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INFLUENCE OF PROBIOTICS CLOSTAT® AND LAKTINA® ON THE AMINO ACID COMPOSITION OF PHEASANT MEAT

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Abstract

The main objective of our study was to determine the impact of CloSTAT® and Laktina® probiotics on the amino acid composition of pheasant meat. The experiment included 90 one-day pheasant chicks (Phasianus colchicus colchicus), divided into 3 groups grown under free access to food and water for 3 months. All birds were fed with standard pheasant feed, to the second group it was added CloSTAT® probiotics (0.5 g / kg fodder); and Laktina® probiotic (0.5 g / l water) was added to the third group.
At the end of the experiment, five pheasants were sampled from each group after slaughtering,. The following amino acids have been tested: asparagine, threonine, serine, glutamine, proline, cystine, glycine, alanine, valine, methionine, isoleucine, leucine, tyrosine, phenylalanine, histidine, lysine and arginine. The results of the experiment show that the probiotic CloSTAT® influences, albeit not statistically-significantly, the amino acid composition of pheasant meat.

Key words*: Pheasants, meat, amino acids, probiotics.*

INTRODUCTION

Probiotics are real alternative to the nutrition antibiotics. They are defined as viable microorganisms (bacteria or yeast) that competitively exclude colonization of intestinal pathogens and demonstrate a beneficial effect on the health of the host when ingested (Salminen et al., 1998). Probiotics are oldest feed additives in poultry nutrition (Gálik, 2012). Kabir (2009), Ivanović et al. (2012) and Maiorano et al. (2012) studied the impact of probiotics on meat quality in broilers, but nobody explored the impact of probiotics on pheasant's meat.
As reported by Tucak et al. (2004) biological value of the meat of pheasants which were fed naturally is higher in comparison to the meat of pheasants fed with commercial mixtures.
In many countries, the pheasant is selected with the aim of producing high quality meat with very desirable nutritional values (Santos Schmidt *et al*. 2007). There are only few publications on amino acid composition of pheasant meat. The knowledge of amino acid composition of pheasant meat can be used to determine its potential nutritional value. Pheasant meat is consumed relatively rarely in comparison with hen meat, pork, or beef (Chisholm *et al*. 2008). Straková *et al*. (2006) compared the amino acid composition of pheasant and chicken meats at the age of 42 days. The knowledge of the amino acid composition of food is very important. It is useful for the determination of the potential nutritional value (Young & Pellett 1984). The main objective of our study was to determine the impact of CloSTAT® and Laktina® probiotics on the amino acid composition of pheasant meat.

MATERIALS AND METHODS

The experiments were carried out with 90 one-day pheasant chicks (*Phasianus colchicus colchicus*) divided into 3 groups of 30 birds each (I group – control; II group – experimental with probiotic CloSTAT®; III group - experimental with probiotic Laktina®). They are bred on the floor, in controlled environment, with an extended light period (24 h / day) and free access to food and water for 90 days. All pheasants were received identical in composi-

tional and nutritional value of standard commercial feed mixtures for pheasants, balanced by protein, energy, amino acids, etc., according to the requirements of NRC (1994). Nutritional value of the feed mixture are presented in Table 1.

Table 1.Chemical composition of feeding mixtures

Nutritive value	Starter (0-28 day)	Grower (29-90day)
Moisture,%	11,1	11,8
ME, (Kcal/kg)	2872	2912
ME (MJ/kg)	12	12,2
Crude Protein,%	28	24,1
Crude Fats,%	3,6	3,3
Linoleic acid,%	1,6	1,4
Crude Fiber,%	3,8	3,6
Crude ash,%	5,8	5,5
Ca,%	1,07	0,98
Available phosphorus,%	0,54	0,51
Phosphorus,%	0,84	0,8
Sodium,%	0,21	0,18
Chlorine,%	0,21	0,22
Chlorides,%	0,3	0,33
Lysine,%	1,7	1,41
Methionine,%	0,54	0,5
Methionine + Cysteine,%	1	0,93
Treonine,%	1,05	0,92
Tryptophane,%	0,35	0,3
Arginine,%	1,85	---

From hatching up to 28 days, the pheasants were fed with a "Starter" commercial feed mixtures with 28% crude protein and ME 2872 Kcal / kg, and from 29 to 90 days with "Grower" commercial feed mixtures with 24.1% crude protein and ME 2912 Kcal / kg.

To the commercial feed mixtures for the first group (I group - positive control) for prophylaxis was added semduramicin sodium as a commercial product Aviax 5% (Phibro Animal Health Corporation) and to the drinking water was added antibiotic growth promoter Enrofloxacin and Colistin as a commercial product QUINOCOL (CEVA SANTE ANIMALE, France) in dose (1 ml / 2 l of water) from the 1st to the 5th day. To the commercial feed mixtures for the second group (II group) was added probiotic CloSTAT® (Kemin, Inc., USA) in dose (0,5 g / kg forage); and nothing to the drinking water was added. To the commercial feed mixtures for the third group (III group) nothing was added and to the drinking water was added probiotic Laktina® (Lactina, Bulgaria) in dose (0,5 g / l of water). All doses used in this study are by the recommendation of the manufacturer.

All birds was vaccinated as follow: against Newcastle with vaccine CEVAC BI L® by instillation into the eye according to the instructions for use of the vaccine from the manufacturer, at the 7th, 28th, 64th and 80th day; against Gumboro with vaccine CEVAC GUMBO L® by drinking water according to the instructions for use of the vaccine, at the 14th and the 22nd day; and against Avian Pox with vaccine CEVAC FP L® by applying in the wing fold according to the instructions for use of the vaccine-on the 56th day.

In this study was used suplements like: probiotic CloSTAT® (Kemin, Inc.) containing: *Bacillus subtilis* $2x10^7$ cfu / g spores, Maltodextrine, Calcium Carbonate and probiotic Laktina® (Lactinia Ltd.) containing *Lactobacillus bulgaricus, Streptococcus thermophilus, Lactobacillus casei, Bifidobacterium longum, Lactobacillus acidophilus* tbc in 1g not less than 1 billion. Laboratory analysis to establish the quality of the fresh meat of pheasants were performed separately for breast and leg muscles in all three experimental groups.

Samples were taken from the pectoral muscles (breast) and femoral muscles (leg).

The muscle was separated from the bones and the skin and subcutaneous fat were also removed. The determination of the amino acid composition of the pheasant meat was made using an automated amino acid analyzer based on the principle of ion-exchange column chromatography by the method of Moore and Stein (Moore and Stein, 1963). In this study, the following amino acids were deteminated: asparagine, threonine, serine, glutamine, proline, cystine, glycine, alanine, valine, methionine, isoleucine, leucine, tyrosine, phenylalanine, histidine, lysine and arginine. All data in our study were analysed statistically using the Program StatMost 3.6, Dataxiom Software, 2003. The results are expressed as means ± SD (standard deviation). The level of statistical significance was at $P \leq 0.05$.

RESULTS AND DISCUSSION

The data of our analysis of amino acid content of breast and leg muscles of pheasants are presented in Table 2.

Table 2. Comparative amino acid composition of the pheasant meat in breast and led muscles(n = 5)

Amino acids		breast muscles			leg muscles		
g/100 g fresh meat		I group control	II group Clostat	III group Lactina	Igroup control	II group Clostat	III group Lactina
asparagine	%	2,17 ±0,16	2,17 ±0,12	2,07 ±0,08	2,31 ±0,14	2,64 ±0,11	2,40 ±0,13
threonine	%	0,834 ±0,04	0,864 ±0,05	0,819 ±0,05	0,927 ±0,03	1,060 ±0,05	0,991 ±0,04
serine	%	0,62 ±0,08	0,66 ±0,09	0,62 ±0,06	0,65 ±0,06	0,74 ±0,05	0,78 ±0,07
glutamine	%	3,98 ±0,02	4,10 ±0,11	3,99 ±0,11	4,24 ±0,11	4,85 ±0,10	4,17 ±0,13
proline	%	0,98 ±0,03	1,06 ±0,04	1,01 ±0,03	0,10 ±0,04	1,13 ±0,05	1,03 ±0,06
cystine	%	0,23 ±0,04	0,26 ±0,08	0,27 ±0,02	0,31 ±0,02	0,35 ±0,09	0,27 ±0,06
glycine	%	1,04 ±0,06	1,07 ±0,03	1,04 ±0,06	1,03 ±0,08	1,18 ±0,08	1,05 ±0,07
alanine	%	1,26 ±0,02	1,30 ±0,03	1,29 ±0,02	1,43 ±0,02	1,63 ±0,02	1,38 ±0,03
valine	%	1,12 ±0,01	1,13 ±0,03	1,13 ±0,01	1,40 ±0,01	1,60 ±0,03	1,35 ±0,02
methionine	%	0,25 ±0,16	0,29 ±0,14	0,37 ±0,04	0,525 ±0,10	0,600 ±0,22	0,344 ±0,14
isoleucine	%	1,07 ±0,01	1,01 ±0,02	1,05 ±0,03	1,26 ±0,06	1,44 ±0,04	1,23 ±0,03
leucine	%	1,80 ±0,02	1,83 ±0,03	1,79 ±0,05	2,07 ±0,02	2,37 ±0,03	2,04 ±0,04
tyrosine	%	0,65 ±0,08	0,66 ±0,13	0,68 ±0,02	0,79 ±0,10	0,90 ±0,10	0,77 ±0,09
phenylalanine	%	0,89 ±0,02	0,91 ±0,02	0,89 ±0,01	0,98 ±0,01	1,12 ±0,02	0,95 ±0,01
histidine	%	0,83 ±0,02	0,87 ±0,03	0,82 ±0,03	1,70 ±0,03	1,94 ±0,02	1,72 ±0,03
lysine	%	2,03 ±0,02	2,08 ±0,05	2,05 ±0,08	2,32 ±0,02	2,66 ±0,05	2,33 ±0,06
arginine	%	1,25 ±0,04	1,30 ±0,03	1,21 ±0,01	1,50 ±0,03	1,71 ±0,04	1,55 ±0,08
Total	**%**	**20,95**	**21,64**	**21,24**	**24,41**	**27,91**	**24,34**

The results of the amino acid profile of the breasts and legs meat showed, that nine of ten possible essential amino acids have been identified. There is no tryptophan, which is an essential amino acid and generally in pheasant meat has the lowest values - 0.29 % of all essential amino acid by scientific data (Petkov, R., 1999). One of other amino acids (essential and semi-essential) hydroxyproline was not found, which according to the literature also has the lowest values – 0.04 % (Petkov, R., 1999). The remaining essential amino acids are within the permissible limits for pheasant meat, which confirms the biological value of the meat. The study conducted by Brudnicki et al. (2012) reported that the meat of the farm pheasants in comparison to that of the wild pheasants was characterized by higher levels of 12 from the total of 15 amino acids analysed.

Comparing the results of the amino acid composition of pheasant meat with the amino acid profile of poultry meat, an increase in the essential amino acids in pheasants except tryptophan was found, which is not found in our studies. The resulting amino acid profile for breasts meat and leg meat showed of a high biological value of the protein in the pheasant meat of the experimental groups. The total amino acid content in the meat of pheasants receiving the probiotic CloSTAT® was higher than that of the control group, and the group received the probiotic Laktina®. Similar is the trend for both types of meat, more pronounced for leg meat than for breast meat.

CONCLUSIONS

Nine of ten possible essential amino acids have been identified in the meat of pheasants.

The total amino acid content in the meat of pheasants receiving the probiotic CloSTAT® was higher than that of the control group. Hydroxyproline and tryptophan was not found in the pheasant meat from all tested groups. The results of the experiment show that the probiotic CloSTAT® influences, albeit not statistically-significantly, the amino acid composition of pheasant meat.

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REFERENCES

Brudnicki A., Kułakowska A., Pietruszyńska D., Łożyca-Kapłon M., Wach J., 2012, Differences in the amino acid composition of the breast muscle of wild and farmed pheasants. Czech J. Food Sci.,30: 309–313.

Chisholm J., Sánchez A., Brown J., Hird H., 2008, The development of species-specific Real-time PCR assays for the detection of pheasant and quail in food. Food Analytical Methods, 1: 190–194.

Gálik, B., 2012. The effect of phytogenic feed additives on nutrients utilization in non-ruminants, (Assoc. prof. thesis). Nitra: Slovak University of Agriculture.

Ivanović S., Pisinov B., Maslic-Strizak D., Savic B., Stojanovic Z., 2012. Influence of probiotics on quality of chicken meat. African Journal of Agricultural Research, 7(14), 2191-2196, available online at http://www.academicjournals.org/AJAR

Kabir S.M.L., 2009. Effect of probiotics on broiler meat quality. African Journal of Biotechnology, 8 (15), 3623-3627.

Maiorano G., Sobolewska A., Cianciullo K., Walasik G., Elminowska-Wenda, A., Slawinska S., Tavaniello J., Zylinska J., Bardowski M., Bednarczyk, 2012. Influence of in ovo prebiotic and synbiotic administration on meat quality of broiler chickens. Poultry Science, 91(11), 2963-2969.

Moore S., Stein W.H., 1963, Chromatographic determination of amino acids by the use of automatic recording equipment. In: Colowick S.P., Kaplan N.O. (eds): Methods in Enzymology. Academic Press, New York

National Research Council, 1994. Nutrients Requirements of Poultry. 9th revised ed. National Academy Press, Washington D.C, pp: 44.

Petkov R., 1999. The game. SD "Mary", Sofia.

Salminen, S.A von Wright, Morelli L., Martean P., Brassart D., de Vos W.M., Fonden R.,Matills-Sandholm T.,1998. Demonstration of safety of probiotic-A Review, Intl. J. Food Microbiol., 44:93-106.

Santos Schmidt E.M., Paulillo A.C., Dittrich R.L.,Santin E., Linder da Silva P.C., Beltrame O., Gonçalves de Oliveira E., 2007, The effect of age on hematological and serum biochemical values on juvenile ring-necked pheasants (Phasianus colchicus).Stracova E., Suchy P., Vitula F.,Vecerek V., 2006, Differences in the amino acid composition of muscles from pheasant and broiler chickens. Archiv Tierzucht, 49: 508-514.

Tucak Z., Škrivanko M., Krznarić M., Posavčević Š., Bošković I., 2004, Indicators of biological value of the pheasant meat originated from natural and controlled breeding. Acta Agriculture Slovenica, 1: 87–91.

Young V.R., Pellett P.L., 1984, Amino acid composition in relation to protein nutritional quality of meat and poultry products. American Journal of Clinical Nutrition, 40: 737–742.

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