, for each group, taking into account the actual indicators of the content of essential and biologically active substances in the main feed and products of soybean. The results of the research. The most common use of soy product — meal [7]. The characteristic of its quality indicators is given in DSTU 4230:2003. In accordance with this regulatory document soybean meal should contain crude protein — not less than 45%, crude fiber — not more than 7%, the content of crude fat not more than 1.5% in terms of dry substance. Unfortunately, according to the monitoring of the chemical composition of soybean meal in the Institute of forages and agriculture of Podillya of NAAS, about 27% of the analysed samples in 2013 did not meet the standard crude protein 80% crude fat, 27% crude fiber. On the territory of our state is valid normative document for soybean cake GOST 27149-94. The crude protein content in this product should not be less than 42,5%, crude fat — not more than 8% of dry matter and crude fiber — not more than 7% in terms of dry substance. The monitoring carried out at the Institute, indicates that more than 50% of soybean meal samples do not meet specified index crude protein more than 80% of crude fat, more than 60% of crude fiber. It is also important that from 62 samples of soybean meal and cake were investigated on the content of non-protein nitrogen, about 30% of its GE - suwali. In some samples exceeded reached 1.2%, whereas nature provides in this product is 0.3–0.5%, which provides a 1.9–3.1% of protein. And for exceeding a certain is about 7.5% protein. This is especially important and should be considered when designing rations and feed structure. After all, the use of amino acids protein in the body of the animal when fed such soy product to pigs is changing and not for the better (Fig. 1). Now in feeding agricultural animals and poultry widely use the products of soybean — extruded and eksponowane soy. Standards or industry standards for them in Ukraine. There are technical conditions that develop enterprise-producers on their products. Included in these documents indicators of quality are very different. The content of crude protein in recalculation on absolutely dry substance in extradonary soy must be at least 30-38%, fat content — not more than 15-17%. During the monitoring of these products found that the content of crude protein in the samples extruded soybean can vary from 33 to 42% in terms of dry substance (Fig. 2).

1. *Scheme of balance test and composition of mixed fodder*

Група	Кількість тварин у групі, гол.	Характеристика годівлі за періодами	
		Підготовчий (5 діб)	Обліковий (8 діб)
I	4	Дерть ячмінна — 60,84%, дерть зерновідходи — 27%, сіль кухонна 0,46%, крейда — 1,7%. Основний раціон (ОР) + макуха соєва — 10%	
II	4	Дерть ячмінна — 59,84%, дерть зерновідходи — 27%, сіль кухонна — 0,46%, крейда — 1,7%. Основний раціон (ОР) + соя експондована — 11%	
III	4	Дерть ячмінна — 58,7%, дерть зерновідходи — 25%, сіль кухонна — 0,46%, крейда — 1,84%. Основний раціон (ОР) + соя екструдована — 11%	

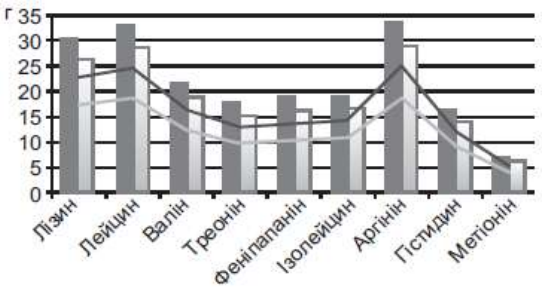

Fig. 1. Use of amino acids of natural and falsified soy meal: - natural soybean meal, average; - counterfeit soy broth, average; - use of natural meal; - use of counterfeit meal

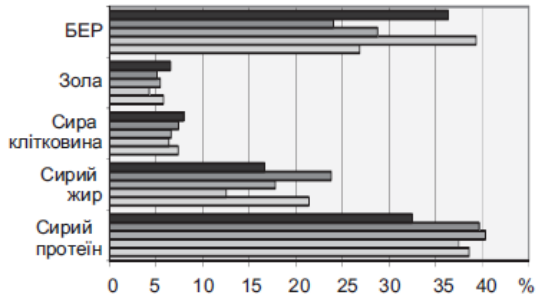

Fig. 2. Results of monitoring of the chemical composition of extruded soy,% (in terms of a completely dry substance)

The content of raw fat in extruded soy is 12.53-23.79%, crude fiber - 6.40-7.96%. That is, before deciding what amount of extruded soy to be added to a feed or animal feed, this product should be tested in the laboratory, primarily on the content of these key quality indicators. After all, their characteristics do not always correspond to the information given in the certificate (if any) or the specifications for this soy product. Exhibited soy is a product that differs from extruded soy and is characterized by a content of crude protein an average of 38.12%, and a raw fat - 19.58% (Fig. 3). After comparing the content of the main nutrients in soybean products, it has been established that soy meal and cake contain more crude protein, and extruded and expanded soybeans - richer in the content of crude fat. Accordingly, when added to diets of farm animals and poultry, this characteristic should be taken into account [5].

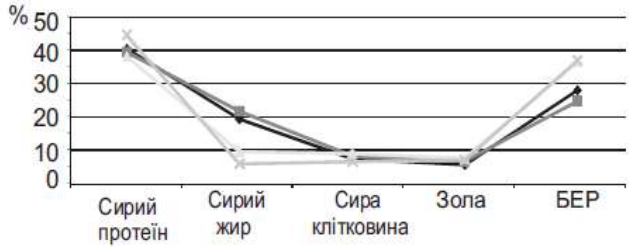

Fig. 3. Comparison of the chemical composition of products for processing soya:

- Extruded soy; - Exhibited soy; - soybean meal; - Shrot soy

In accordance with the scheme of balance experiment on pigs weighing 65 kg formed 3 groups of animals in 4 goals. in each one. The trial lasted 13 days, 5 of which were preparatory periods and 8 - accounting. During the accounting period samples were taken: feed, drops, stool, urine, from which samples were prepared at the end of the experiment. The main diet for experimental animals was the same components, and protein supply was provided by various types of soybean processing products. The number depended on their chemical characteristics and animal requirements [4]. The nutritional value of the daily ration of each of the experimental groups was close to the norm required for the normal course of physiological processes in the body of pigs weighing 60 kg and providing 850 g of average daily increments (Table 2). In rations of experimental animals, the content of crude protein was almost the same, but lower by about 5% of normal. The deteriorating indicator for the increased introduction of soy products was the crude fiber, the content of which was higher in II and III groups. Regarding crude fat content index, which does not provide detailed rules of feeding pigs, it was almost twice as high in the second and third groups compared with I. We believe that pigs need fat to install because of its excess in the diet as the deficit is harmful [10]. Thus, an excess is deposited in large quantities in the body leads while reducing protein synthesis in muscle tissue, affects the secretion of the digestive tract, reduces the activity of proteolytic enzymes, all this leads to performance degradation [7]. Adding only 10-11% of soy products to experimental animals rations provided an average of 28% crude and digestible protein.

2. *The nutritional value of the daily ration of experimental groups of pigs in comparison with norms*

Показник	Норма, для свиней масою 65 кг	Всього у добовому раціоні групи		
		I	II	III
Суха речовина, г	2500	2519,88	2532,65	2516,92
Сирий протеїн, г	435	412,81	411,73	412,1
Перетравний протеїн, г	338	356,21	339,13	375
Сирий жир, г	–	52,91	100,53	88,5
Сира клітковина, г	140	139,91	143,63	144
Обмінна енергія, МДж	35,5	36,22	36,04	37,8
Кормові одиниці	3,2	3,17	3,14	3,19

During the experiment there was a constant observation of the physiological state of animals and their productivity. The average increments of pigs in groups were different (Table 3). The highest average daily gain was in pigs that consumed extruded soy in the diet. In 2 animals from the group, the average daily increments were higher than 1000 g, in 2-lower ones. The same pattern was in the other two groups. In the I group of pigs in the 4th animal, the average daily gain is higher than in the third group. At the same time, in the 1st and 2nd animals of the III group average daily increments were lower by 5% compared to the average in the 1st group. In pigs consuming as

part of the exposed soy diet, the average daily gain in the group was the lowest. In the 4th animal of this group, the average daily gain was only 761.5 g, in the 2nd animal - 861.5 g (the highest in the group indicator). Perhaps this is due to the high fat content of this product of processing soybean seeds, because a number of scientists in their studies prove that high fat content slows the synthesis of protein in the muscle tissue.

Conclusions

Before adding soy products to compound feeds or rations for pigs, it is necessary to determine the basic and preferably biologically active substances in them. When designing the ration structure, it is imperative to take into account the actual performance of their chemical composition and nutrition. This will allow you to provide the animals with the necessary nutrients to the highest possible level and get guaranteed high performance. The addition of extruded soy to the 65 kg weight of pigs provides daily average increments of up to 1000 g, while the addition of soybean meal yields only 2,3% increment.

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