The Effect of Microbial Phytase on Broiler Chicken Production and Nutritional Quality of Meat

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Abstract
We carried out an experiment using chickens producig meat Cobb 500 form 1 to 42 days of age and microbial 6-phytase. The aim of study was to determinate the impact of microbial 6-phytase on the quality of broiler chickens production. In our experiment were used standard soybean-cereal feed mixtures. The content of the nutrients and metabolizable energy was balanced in control group in terms of the broiler chickens physiological needs. In experimental feed mixtures was reduced phosphorus content through the feed addition of dicalcium phosphate about 37.7% in starter, about 35% in grower and about 35.14% in finisher of the sdandardized physiological needs for broiler chickens. A body weight of chickens aged 42 days was 2302.0 g compared with 2197.0 g of the broiler chickens of the control group with not statistically significant difference (P>0.05). Feed conversion was 1.69 versus 1.71 of the control group. Crude protein content of breast muscle was 23.52 g per 100 g compared with 23.36 g per 100 g of the control group with not statistically significant difference (P>0.05). Crude protein content in the thigh muscle was 18.33 g per 100 g compared with 18.20 g per 100 g of the control group with not statistically significant difference (P>0.05).

Keywords: broiler chicken, crude protein, meat, phytase, quality

1. Introduction

Plant materials are the major constituents of poultry diets. Unfortunately, about two-third of the phosphorus (P) in cereal grains, oilseed meals and plant by- products is present in the form of P bound to phytic acid (phytate P), which is not available to poultry. Phytic acid was considered as the major storage form of phosphorus. Phosphorus from phytic acid is of great importance as this acid has a high P content (28.2%), and the major portion of poultry and pig diets consists of plant derived ingredients, where high levels of phytic acid is available. The ability of poultry and pigs to use phytate P is poor [1,2,3] due to insufficient quantities or lack of intestinal phytase secretion. This is due to lack of phytase, the enzyme that hydrolyses phytic acid into inositol and orthophosphate [4, 5, 6].
Many researchers have shown that, supplemental microbial phytase improves the bioavailability of phytate P [7, 8].
Denbow [9] observed that in soybean meal diets fed 0 to 3 week-old broilers, added phytase improved body weight gain and feed intake in all the non-phytate P levels.
The aim of study was to determinate the impact of microbial 6-phytase on the quality of broiler chickens production.

2. Materials and methods

The object of investigation was the final fattening type of chickens Cobb 500, which fed the feed mixtures with supplemented microbial 6-phytase Phyzyme XP (TPT) (IUB/EC 3.1.3.26) in powder

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form, which is the product of Schizosaccharomyces pombe. We carried out the group feeding experiment on poultry farm in operating conditions. In the experiment were used soy-cereal types feed mixtures. The content of nutrients and metabolizable energy was balanced in terms of the physiological needs of broiler chickens. In trial feed mixtures was supplemented microbial 6-phytase and the content of non-phytate phosphorus was decreased compared with the control group.

The body weight of broiler chickens was measured at the end of experiment using scale type KERN FKP 20.0 kg. Furthermore, we observed the feed conversion as the difference of the total weight of feeds used in the group at the beginning of the experiment and the rest of the feed at the end of experiment. The total weight gain of broiler chickens we observed as the difference of body weight of chicks at the end of the experiment and the weight of chickens at the beginning of experiment. For chemical analysis of meat we selected 6 pieces of birds from each group. After slaughtering the carcass treatment was performed. Breast and tight muscle without skin we used for chemical analysis. We observed the crude protein by Kjeldahl method on Kjeltec 8200 equipment. Data obtained in experiment were statistically processed by the program SAS version 8.2. We calculated the arithmetic mean, standard deviation, coefficient of variation and differences between values were evaluated by ANOVA t-test.

3. Results and discussion

The average body weight of chickens at 42 day of age was in the group (TG) were microbial phytase was added into feeds 2302.0 g and 2197.0 g in control group. The more balanced values of body weight of chickens were in the trial group with phytase compared with control group (CG), this is confirmed by standard deviation sd=187.13 g per 100g, respectively coefficient of variation cv=8.76% compared with sd=230.0 g per 100 g, respectively Cv=10.73%. The difference in body weight of broiler chickens between groups was not statistically significant (P>0.05) (Table 1, Figure 1).

Table 1. Mathematical – statistical evaluation of body weight of broiler chickens

GROUP				
Control	n = 100	Trial	n = 100	
SD (g)	C_v (%)	SD (g)	C_v (%)	t-test
230	10.73	187.13	8.76	1.81^{-}

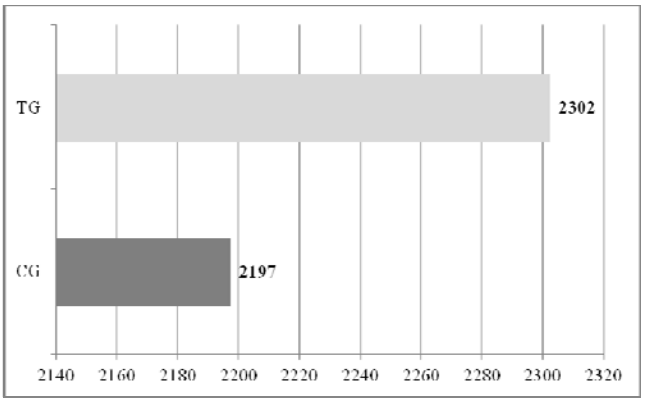

Figure 1. Body weight of broiler chickens at the end of experiment

Bozkurt et. al (2006) [10] have reported the increases in body weight in broiler chickens with dietary phytase in soybean meal based diets, which are in agreement with the result of this study. Zyla [11] have noted that the growth rate of broiler chickens fed low phosphorus diets containing microbial phytase were comparable with or even better than those fed standard phosphorus diet, supporting the concept that phytase improves not only availability of phosphorus.

Feed conversion ratio with phytase was 1.69 in total feed consumption 3820.0 g for the entire experimental period. In the control group was 1.71 in total feed consumption 3690.0 g, it means difference about 0.02 (Table 2, Figure 2).
Aksakal et.al. (2002) [12] reported that the feed utilization in broiler fed with diets containing phytase was increased. Pintar et. al. (2004) [13] reported that due to increasing feed intake simultaneously with body weight, effect of phytase supplementation on feed conversion ratio of broiler chickens was not significant, what is comaparable with our results.

Table 2. Total feed consumption and total body weight gain of broiler chickens

Group	Body weight gain (g)	Feed consumption (g)
Control	2156.0	3690.0
Trial	2261.0	3820.0

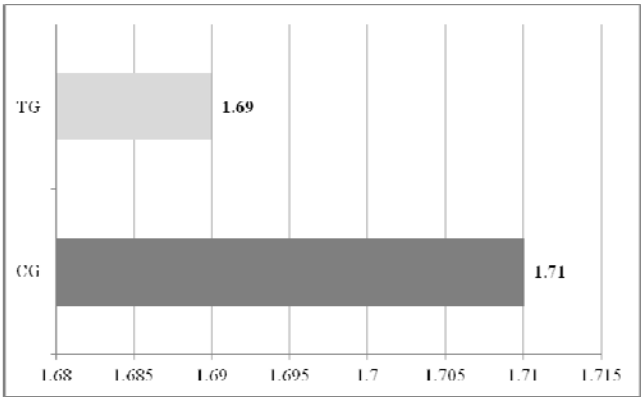

Figure 2. Feed conversion ratio

The content of crude protein in the breast muscle of broiler chickens which fed phytase was 23.52 g per 100 and in control group 23.36 g per 100 g. The mathematical and statistical data evaluation of crude protein content in breast muscle shows that more variations in values were in the group were was used phytase in feed mixtures compared with the control group.
This is confirmed by the values of standard deviation SD=0.48 g per 100 g, respectively, coefficient of variation CV=2.04% compared with=0.35 g per 100 g, respectively, CV=1.50%. The difference in crude protein content in breast muscle of broiler chickens between groups was not statistically significant (P> 0.05) (Table 3, Figure 3).

Table 3. Mathematical – statistical evaluation of crude protein content in broiler chickens' breast muscle

Group				
Control	n = 6	Trial	n = 6	
SD (g)	C_v (%)	SD (g)	C_v (%)	t-test
0.35	1.50	0.48	2.04	0.46-

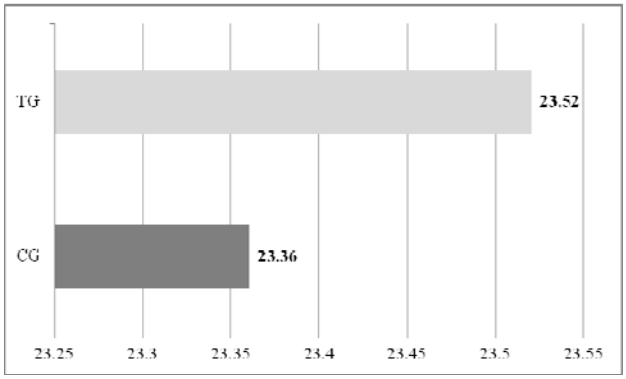

Figure 3. Total crude protein in broiler chickens' breast muscle

In the thigh muscle of broiler chickens which fed feed mixtures with phytase was observed crude protein content 18.33 g per 100 g. The content of crude protein in the thigh muscle of broiler chickens of the control group was 18.20 g per 100 g. Balanced levels of crude protein in the thigh muscle of broiler chickens were in the control group compared to the group with phytase (SD=0.63 g per 100 g or CV=3.45%, compared with SD=0.81 g per 100 g, respectively CV=4.42%). Differences in crude protein content in the thigh muscle of broiler chickens were not statistically significant (P>0.05) (Table 4, Figure 4).

Table 4. Mathematical – statistical evaluation of crude protein content in broiler chickens' thigh muscle

Group				
Control	n = 6	Trial	n = 6	
SD (g)	C_v (%)	SD (g)	C_v (%)	t-test
0.63	3.45	0.81	4.42	0.78^-

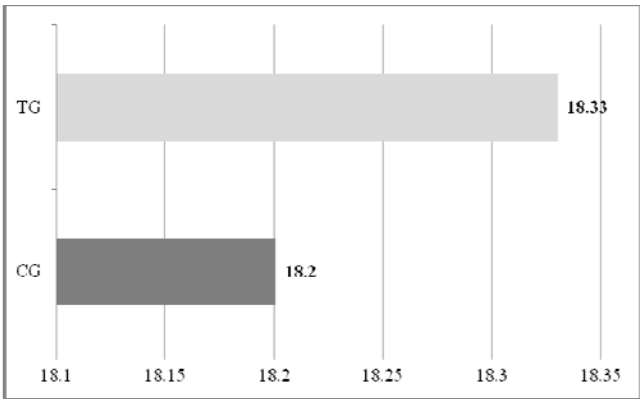

Figure 4. Total crude protein in broiler chickens ' thigh muscle

4. Conclusions

Based on the results of experiment with broiler chickens Cobb 500 we can conclude that microbial 6-phytase supplementation helped to higher body weight gain, better feed conversion ratio. Protein content in breast and thigh muscle is very important nutrient and it is indicated quality of chicken meat. Our result shown that protein content was maintened with the requirements to quality of broiler chickens. We can conclude that supplemental microbial phytase did not significantly affected broiler chickens production.

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