Effect of Different Proportion of Lucerne Meal in Broiler Chickens

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Abstract

We carried the feeding experiment with broiler chickens ROSS 308. The experiment was contained from two groups. In each group were 100 pcs broiler chickens. We research in the experiment the efficiency of lucerne meal with proportion 2% and 6% in feed mixtures. The lucerne meal contains protein 164 g per kg, fiber 257 g per kg, lysine 6.95 g per kg, methionine 2.4 g per kg, methionine + cysteine 4.1 g per kg, threonine 6.66 g per kg, thryptophane 2.1 g per kg, metabolizable energy 4.0 MJ per kg and carotenoids content 293.0 mg per kg. The broilers body weight was increased 1738.4 g in group with proportion of lucerne meal 2% in feed mixtures. The proportion of proportion 6% lucerne meal in feed mixtures decreased a body weight of the broiler chickens on level 1552.8 g. The differences of body weight between groups of the broiler chickens were statistically significant ($P<0.05$). Lucerne meal contains fiber, which increases the overall percentage of fiber in the compound, resulting in worse feed utilization.

Keywords: lucerne meal, nutrient, feed mixture, broiler chicken, body weight.

1. Introduction

Physiological status of the bird depends on use of nutrients, including amino acids and energy, in feed ingredients. The use may vary [1].

Alfalfa is widely used in animal feeding. It is moderately rich in protein but has low levels of energy. Dehydrated alfalfa meal generally is used at very low levels in poultry feeding, due primarily to its high fiber and low energy content [2]. Smith [3] reported that, with high crude fiber content above 7%. The use of alfalfa in diets for monogastric animals is limited by its high fiber content. However, it is well established that alfalfa is a natural source of xanthophylls, giving the poultry carcasses a desirable yellow colour [4].

Xanthophylls of alfalfa deposited in the skin and shanks give poultry carcasses and that desirable yellow colour [2]. Alfalfa is well balanced in amino acids and rich in vitamins, carotenoids [5] and saponins [6]. Carotenoids are polyenoic terpenoids having conjugated trans double bonds. They include carotenes (β-carotene and lycopene), which are polyene hydrocarbons, and xanthophylls (lutein, zeaxanthin, capsanthin, canthaxanthin, astaxanthin, and violaxanthin) having oxygen in different form [7]. The effects of saponins may depend on the level in the diets and the type of saponin [8]. Many authors say that have adverse effects on the performance of birds [6, 9]. Titus and Fritz [10] state two types of dehydrated alfalfa meal: artificially dehydrated by heat, and sun (sun-cured) were available. There are three kinds of dehydrated alfalfa meal: first is dehydrated alfalfa leaf meal (20% crude protein), second is dehydrated alfalfa leaf and stem meal (17% crude protein), third is dehydrated alfalfa stem meal (13% crude protein).

2. Materials and methods

A grouped feeding experiment with the Ross 308 final feeder chicken hybrid was carried out in a

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fattening station for 24,000 broiler chickens and the deep litter technology called Big Dutchman was used. In the front part of the fattening station an area was reserved for our own model experimental technology of fodder and water feeding.

The experiment was performed with 100 chickens ROSS 308, which were fed by the feed mixtures. The trial consisted of 2 experimental groups. The following feed mixtures were used: starter, growth and finish. We used powder structure in all phases of trial. The content of the feed mixtures is as follows: first experimental group contained 2.0 % alfalfa (*Medicago sativa*) meal and second experimental group contained 6.0 % alfalfa meal. For feeding we used commercial feed mixtures, which was enriched alfalfa meal. Alfalfa meal used contained the following components shown in the table no. 2. Lucerne meal was added in all feed mixtures - starter, growth and finish. Starter period took the 1st-18th days, the growth period the 19th–31st days, the finish period the 32nd–38th days.

Table 1. Process chart of feeding the broiler chickens with feed mixtures

	Fattening day/number of days		
	1- 18/18	19 - 31/13	32- 38/5
Group 2%	starter period	growth period 2% of alfalfa	final period 2% of alfalfa
Group 6%	starter period	growth period 6% of alfalfa	final period 6% of alfalfa

The law of compound feed content does not strictly lucerne meal. Lucerne meal was produced by drying and milling the tops of alfalfa (*Medicago sativa*) in the stage of buds.

Throughout the experiment we weighed broilers chickens each weak and we statistical evaluated achieved results. At the end of experiment we compared both experimental groups each other.

3. Results and discussion

We used lucerne meal for experiment which contained 16.4% crude protein. Fiber in lucerne meal was at lavel 257g per kg. However, the total fiber content of the resulting mixtures ranged on level from 33.418 g per kg to 42.72 g per kg.

Table 2. Chemical composition of alfalfa meal

Component	Quantity	Unit
ME_N	4.00	MJ
Fiber	257.00	g
Crude protein	164.00	g
Lysine	6.95	g
Methionin	2.40	g
Methionin+Cystein	4.10	g
Threonin	6.66	g
Thryptophan	2.10	g
Carotenoids	293.00	mg

in 1 kg

In addition to its high fiber content, alfalfa is also high levels of bioactive, antinutritive factors such as saponins [5].Use of plant cell wall hydrolyses might improve the nutritional value of alfalfa for poultry, and therefore would allow the inclusion of low-cost product in less intensive production systems.

Cellulases and hemicellulases could contribute significant depolymerization of alfalfa plants polysaccharides of cell walls leading to a significant release of energy, not otherwise available to the animal. Anticipating a potential ban on the use of synthetic dyes in animal nutrition and the use of enzymes could provide a means for establishing alfalfa in poultry diets at levels required to achieve the desired yellow color in carcasses. In addition, low intensive chicken production systems are developed in some countries, particularly in the European Union [11].

In the experiment [4], the addition of cellulases and xylanases from a commercial and recombinant sources, did not result in significant improvement in daily weight gain and feed utilization efficiency of poultry. Statistical analysis showed that the recombinant xylanase, individually, had a significantly negative impact on the final weight, daily weight gain and feed intake, while no significant differences were seen in feed conversion ratio (FCR). Effect of alfalfa saponins on growth and lipid metabolism was studied in quail [12]. Parameters of lipid metabolism were not affected by alfalfa saponins, in addition to increased cholesterol biosynthesis in liver.

In addition to its high fiber content, alfalfa contains high levels of bioactive antinutritive factors, including saponins [5], which are steroids or triterpenoid glycosides. Saponins showed

have hypocholesterolemic, anticarcinogenic, anti-inflammatory, and antioxidant activity [13, 14].
A lysine in feed mixture was in natural forms from lucerne meal and lysine was added as synthetic form of 78% lysine preparation same methionine. A methionine was added as 100% methionine
Feed conversion in the first group containing 2% lucerne meal was at 1.57. The average weight of the group stood at 1738.4 kg. The average feed consumption reached 266.5 kg. However, in the second group containing 6% lucerne meal feed conversion was at 1.93. The average weight of the group stood at 1552.8 kg. The average feed consumption reached 290.55 kg.
The alfalfa makes an important contribution to broiler skin pigmentation, especially with yellow pigments, while red and pink tones side were significantly reduced [4].
The results of experiments suggest that ingestion of high levels of alfalfa meal broilers do not apparent health problems in animals [4].
Feed conversion in group 2% lucerne meal was 1.57 in the group with 6% was 1.93. Poorer feed utilization in the group with 6% of lucerne meal attributable to the fact that throughout the fattening period was the fiber content in compound feed at about 42 g per kg and group 2% lucerne meal contained approximately 34 g per kg.
A feed conversion predicts growth parameters of broiler chickens. This fact is described in articles [15, 16, 17, 18, 19]. The estimate and predicting of feed conversion very specific in describing their work [20].

Table 3 Effect of lucerne meal on the performance of broiler chickens

Period of trial	Mean		SD	Level of significant
	group 2%	**group 6%**		
Week 1	137.40	138.32	15.31	P>0.05
Week 2	390.24	348.48	53.21	P<0.05
Week 3	781.60	708.00	91.66	P<0.05
Week 4	1188.00	1018.40	159.92	P<0.05
Week 5	1675.20	1488.80	232.93	P<0.05
End of trial	1738.40	1552.80	237.88	P<0.05

SD - standard derivation
P Value - statistical significance

4. Conclusions

The use of lucerne meal in broiler chickens has a long tradition in Slovakia. It is due to the fact that a lucerne meal itself contains a large amount of a fiber. Therefore, the use of alfalfa for monogastric animals is limited. When using high doses of lucerne meal then there is a lower feed conversion, resulting in impaired feed conversion, and increased the economic costs to produce one kilogram of body weight.

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