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BROILER´S ROSS 308 MEAT CHEMICAL COMPOSITION AFTER ADDITION OF BEE POLLEN AS A SUPPLEMENT IN THEIR FEED MIXTURES

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ABSTRACT

The goal of this study was to evaluate the meat chemical composition of broiler chicken Ross 308. In the experiment, totally 200 one-day-old chicks were divided into 4 groups (n=50) for 42 days. Bee pollen was added to feed mixtures in doses 0; 2,500; 3,500 and 4,500 mg.kg^{-1}. The findings found the moisture content of breast and thigh muscles were higher in the experimental groups compared to the control except E3 in thigh muscle, but in protein content were higher in the control group. On the other hand the fat content and energy value in the control group were higher comparison to experimental groups except E1. There are no significant differences ($P \geq 0.05$) among the experimental groups. From the current study they conclude the bee pollen has a positive effect on the broiler Ross 308 chemical composition because the increase of moisture content and decrease the fat content which may be acceptable for several special human diets.

Keywords: Bee pollen, meat, chemical composition, Ross 308

INTRODUCTION

Poultry meat is considered one of the most prevalent in the world, which led to the attention of researchers and breeders in poultry try to improve the meat quality, such as meat composition. From the standpoint of consumer interests and the slaughter industry, broilers should have not only high slaughter yields and desirable carcass conformation scores but also good aesthetic, sensory and nutritional characteristics. In that respect, the chemical composition of muscle tissue of major primal cuts is an important element of broiler meat quality (**Ristic, 1999; Grashorn and Clostermann, 2002; Suchy *et al.*, 2002; Holcman *et al.*, 2003**). A positive effect of rearing system on certain meat quality traits (breast and thigh yields, improved sensory quality) was reported by **Castellini *et al.* (2002), Fanatico *et al.* (2005)** and **Dou *et al.* (2009)**. The authors have also observed a reduced content of fat (abdominal fat in particular) in free range broilers as attributable to more intensive locomotor activity (**Bogosavljevic-Boškovi *et al.*, 2010**). Pollen grains are the most important source of proteins for bee survival. During collecting trips they pack pollen grains from the flowers into pollen pellets on their hind legs with the help of several combs and hairs (**Almeida-Muradiana, 2005**). The pollen is stored inside the hive separated from the nectar cells. To obtain pollen for themselves, humans install a trap in front of the hive entrance, so that the worker-bees, when coming home, lose their pollen pellets which are then withdrawn into a container (**Krell, 1996; Dutra and Barth, 1997; Barth and Luz, 1998; Luz and Barth, 2001**). Pollen grain as fine powder-like material, are the male seeds of a flower blossom which has been gathered by the bees and to which special elements from the bees has been added. Honey bee collects pollen and mixes it with its own digestive enzymes. Bee pollen is a rich source of protein (25%), oil (6%), containing more than 51% PUFA of which 39% linolenic, 20% palmitic and 13% linoleic acids, more than 12 vitamins, 28 minerals, 11 enzymes orco-enzymes, 11 carbohydrates (35-61%) which are mainlyglucose, fructose and sucrose, flavonoids and carotenoids, phytosterols (**Crane, 1990; Abreu, 1992; Xu *et al.*, 2009**).

The present experiment object to study the effect of bee pollen as a supplemental dietary on chicken meat chemical composition, for improving the quality of poultry meat.

MATERIAL AND METHODS

The experiment was implemented in the test Poultry Station of Slovak University of Agriculture in Nitra. The tested chickens were Ross 308. The experiment included 200 one-day-old chicks, which were divided into 4 groups (n=50): control (C) and experimental (E1, E2 and E3) groups, the fattening duration was 42 days. The chickens were bred in a cages conditions. Each cage was equipped with feed dispenser and water intake was ensured ad libitum through a self feed-pump. The temperature was controlled during the fattening period and it was 33 °C at the first day and every week was reduced about 2 °C. The lighting during the feeding period was continuous. Each group was fed by same starter complete feed mixture (CFM) HYD-01 (loose structure) from 1st day to 21st day of their age, and from the 22nd to 42nd day of their age, chickens were fed by a complete feed mixture (CFM) HYD-02 (loose structure), in all investigated groups of experiments (Table 1). However, they were added natural bee pollen in the amount (0; 2,500; 3,500 and 4,500 mg.kg^{-1}) to experimental groups (C, E1, E2, E3) in their feed mixture. The complete feed mixtures starter HYD-01 and grower HYD-02 had been produced without antibiotic preparations and coccidiostatics. The bee pollen which was used in the experiment was natural.

At the end of the fattening period (days 42) from each group were selected 30 pieces of chickens for slaughter analysis (15 ♀ pieces and 15 ♂ pieces), to evaluate the meat chemical composition of breast muscles (*musculus pectoralis major*) and skinless thigh muscles (*musculus biceps femoris*) with skin and subcutaneous fat of each group experiment. Chemical composition of meat was determined device INFRATEC 1265 (NSR), where we measured water content, fat content and protein g.100 g^{-1}. Energy value in kJ.100 g^{-1}, we investigated the calculated through conversion factors for fat and protein (**Strmiska *et al.*, 1988**). The experimental analyses were evaluated at Experimental Centre for Livestock in Slovak University of Agriculture in Nitra.

The results of meat performance (arithmetic mean, standard deviation) were statistically analysed by the statistic program Statgraphics 5.0. For the determination of significant differences among the tested groups was used analysis of variance.

Table 1 Composition of the basal feed mixtures

Ingredients (%)	Starter (1 to 21 days of age)	Grower (22 to 42 days of age)
Wheat	35.00	35.00
Maize	35.00	40.00
Soybean meal (48% N)	21.30	18.70
Fish meal (71% N)	3.80	2.00
Dried blood	1.25	1.25
Ground limestone	1.00	1.05
Monocalcium phosphate	1.00	0.70
Fodder salt	0.10	0.15
Sodium bicarbonate	0.15	0.20
L-Lysine	0.05	0.07
DL-Methionine	0.15	0.22
[1]Palm kernel oil Bergafat	0.70	0.16
[2]Premix Euromix BR 0.5%	0.50	0.50
Analysed composition (g.kg^{-1})		
Crude protein	210.76	190.42
Fibre	30.19	29.93
Ash	24.24	19.94
Ca	8.16	7.28
P	6.76	5.71
Mg	1.41	1.36
ME (MJ.kg^{-1})	12.02	12.03

Legend: [1] feed fat based on palm oil; [2] active substances per kilogram of premix: vitamin A 2,500,000 IU; vitamin E 50,000 mg; vitamin D_3 800,000 IU; niacin 12,000 mg; d-pantothenic acid 3,000 mg; riboflavin 1,800 mg; pyridoxine 1,200 mg; thiamine 600 mg; menadione 800 mg; ascorbic acid 50,000 mg; folic acid 400 mg; biotin 40 mg; vitamin B_{12} 10 mg; choline 100,000 mg; betaine 50,000 mg; Mn 20,000 mg; Zn 16,000 mg; Fe 14,000 mg; Cu 2,400 mg; Co 80 mg; I 200 mg; Se 50 mg

RESULTS AND DISCUSSION

There is considered that chemical composition is most important factors of meat quality, table 2 report the chemical composition (water, protein, fat (g.100 g^{-1}) and energy value (kJ.100 g^{-1}). Of breast and thigh muscles of broiler Ross 308 after were addition bee pollen as a feed supplement on their feed mixture, from the data we found that the breast and thigh muscles moisture content (g.100 g^{-1}) in experimental groups was higher comparison to the control group except in thigh muscles moisture content it was lower in experimental groups than control. The protein content (g.100 g^{-1}) was in control group higher little bit than experimental groups. On the other hand the fat content in breast and thigh muscles was higher in the control group than experimental groups except the thigh muscle in (E3) was higher than the control group. Also the energy value (kJ.100 g^{-1}) in the control group was higher in comparison to the experimental groups excluding thigh muscle in (E1) was higher than the control group and there were no significant differences ($P \geq 0.05$) among the experimental groups.

Table 2 Chemical composition of breast and thigh muscles for chickens Ross 308

Indicator	Groups	Breast muscles means ± SD	Thigh muscles means ± SD
Water content (g.100 g^{-1})	C	73.81 ± 0.56	66.69 ± 2.65
	E1	74.53 ± 0.42	66.05 ± 1.98
	E2	74.36 ± 0.52	66.52 ± 2.41
	E3	74.67 ± 0.41	68.66 ± 1.95
Protein content (g.100 g^{-1})	C	23.09 ± 0.46	19.24 ± 0.65
	E1	22.83 ± 0.57	18.99 ± 0.35
	E2	22.94 ± 0.44	19.25 ± 0.55
	E3	22.79 ± 0.26	19.23 ± 0.36
Fat content (g.100 g^{-1})	C	2.04 ± 0.47	13.20 ± 3.06
	E1	1.59 ± 0.39	14.11 ± 2.18
	E2	1.70 ± 0.47	13.00 ± 2.51
	E3	1.51 ± 0.44	10.96 ± 1.99
Energy value (g.100 g^{-1})	C	462.6 ± 17.82	819.10 ± 108.73
	E1	442.41 ± 11.2	849.5 ± 79.40
	E2	448.29 ± 16.84	812.00 ± 96.30
	E3	438.90 ± 15.38	735.09 ± 73.50

Legend: C – control group, E1, E2 and E3 – experimental groups, mean - average, SD - standard deviation

The recent study was supported **Haščík *et al.* (2012)** who were added bee pollen extract in broiler´s feed mixtures at doses of 400 mg.kg^{-1} and 800 mg.kg^{-1} to tested meat chemical composition of breast and thigh muscles (g.100 g^{-1}) of chickens Ross 308 and he found analogous of our results, also our study in agreement with **Čuboň *et al*. (2013)** who was added bee pollen in broiler´s feed mixture in doses 500 mg.kg^{-1}, 1,500 mg.kg^{-1} and found similar of our results. In other hand our results confirm **Haščík *et al*. (2011)** who was studied the effect of probiotic preparation for meat chemical composition of cocks different combinations of hybrid chicks. Our study confirms the **Attia *et al.* (2010)** who was using bee pollen in doses (0, 100, 200 and 300 mg bee pollen.kg^{-1}) and they were founded that the rabbits muscles fat content in experimental groups was decreased, and also protein content was decreased. The present study shows that the bee pollen decrease the fat content in breast and the muscles. This result confirms the study of (**Denli *et al*., 2005; Seven *et al*., 2008**) who were study the effect of propolis on broiler and found that the propolis was decrease the abdominal fat in experimental groups. Why the propolis and bee pollen decrease the fat content, because the bee pollen and propolis content flavonoids, and the flavonoids are decrease plasma lipid levels, improve glucose tolerance, and attenuate obesity (**Botsoglou *et al*., 2010**). One possible mechanism underlying these physiological effects is reduction of hepatic levels of the mRNA for stearoyl-CoA desaturase-1 (SCD1), since repression of this enzyme reduces hyperlipidemia and adiposity **(La Nita *et al*., 2011**).

On the other hand the recent study shows the bee pollen increase moisture content, this is a good result because the moisture content was a more important factor than cooking temperature for both extrusion process parameters and product sensory characteristics (**Lin *et al*., 2006**).

CONCLUSION

The recent study concludes that the bee pollen has a positive effect on broiler meat chemical composition. The higher values of moisture content in breast muscles were found in the experimental groups compared with control group. Protein content values were comparable in all evaluated groups. Bee pollen addition has mostly a decreasing effect on fat content of chicken meat. This has led to improve the meat quality and better effects to human health.

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