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PHYTASE IN DIET FOR FATTENING CHICKENS, INFLUENCE ON BONE'S QUALITY**

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** Original scientific paper

Abstract: The influence of phytase added in diet for fattening chickens on the meat quality, was examined during the feed experiment. The experimental examinations were done on the chickens of Arbor Acres strain. There were 440 chickens in the experiment, divided into the 4 experimental groups considering the levels of mineral sources of phosphorus and phytase added into the diet. Control group K (110 chickens) dicalcium phosphate 2%, O-I group (110 chickens) monocalcium phosphate 1,4%; O-II group (110 chickens) dicalcium phosphate 1% + 0,1% phytase; O-III group (110 chickens) monocalcium phosphate 0,7% + 0,1% phytase. The feeding experiment lasted for 42 days.

The chemical analyzes of white and red meat of experimental chickens that the meat of the chickens that gained phytase by diet with lower level of mineral source of phosphorus have more proteins and less fat phytase by diet ($P<0,05$).

Key words: chickens, phytase, sources of phosphorus, meat, quality.

Introduction

The phosphorus is of the main structural elements of body. Besides the fact it has very significant role as a bone part, the phosphorus is essential component of organic compounds which are inclooded into the metabolism of energy, carbohydrates and fat.

The facts that phosphorus takes part in lot of more processes of metabolism than any other mineral, makes it body essential element in animal body *(Jovanović,* 1984*, Khan,* 1995*)*.

The metabolism of phosphorus that has plant origin, presents one of the most examined problems connected to the mineral feeding. Considering that

the diets for poultry are mainly based on the diets of plant's origin, the question to what extent animal can use phosphorus out of these sources. Out of the total phosphorus amount 50-80% is firmly connected into the phytate *(Matyuka et al.* 1990*, Simons et al,* 1990*; Vogt* 1992*),* those that couldn't be didied by endogenous enzymes of poultry. The consequence of that is lower digestibility of phosphorus out of plant stuff (for the chicken only 10%), what brings to the need of adding phosphorus out of unorganic sources. However, the application of mineral sources of phosphorus in diets of animal has its risk on the health of animals and people. The inorganic sources of phosphorus are determined as the great environmental pollutants, because by the animal excrements they are extracted into environment. Considering the mentioned facts, experts for nutrition suggest the other formation of diets.

The aim of decreasing levels of sources of phosphorus or total elimination from animal diet. Into these formations of diet enzyme phytase is added. Enzyme phytase decay phytate molecule, and phytase makes reachable phosphorus bound in the form of phytate, out of plant diets for monogastric animals and poultry. The application phytase in poultry science and large effects of that application from different views as many authors have mentioned in their works; phytates decoy to inositol and inorganic phosphate that could be adapted in digestion tract (adaption of phosphorus is increased about 50-60*%, Simons et al.* 1990*),* the minerals are released such as proteins and digestable enzymes , the delay of nitrogen is increased and the extraction of phosphorus to environment for 30% is decreased *(Kies et al.* 2001*, Sebastian et al.* 1998*)*. The diets with addition phytase by fattening chickens have influence to the increase growth and body weight *(Kies et al,* 2001*; Radović et al.,* 2003 quote the growth increase for 1,5-3,8 respectively 6,98-8,51%).

The aim of this work, was to examine the effects of enzyme addition to the compositions for feeding fattening chickens with different levels of mineral sources of phosphorus (mono-calcium –phosphate and di-calcium-phosphate) considering the influence to the meat quality of the experimental chickens.

Material and method of work

The influence of supplemented phytase into the diet for fattening chickens by different levels of mineral sources of phosphorus. Chickens of the Arbor Acres strain were used as the experimental material. Experimental chickens (entirely 440) were divided into 4 groups (per 110) of chickens.

The chickens were fed with gradually nutritive compositions of the some stuff constituents. The only difference were the different sources and levels of the mineral sources of phosphorus, with or without addition of phytase. The first group, was the control one (K) with no addition of phytase enzyme, with 2% of di-calcium-phosphate in diets. The second group (O-I) with mono-calcium-phosphate (1,4%). The third group (O-II) di-calcium-phosphate (1%+ 0,1%phytase); the fourth group (O-III) mono-calcium-phosphate (0,7%) with addition of phytase (0,1%). The feeding experiment lasted for 42 days. In the period of fattening chickens the three compositions were used: starter (0-21day), grower (22-37day) and from 38 till 42 day finishing composition.

Enzyme phytase was used for the experiment made by American company "Alltech" (what resulted 125FYT/g of the product). The control measuring of the chicken were done at the beginning of the experiment, and after that each 7. day during the experiment and at the end of fattening. After the finishing feeding experiment, 14 chickens (7 male+7 female) out of each experimental group were sacrificed for determination of conventionally dressed carcass traits, such as other qualitative traits of meat and bones.

After cutting samples of muscular tissue of breast,, thigh and femur were taken for the chemical analyzes. Each sample was from 2 female and 2 male chicken out of some examined groups. In the aim of determination of the basic chemical composition of white and red meat, following examinations were done according standard analytical methods: water percentage, fat percentage, total protein percentage. The existence of statistical significance was determined by the analysis of variants, F-test as group test and Lsd-test for some comparisons for the difference level of 5% and 1% in both tests.

Results and discussion

The results considering basic chemical composition of breast, thigh and femur muscle of examined groups of chickens are shown in table 1.

On the basis of these data mentioned in table 1, certain similarity among experimental groups could be perceived out of point of basic chemical compositions of some significant parts of examined chickens carcass.

The water content in breast muscle as we perceive was approximate by O-I, O-II and O-III group, meaning (74,32; 74,09 and 74,11%, and K-group 73,15%). Similar, meaning united results we have when the muscle of thigh and femur is in the question, and considering water content.

Table 1. Chemical composition of breast (B), thigh (T) and femur (F) muscle of chickens

Groups		Water	Dried at 105°	Ash	Organic part	Fat	Nitrogen	Proteins
		%	%	%	%	%	%	%
K	B G	73,15	26,25	1,01	98,99	2,14	3,69	23,09
	T K	71,62	28,35	1,12	98,87	8,63	3,01	18,84
	F B	72,90	27,10	1,10	98,90	4,94	3,37	21,07
index	B G	100	100	100	100	100	100	100
index	T K	100						
index	F B	100						
0-I-	B G	74,32	26,45	0,99	99,00	2,08	3,66	22,87
	T K	71,75	28,38	1,01	98,99	8,63	3,00	18,77
	F B	73,06	26,94	1,01	98,99	4,94	3,39	21,21
index	B G	100,77 +0,77	100,76 +0,76	98,51 -1,49	100,01 +0,01	97,20 -2,80	99,19 -0,81	99,05 -0,95
index	T K	100,18 +0,18	100,10 +0,10	89,78 -10,22	100,12 +0,12	100 -	99,50 -0,50	99,52 -0,38
index	F B	100,22 +0,22	99,41 +0,59	91,82 -8,18	100,09 +0,09	100 -	102,73 +2,73	100,66 +0,66
0-II-	B G	74,09	25,91	1,00	98,99	1,96	3,94	24,63
	T K	72,10	27,90	0,98	99,01	8,19	3,30	20,61
	F B	73,13	26,87	0,96	99,04	4,93	3,51	21,97
index	B G	100,46 +0,46	98,70 -1,30	99,50 -0,50	100 -	91,82 -8,18	106,77 +6,77	106,67 +6,67
index	T K	100,67 +0,67	98,41 -1,59	87,11 -12,89	100,14 +0,14	94,96 -5,04	109,63 +9,63	109,39 +9,39
index	F B	100,27 +0,27	99,15 -0,85	87,27 -12,73	100,14 +0,14	99,80 -0,20	104,15 +4,15	104,27 +4,27
0-III-	B G	74,11	25,89	1,01	98,98	1,88	3,89	24,47
	T K	72,26	27,73	1,02	98,98	8,11	3,23	20,22
	F B	73,46	26,53	0,96	99,04	4,90	3,53	22,09
index	B G	100,49 +0,49	98,63 -1,37	100,49 +0,49	99,99 -0,01	87,85 -12,15	105,55 +5,55	105,98 +5,98
index	T K	100,90 +0,90	97,83 -2,17	90,67 -9,33	100,11 +0,11	93,97 -6,03	107,30 +7,30	107,32 +7,32
index	F B	100,77 +0,77	97,91 -2,09	87,27 -12,73	100,14 +0,14	99,19 -0,81	104,75 +4,75	104,84 +4,84

If we observe the content of proteins in breast muscle, we perceive that O-III group had bigger percent of proteins (1,38%), O-II (1,54%) considering K-group, while O-I group had (0,22%) less than K-group. As for as fat content in breast muscle of examined groups, we perceive the K-group had the biggest fat content (2,14%) O-I less for (0,06%); less forthan K-group for (0,26) ($P<0,05$).

Proteins of thigh muscle had by O-III group for (1,38%) bigger value relating K-group; by O-II (1,77%) and O-I (0,07%) less than K-group. The fat content at thigh muscle was by K and O-I group. The some, but in comparison to them O-II group had (0,44) and O-III (0,52%) less fat ($P<0,05$).

The results of femur muscle, considering the content of proteins are following: O-III group had for (1,02%); O-II group (0,9), O-I group (0,14%) more proteins than K-group.

The percentage of fat in femur muscle was the some by K-group and O-I group; but respecting that O-II group (0,01) and O-III group (0,04%) less fat ($P<0,05$).

Analyzing mentioned data, relating to the most content of proteins in breast muscle, femur and thigh of the chickens of examined groups O-II and O-III whith decreased level of mineral phosphorus relating the groups K and O-I which gained only mineral phosphorus source (di-calcium-phosphate or mono-calcium-phosphate), we come to the conclusion that the results of this examination of Sebastian et al. (1998), that the application of microbe phytase releases proteins out of phosphorus bond in the improves activity of pepsin, trypsin an α-amylase respectively delay of nitrogen.

Also, *Okoleva et al.* (1998) by application of phytase in diets for pultry gain the better delay of nitrogen (5,6%) and phosphorus (8,3%), *Korsbak et al.* (1998) quotate improved digestibility of aminoacids for about 2%. As we can see, phytase added to diet have a great deal of useful influences, what resulted not only in increasing body weights of chickens, but in certain positive influence to the quality of white and red meat.

Is necessary to emphasize that the results of this examination considering the content of water, fat and proteins in white and red meat, are nearest to the results reached by *Dakić* (1985)*, Ristić* (1986)*, Perić* (1986) *(quotated Bogosavljević-Bošković,* 1994)*,* such as the results of one's self quotated *author (1994).*

Conclusion

On base of results of examinations presented data and considerations we can conclude that phytase added into the diets for fattening chickens at lower lever of mineral phosphorus source show positive effect to the observed traits, quality of white and red meat of experimental chickens (O-II and O-III group) increased level of proteins and decreased level of fat in muscle ($P<0,05$).

Considering the results of examinations we found warrantable and suggest addition of enzyme phytase in diets for poultry. It has good influence to production traits, such as to the meat quality.

Also, the decreased using of mineral sources of phosphorus with added phytase to diet, satisfy strict protection of life environment.

FITAZA U ISHRANI PILIĆA U TOVU, UTICAJ NA KVALITET MESA

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Rezime

Uticaj fitaze, dodate u hranu pilića u tovu, na kvalitet mesa, ispitivan je ogledom ishrane. Eksperimentalna istraživanja obavljena su na pilićima provenijence Arbor Acres. U ogledu je bilo 440 pilića, podeljenih u 4 eksperimentalne grupe, obzirom na nivoe mineralnog izvora fosfora i dodate fitaze u hranu. Kontrolna grupa K (110 pilića) dikalcijum-fosfat 2%, O-I grupa (110 pilića) mono-kalcijum-fosfat 1,4%, O-II grupa (110 pilića) dikalcijum-fosfat 1% + 0,1% fitaze, O-III grupa monokalcijum-fosfat 0,7% + 0,1% fitaze. Ogled ishrane trajao je 42 dana.

Hemijske analize belog i crvenog mesa eksperimentalnih pilića pokazale su da meso pilića koji su hranom dobijali fitazu uz niži nivo mineralnog izvora fosfora sadrže više proteina, a manje masti od pilića koji nisu dobijali fitazu ($P<0,05$).

Ključne reči: pilići, fitaza, izvori fosfora, meso, kvalitet.

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