International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies

http://TuEngr.com

PAPER ID: 11A05T

USE OF WHITE LUPINE IN THE DIETS OF MEAT CHICKENS OF BASELINE AND BROILER CHICKENS OF SELECTION OF SGC "SMENA"

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ARTICLEINFO

Article history:
Received 07 August 2019
Received in revised form 19 November 2019
Accepted 28 November 2019
Available online 26 December 2019

Keywords:
Broiler chickens; Digestive enzymes; Zootechnical indicators; Hen live weight; Plimutrok breed; Sweet lupine; Initial lines B6; B7 and B8 of meat chickens.

ABSTRACT

This article presents the results of studies on the use of white lupine in compound feeds for meat chickens of the three source lines and broiler chickens of the SGC “Smena” selection. The objective of the research was to determine the effect of different white lupine in animal feed from plant components on the zootechnical parameters of broiler chickens and meat chickens of the initial lines B6 (Cornish breed), B7 (Plimutrok breed) and B8 (Plimutrok breed). To achieve this goal, zootechnical and physiological experiments were conducted under the conditions of the FSBI SGC "Zagorsk EPH" VNITIP. Studies on the baseline lines of meat chickens showed that replacing soybean meal in compound feeds with white lupine made it possible to ensure high productivity of the experimental bird.

Disciplinary: Animal Sciences (Poultry Science, Animal Nutrition and Feed Technology), Biotechnology.

1. INTRODUCTION

In Russia, the production of feed for poultry is constrained by the lack of protein feeds of plant and animal origin. This leads to Russia's dependence on imports primarily soybean meal and fishmeal. Soybean is grown in the Far East, the Krasnodar Territory and southern regions of Russia do not cover the needs of poultry farming. From this perspective, the expansion of the use of such a crop as lupine in poultry farming is promising. However, the presence of alkaloids in it (lupinin, lu, etc.) is the reason that it did not find wide application in fodder production. Plant breeders have now bred sweet varieties of this crop with a harmful substance content of 0.008-0.12%, and in bitter varieties, the content of alkaloids reaches 3%. In sweet varieties of lupine, the total polysaccharide content is 34–40% and less than 1% is due to starch. Only sweet varieties of this crop are recommended for bird feed. Of great importance in this regard is the use of protein feed products of the processing industry,

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obtained on the basis of innovative technologies and enzymes, which will make it possible to more widely use vegetable feeds in feeding poultry.

In general, in world agriculture, lupine occupies about 1% of the cultivated area. The leaders in lupine cultivation at present are Australia, New Zealand, Poland and Belarus [1].

Legumes are high in protein (20–40%) and essential amino acids, lipids and unsaturated fatty acids, vitamins B, E, C, and carotenoids. The most widespread among them in poultry farming was soy. Due to the increased (over 40%) protein content, soybean meal occupies the main place in compound feeds for poultry. They are used in feeding birds, and especially in feeding broilers, full-fat soy.

However, soybean is demanding on soil and climatic conditions and its productivity in the Central Federal District for many years does not exceed 10 kg/ha. Therefore, the need for poultry in soybean meal is largely satisfied thanks to imports. Constantly increasing prices for legumes, primarily soybeans, lead to an increase in the cost of feed and poultry products.

In solving this problem, lupine (Lupinus) has great potential. Of the more than 200 known species of this culture, 4 were found in Russia - perennial (L. polyphyllus Lindl), narrow-leaved (L. Angustifolia), yellow (L. luteus) and white (L. albus) [3, 7].

The undoubted advantages of lupine include high nitrogen fixation activity, ability to grow on poor and acidic soils, extract phosphorus from trisubstituted phosphates, create favorable conditions for air and water regimes of the soil, be the best precursor for spring and winter crops [1, 2, 6].

By the amount of crude protein in the grain, white lupine is superior to legumes such as peas, vetch and fodder beans, and in terms of quality and digestibility, it is not inferior to soy but surpasses it in yield. The amount of essential amino acids in lupine is higher than that of other legumes but slightly inferior to soy (Table 1).

Table 1: Content of crude protein (%) and amino acids (% to crude protein) in legumes

Amino acids	Full Fat Soya	Lupine	Forage beans	Vetch	Peas
Crude protein	34.5	32.5	24.7	24.0	20.7
Lysine	2.12	1.47	1.32	1.30	1.
Methionine	0.50	0.36	0.26	0.26	0.20
Cystine	0.54	0.32	0.27	0.23	0.17
Threonine	1.37	0.95	0.89	0.84	0.80
Tryptophan	0.38	0.20	0.29	0.16	0.14
Arginine	2.60	3.07	2.04	1.62	1.33
Valine	1.64	1.14	1.35	0.69	0.99
Isoleucine	1.67	3.35	1.39	1.14	0.97
Leucine	2.81	3.37	2.01	1.17	0.98
Phenylalanine	1.70	1.40	1.01	0.87	0.90
Histidine	0.94	1.01	0.73	0.64	0.69
Glycine	1.52	0.92	1.05	0.99	0.75

Among the advantages of white lupine over other types of this crop and soybeans can be called a large yield potential, relative drought tolerance and high attachment of beans.

The purpose of this research was to study the effectiveness of the use of white lupine in compound feeds for meat chickens of the three source lines B6, B7 and B8, and broiler chickens.

2. METHOD

The work was carried out on three initial lines of the bird: B6 - the maternal line of the paternal parent form of the Cornish breed, fast-growing, fast-changing. The main breeding traits are growth rate, feed conversion, meat quality, egg production.

B7 is the paternal line of the maternal parent form of the plimutrok breed, fast-fledging, breeding by egg production, hatchability, growth rate, feed conversion, viability.

B8 is the paternal line of the maternal parent form of the plimutrok breed, which is slowly changing and is selected for egg production, hatchability, growth rate, feed conversion, and viability [8, 9].

The objective of the research was to determine the effect of different white lupine in animal feed from plant components on the zootechnical parameters of broiler chickens and meat chickens of the initial lines B6 (Cornish breed), B7 (Plimutrok breed) and B8 (Plimutrok breed). To achieve this goal, zootechnical and physiological experiments were conducted under the conditions of the FSBI SGC "Zagorsk EPH" VNITIP. The birds were kept in special cages of 25 animals per group from 21 to 62 weeks of age, and broiler chickens were raised in Big Dutchman type cell batteries from daily to 35 days of age. The light, temperature and humidity conditions, the front of feeding and watering were in accordance with the recommendations of VNITIP (2015). The bird was fed with loose feed with nutrition according to the standards of VNITIP (2018). The level of exchange energy in feed for broiler chickens up to 21 days of age was 12.98 MJ / kg; from 22 to 28 days - 13.19 MJ / kg and from 29 days to slaughter - 13.4 MJ / kg, with a crude protein level of 23%, 21, 20%, respectively, with age, and the fiber level was the range of 3.7-4.2%.

Laying hens received compound feed normalized taking into account live weight in the amount of 147–162 g per day per head, with an exchange energy level of 11.3 MJ / kg up to 49 weeks and 11.1 MJ / kg from the 50th week at the level of crude protein 17.0 and 16.0%, respectively, age. When preparing recipes for compound feeds, the normalization of amino acids was carried out taking into account their digestibility, and all vitamins and minerals were introduced into compound feeds through a 1% premix. The experiments on broiler chickens and laying hens were carried out according to the scheme shown in Table 2.

Table 2: Scheme of the experiment on broilers and laying hens

Group	Feeding Features
Control 1	The main ration balanced in all nutrients in accordance with the norms of VNITIP (MR).
Experienced 2	MR with the inclusion of 15% crushed white lupine instead of soybean meal for broilers and 10% for laying hens *.

* The experiment was carried out according to a single scheme for chickens of the B6, B7 and B8 line, and rational levels of input of white lupine in compound feeds were determined in previous studies.

The study took into account the following indicators: The chemical composition of white lupine; preservation of livestock by accounting for waste and establishing its causes; live weight of broilers at the age of: day, 21, and 35 days, and laying hens at the age of 21 and 62 weeks by individually weighing the entire population in groups; average daily gain in live weight; feed costs per 1 kg gain in

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live weight at the end of the experiment; feed intake, for the entire growing period, kg per head; the digestibility and use by birds of the main nutrients of compound feed according to the results of physiological experience at the age of 30-35 days; the chemical composition of the liver and pectoral muscles of broilers at the end of cultivation, egg-laying on the initial laying layer for 62 weeks, the mass of eggs at 30 weeks of age and the yield of hatching eggs.

3. RESULT AND DISCUSSION

An analysis of the chemical composition of white lupine showed that the content of crude protein in it was 32.5% at a level of crude fat of 10.5%, crude fiber 10.7%, calcium 0.32% and phosphorus 0.41%. The exchange energy was at the level of 10.09 MJ/kg. Zootechnical indicators obtained in the experiment on broilers are presented in Table 3.

Table 3: Zootechnical indicators in the experiment on broiler chickens

Indicator	Group	
	1c	2
Preservation,%	100.0	100.0
The average live weight in 1 day, g	43.4 ±0.11	43.7 ±0.09
4 days	90.1 ±0.34	92.2 ±0.44
7 days	140.2±1.20	147.2±1.50
14 days	400.2±4.12	444.4±7.17
21 days, g	800.4±13.7	832.4 ±17.1
35 days on average, including	1962.8	2033.5
Cockerels	2118.3±30.16	2161.4±50.02
Chickens	1807.3±29.22	1905.7±29.40
35 days, g	1976.5	2018.91
Cockerels	2090.50±29.91	2135.98±33.24
Hens	1862.5±27.20	1901.84±23.45
The average daily gain in live weight, g	54.83	56.85
Feed intake 1 head, kg in 35 days	3.009	3.011
The cost of feed per 1 kg of increase in live weight, kg, for 35 days	1.568	1.513

From the data of Table 3, it follows that the introduction of white lupine in the amount of 15% in the diets of broilers ensures the safety of young animals at the level of 100%.

The live weight of broilers in experimental group 2 at 21 days of age was 890.3 g; at 35 days of age, this indicator was at the level of 2033.5 g, which is higher than the control bird by 3.4 and 3.6%, respectively, of the age periods.

At 35 days of age, the live weight of the hens in experimental groups 2 was 5.4% higher; and cockerels - by 2.0 compared with the control group. The research results showed that the males and hens equally reacted with live weight when white lupine was included in the feed.

When using white lupine in broiler diets in an amount of 15%, the average daily gain in live weight was higher than the control by 3.7%. The higher live weight of the experimental young animals by the end of the cultivation provided a high feed conversion. The cost of feed per 1 kg gain in live weight in the experimental group was 1.513 kg and was lower than the control group by 3.5%.

The main indicators of digestibility and use of feed nutrients are presented in Table 4.

Table 4: Key indicators of digestibility and use of feed nutrients in broiler chickens aged 30-35 days

Indicator	Group	
	1c	2
Digestibility of protein,%	89.4	91.0
The use of nitrogen,%	50.6	51.9
Availability, %:		
lysine	82.2	82.8
methionine	81.6	82.2
Digestibility of fat,%	73.0	74.9
Use,%:		
calcium	35.1	35.4
phosphorus	37.8	38.0

The digestibility of protein in the experimental group, of chickens that received 15% white lupine as part of the feed, was 91.0% and was 0.6% higher than that in the control group.

The use of feed nitrogen in the experimental group was higher than 1.3% compared with broilers in the control group.

The availability of lysine and methionine from the experimental feed was 82.8 and 82.2%.

The digestibility of fat from feed containing 15% white lupine in broilers of the experimental group was 74.9%, exceeding the control by 1.9%.

The use of calcium and phosphorus in experimental broilers practically did not differ from the birds of the control group.

Based on the chemical composition of the pectoral muscles, it can be said that when using white lupine in broiler feeds, there was a tendency to increase the level of protein in the pectoral muscles of experimental young animals compared to the bird of the control group by 0.4%.

The content of fat and ash in the pectoral muscles of the experimental and control groups was practically the same. There were no significant differences in the content of dry matter broilers in the pectoral muscle.

In the experiment on laying hens of the initial lines B6, B7, and B8, it was found that the safety of the livestock for the period of the experiment (21–62 weeks) was at the level of 96% (table 5).

Table 5: Zootechnical indicators of meat chickens of the initial lines B6, B7 and B8 for the experiment period of 21–62 weeks.

Indicator	Groups					
	Line B6		Line B7		Line B8	
	1 c	2	1 c	2	1 c	2
The safety of the livestock,%	96.0	96.0	96.0	96.0	96.0	96.0
Live weight g:						
at the beginning of the experiment 21 weeks	2417± 36.1	2427± 30.1	2299± 32.4	2301± 31.5	2292± 29.1	2297± 29.9
at the end of the experiment 62 weeks	4503± 42.2	4514± 35.8	4032± 41.4	4029± 41.3	4040± 43.3	4035± 37.7
Egg-laying on the initial layer for 62 weeks, pcs	120	121	160	162	159	161
The mass of eggs at 30 weeks of age, g	62.4± 0.20	62.7± 0.22	60.8± 0.21	60.7± 0.23	60.4± 0.23	60.7± 0.25
The output of hatching eggs,%	91.0	91.1	93.2	93.5	93.1	93.1

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Studies on the baseline lines of meat chickens showed that replacing soybean meal in compound feeds with white lupine made it possible to ensure high productivity of the experimental bird. In 62 weeks, egg-laying on the initial laying hen amounted to 121 eggs in the experimental group and 120 in the control group; along the B7 line - 162, in the control - 160; and along the line B8 - 161 eggs, in the control - 159. According to the mass of eggs on each line at 30 weeks of age, there were no significant differences between the control and experimental birds. The yield of hatching eggs along line B6 was in the range of 90.0 and 91.1%; along the line B7 - 93.2 and 93.5% and along the line B8 - 93.1 in the control and experimental groups. Thus, studies have established that white lupine is a valuable protein and energy product. It contains 10.08 MJ of metabolic energy per 1 kg and 32.5% of crude protein; 10.5% crude fat.

4. CONCLUSION

Thus, the results of the study show that the inclusion of white lupine in the amount of 15% in the feed of broilers and 10% in the feed of laying hens of the original lines B6, B7 and B8 with a balanced feed for amino acids and other nutrients allows you to get good zootechnical performance.

5. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding author.

6. ACKNOWLEDGEMENT

The study was performed at the FSC ARRTPI RAS, with the aid of the Russian Science Foundation, grant No. 16-16-04089-P, for the study of the physiological and microbiological characteristics of the embryonic and postembryonic digestion in meat chicken to develop feeding programs ensuring complete use of genotype potential.

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