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EFFECT OF PROBIOTIC PREPARATION FOR CHEMICAL COMPOSITION OF MEAT COCKS DIFFERENT COMBINATIONS OF HYBRID CHICKS

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Abstract

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In the experiment were verified the application of probiotic preparation through a water supply for feeding of cock's hybrids Ross 308, Hubbard JV and Cobb 500 in the chemical composition of the most valuable parts of the carcass. Probiotic was based on the strain *Lactobacillus fermentum* with containing of 1.10^9 cfu.g^{-1} and potentially components of maltodextrin and oligofructose in 1% concentration. Length of feeding period was 42 days. Cocks were fed an *ad libitum* with the same starter mixture HYD-01 to 21th day and from 22nd to 42nd day of feeding with mixture HYD-02 in powdery form. The average of protein content of breast muscle was highest in Hubbard JV hybrid (23.93 g.100 g^{-1}), lower in Cobb 500 hybrid (23.90 g.100 g^{-1}) and lowest in Ross 308 hybrid (23.73 g.100 g^{-1}), without significant differences ($P \geq 0.05$) between hybrids and hybrids groups. Effect of probiotics had increased the protein content ($P \geq 0.05$) in breast muscle of Ross 308 and Cobb 500 cocks and at the Hubbard JV only lower doses application during the feeding. The average of fat content in 100 g of breast muscle was lowest in Cobb 500 hybrid (1.09 g), higher in Hubbard JV hybrid (1.28 g) and highest in Ross 308 hybrid (1.35 g). Effect of probiotic to reduce fat content in breast muscle of cocks was at Ross 308 hybrid (1.33 and 1.23 g.100 g^{-1}), Cobb 500 hybrid (0.98 and 1.02 g.100 g^{-1}) and in second experimental group at Hubbard JV hybrid (1.03 g.100 g^{-1}) statistically significant ($P \geq 0.05$) in compared with control group, but significantly ($P \leq 0.05$) between hybrids Cobb 500 and Hubbard JV in the first test groups. The average of energy value in 100 g of breast muscle was highest in Hubbard JV hybrid (449.24 kJ), lower in Ross 308 hybrid (448.40 kJ) and lowest in Cobb 500 hybrid (441.45 kJ), without significant differences ($P \geq 0.05$) between hybrids and hybrids groups. The average of protein content of the femur was highest in Ross 308 hybrid (18.56 g.100 g^{-1}), lower in Cobb 500 hybrid (18.42 g.100 g^{-1}) and lowest in Hubbard JV (17.54 g.100 g^{-1}) without statistical significance ($P \geq 0.05$). Significant differences ($P \leq 0.05$) of the femur were found at lower dose of probiotics between cock's hybrids Hubbard JV (16.95 g.100 g^{-1}) and Ross 308 (18.48 g.100 g^{-1}) in the protein content. The average of fat content in the femur was highest in Ross 308 hybrid (10.58 g.100 g^{-1}), lower in Hubbard JV hybrid (10.51 g.100 g^{-1}) and lowest in Cobb 500 hybrid (10.29 g.100 g^{-1}) without significant differences ($P \geq 0.05$) between hybrids and hybrids groups. The higher fat and protein content in 100 g of the femur in Ross 308 hybrid was ensured the highest energy value (710.88 kJ), lower in Cobb 500 hybrid (696.40 kJ) and lowest in Hubbard JV hybrid (689.77 kJ) without significant differences ($P \geq 0.05$) between hybrids and hybrids groups. The verified probiotic preparation in the final analysis had not negative effect on the chemical composition of the most valuable parts of the carcase cock's hybrids Ross 308, Hubbard JV and Cobb 500.

probiotic, broiler chicken, hybrid, meat, chemical composition

Poultry industry is today's actual industrial technology, working with living organisms and in the case if in the community there is a sudden deficiency of meat or protein, this deficiency can be quickly offset by poultry meat, as the increase in production is only a organizational problem and the technical aspect is completely developed Kerekréty (1998).

Dawkins *et al.* (2004) provide that in addition to concentrations and movements of animals has influence to the welfare the production performance of broilers and environmental conditions, including nutrition in the first place.

Poultry meat which takes in consumption per capita in the Slovakia the second place, immediately after pork meat, belong into human food chain and his rational nutrition inherently (Kerekréty, 1998; Holoubek, 2001; Haščík *et al.*, 2009a).

Important is also the qualitative composition, since it is one of the protein-rich and valuable foods with high tasteful, digestibility, which is ensured by low lipid content with high presence of unsaturated fatty acids in contradistinction to other animals. Poultry meat on the ground of following aspects is becoming more fans than it did in the past (Berri *et al.*, 2007, 2008; Fanatico *et al.*, 2008; Haščík *et al.*, 2009a, b, c).

Influence on qualitative composition of poultry meat has the animal's genotype, age, farming, environment, various extra and intra vital factors and mainly nutrition in which are often used a various alternative feed and additives (Klíma, 1996; Kratochvílová *et al.*, 2009).

Straková *et al.* (2003) notice that the most important component of poultry meat is mainly proteins with a high content of essential amino acids whereby proteins of chicken and turkey meat contain more essential amino acids, especially arginine, leucine, isoleucine, methionine and valine in comparison to pork and beef meat. The high content of essential amino acids forms conditions for healthy human development and its performance in poultry meat.

Proteins on technological and nutritional point are the most important components of muscle and the content ranges are between 18 and 22%. Ingr (1996) also notes that the main components of drily meat are the proteins. They are highly variable and depend on their content of specifically tissues (Steinhauser *et al.*, 2000). According Simeonovová (1999) is breast muscle chicken contains about 22% protein, while in the thigh muscle 17.20%, which contains more fat. Part of drily poultry meat is fat, which is important from sensorial aspect, whereas is the resource of many aromatic substances, which have effect on the taste of meat.

Fat is a reservoir of energy, a rack of fat-soluble vitamins and provider of essential fatty acids, which can by influenced with particular nutrition of poultry (Benková *et al.*, 2005; Zelenka *et al.*, 2008). Skřivan (2000, 2010) notes as the main reason of formation of the fat in muscle as well as regrettable abdominal fat is the disequilibrium between receipted and consumed energy by chickens. Chicken meat except for protein and fat also contains considerable minerals such as potassium (0.4%), phosphorus (0.2%), sodium (0.09%) and others (Lazar, 1990).

Poultry meat on the ground of its nutritional composition is appropriate for the creation of so-called functional foods for human consumption, which is currently in the interest of human, agricultural and food research (Benková *et al.*, 2005). In the nutrition of poultry including broilers has become of radical changes in recent years, whereas from the nutrition were discarded meat-bone meal, antibiotic preparations and growth stimulants in ordering of EU regulations and began to use various new feed supplements and additives which are designed to eliminate undesirable microflora in the digestive tract of poultry and to increase the immunity of animals, with the possibility to increase their meat production, effect on technological meat quality, respectively (Shalmany and Shivazad, 2006; Brzóska *et al.*, 2007; Barteczko and Lasek, 2008; Haščík *et al.*, 2009a, b).

The aim of the experiment was to verify the effect of probiotic preparations applied through the water source on the chemical composition of the most valuable parts of the chicken's cocks of different hybrid combinations cradled in the same breeding conditions.

MATERIAL AND METHODS

The experiment was implemented in test poultry station of Slovak Agricultural University in Nitra. The experiment enrolled 180 pieces of one day cocks hybrid combination Ross 308, Cobb 500 and Hubbard JV. The cocks were reared in cage technology from company MBD (CR), each cage was equipped with feed disperser and water feed was ensured an *ad libitum* through a self fount. The heating was provided by central heater.

The air temperature was at the first day 33 °C, and every week was reduced about 2 °C. The lighting government during the feeding period was continuous. Custom feeding of cocks abided 42 days. Cocks were fed to 21th day of age an *ad libidum* with the same starter feed mixture HYD-01 (powdery form) and from 22nd to 42nd day of age fed with the growth feed mixture HYD-02 (powdery form) in the monitored groups. The fed feed mixture HYD-01 and HYD-02 have been produced without antibiotic preparations and coccidiostats. The average composition and nutritional value of feed mixtures is shown in Table I.

In the experiment has been used probiotic preparation administered through a self fount that was based on the strain *Lactobacillus fermentum* containing 1.10^9 cfu in 1 g of medium with ingredient of maltodextrin and oligofructose incorporated in probiotic preparations in 1% concentration. The dosage of probiotic preparation in experimental groups is shown in Tab. II. For the evaluation of the

I: *Composition and nutritional value of feed mixtures fed in experiment*

Ingredient	KKZ HYD-01	KKZ HYD-02
	%	
Wheat	35.83	31.21
Corn	35.00	40.00
Soybean extracted (48% NL^{-1})	20.00	21.00
Fish meal (71% NL^{-1})	4.00	-
Dried whey	-	2.20
Dried blood	1.60	2.10
Ground limestone	1.00	0.80
MCP[2] 22, 7 P[3], 16 Ca[4]	1.00	0.90
Fodder salt	0.10	0.15
Sodium hydrogen carbonate	0.20	0.20
Lysine 78%	0.10	0.06
Methionine 100%	0.17	0.23
Fat - Bergafat	0.50	0.65
Euromix BR*	0.50	0.50
	Nutrient composition	
ME_N ($MJ.kg^{-1}$)	11.99	12.08
Nitrogenous proteins ($g.kg^{-1}$)	210.39	191.47
Linoleic acid ($g.kg^{-1}$)	12.77	13.41
Pulp ($g.kg^{-1}$)	29.78	29.89
Methionine ($g.kg^{-1}$)	5.16	5.15
Lysine ($g.kg^{-1}$)	11.73	9.99
Calcium ($g.kg^{-1}$)	8.24	7.13
Phosphorus total ($g.kg^{-1}$)	6.76	6.11
Phosphorus nonphytate ($g.kg^{-1}$)	3.72	3.11

*Euromix BR – premix provided per kg of diet: vitamin A – 2 500 000 lu, vitamin D3 – 800 000 lu, vitamin E – 20 000 mg, vitamin K3 – 800 mg, vitamin B1 – 600 mg, vitamin B2 – 1 800 mg, vitamin B6 – 1 200 mg, vitamin B12 – 8 mg, vitamin C – 20 000 mg, biotin – 40 mg, folic acid – 400 mg, calcium pantothenate – 3 000 mg, nicotinic acid – 12 000 mg, choline – 100 000 mg, betaine – 50 000 mg, Mn – 20 000 mg, Fe – 14 000 mg, Cu – 2 400 mg, Zn – 16 000 mg, Co – 80 mg, I – 200 mg, Se – 50 mg, anioxidant Endox– 5 000 mg

II: *Dosage of drinking water and probiotics in experimental groups per day*

Week	Pieces	Dose of drinking water (l)	Dosage probiotics (ml)	
			1st experimental group	2nd experimental Group
1st	60	2.5	6.6	3.3
2nd	60	3.5	6.6	3.3
3rd	60	4.6	3.7	3.3
4th	60	6.7	3.7	3.3
5th	60	8.6	3.7	3.3
6th	60	10.6	3.7	3.3

chemical composition were taken breast muscle without skin and thigh muscle with skin and subcutaneous fat from 30 pieces of cocks from each group experiment.

The basic chemical composition of meat was evaluated using a INFRATEC 1265 instrument (NSR), where was detected the water content, fat and protein in $g.100\ g^{-1}$. Energy value in $kJ.100\ g^{-1}$, was searched through the calculation of conversion factors for fat and protein (Strmiska *et al.*, 1988).

It was calculated the basic variation-statistical values arithmetic mean, standard deviation, coefficient of variation) by data from the statistical program Statgraphics Plus version 5.1 (AV Trading Umex, Dresden, Germany) and to determine the differences between groups, analysis of variance with followed by Scheffe test was used.

RESULTS AND DISCUSION

Statistical comparison among the hybrid combinations are shown in Tab. III.–VI.

Chemical composition of animal's meat is often different (Horniaková *et al*., 1999), one of the possibilities to influence to the composition of meat is the diet, application of new trends in nutrition, breeding environment and a relatively large impact may also have a kind of animal.

The results show (Table III) that the water content in 100 g of breast muscle was from 73.68 g (Hubbard JV), 73.90 g (Cobb 500) to 74.05 g (Ross 308) in the control group. The water content in the breast muscle monitored hybrids was the lowest in Ross 308 (73.85 g), higher in Cobb 500 (74.02 g) and highest at Hubbard JV (74.10 g) in the 1st experimental group. Tendency to increase of the water content in 100 g of breast muscle in the 2nd experimental group observed only in chickens Cobb 500 (74.10 g). In chickens Ross 308 (73.85 g) and Hubbard JV (73.58 g) was lower compared with the control group (74.05 respectively 73.68 g.100 g^{-1}). With statistical evaluation we don't found (P ≥ 0.05) a significant differences between cocks groups in ambit of hybrid combinations (Table III) as well as between the hybrid combinations (Table IV).

III: *Chemical composition of chicken breast muscle cocks under hybrids*

Index	Hybrid combination	Group	Mean ± S.D.	CV%
Content of water (g.100g^{-1})	Ross 308	Control	74.05a ± 0.66	0.89
		1st experimental	73.85a ± 0.42	0.56
		2nd experimental	73.85a ± 0.58	0.78
	Hubbard JV	Control	73.68a ± 0.56	0.75
		1st experimental	74.10a ± 0.46	0.61
		2nd experimental	73.58a ± 0.83	1.12
	Cobb 500	Control	73.90a ± 1.14	1.54
		1st experimental	74.02a ± 0.21	0.28
		2nd experimental	74.10a ± 0.36	0.48
Content of proteins (g.100g^{-1})	Ross 308	Control	23.45a ± 0.73	3.12
		1st experimental	23.83a ± 0.44	1.83
		2nd experimental	23.93a ± 0.22	0.93
	Hubbard JV	Control	24.10a ± 0.91	3.77
		1st experimental	23.30a ± 0.26	1.11
		2nd experimental	24.40a ± 0.94	3.86
	Cobb 500	Control	23.82a ± 1.27	5.35
		1st experimental	24.00a ± 0.54	2.23
		2nd experimental	23.88a ± 0.47	1.95
Content of fat (g.100g^{-1})	Ross 308	Control	1.50a ± 0.57	38.10
		1st experimental	1.33a ± 0.22	16.73
		2nd experimental	1.23a ± 0.37	30.09
	Hubbard JV	Control	1.23ab ± 0.57	46.36
		1st experimental	1.60a ± 0.22	13.50
		2nd experimental	1.03b ± 0.22	21.63
	Cobb 500	Control	1.28a ± 0.26	20.63
		1st experimental	0.98a ± 0.44	44.61
		2nd experimental	1.02a ± 0.46	44.62
Energy value (kJ.100g^{-1})	Ross 308	Control	449.31a ± 18.57	4.13
		1st experimental	448.99a ± 9.16	2.04
		2nd experimental	446.90a ± 17.27	3.86
	Hubbard JV	Control	449.83a ± 12.64	2.81
		1st experimental	450.56a ± 11.99	2.66
		2nd experimental	447.32a ± 12.59	2.82
	Cobb 500	Control	447.11a ± 17.50	3.91
		1st experimental	438.74a ± 8.69	1.98
		2nd experimental	438.52a ± 13.01	2.97

Mean values in the same columns with different superscripts (a,b) are significant at the P ≤ 0.05 level

IV: *Statistical comparison (P-value) of the average chemical composition of breast muscle of cocks between hybrid combinations and the same groups*

Hybrid combination	Experimental group	Water content ($g.100g^{-1}$)	Protein content ($g.100g^{-1}$)	Fat content ($g.100g^{-1}$)	Energy value ($kJ.100g^{-1}$)
Cobb 500: Hubbard JV	K:K	0.735^{-}	0.737^{-}	0.878^{-}	0.809^{-}
	P1:P1	0.774^{-}	0.056^{-}	0.042^{+}	0.161^{-}
	P2:P2	0.287^{-}	0.356^{-}	0.991^{-}	0.368^{-}
Cobb 500 : Ross 308	K:K	0.827^{-}	0.628^{-}	0.501^{-}	0.869^{-}
	P1:P1	0.482^{-}	0.629^{-}	0.202^{-}	0.155^{-}
	P2:P2	0.487^{-}	0.852^{-}	0.521^{-}	0.468^{-}
Hubbard JV : Ross 308	K:K	0.418^{-}	0.308^{-}	0.520^{-}	0.964^{-}
	P1:P1	0.450^{-}	0.083^{-}	0.126^{-}	0.842^{-}
	P2:P2	0.604^{-}	0.364^{-}	0.388^{-}	0.969^{-}

K - control group, P1 - 1-st experimental group, P2 - 2-nd experimental group, $^{-}$ ($P \geq 0.05$), $^{+}$ ($P \leq 0.05$)

The water content in 100 g of breast muscle of cock's hybrid combinations (Table III) is comparable with the results of Uhrín *et al.* (1993), Mojto and Palanska (1997) and Simeonovová (1999), which found a content from 73.81 to 74.64 g. 100 g^{-1}.

Suchý *et al.* (2002) found slightly higher water content (+ 0.15 g) in 100 g of breast muscle Ross 308 chickens and lower in Cobb 500 chickens from 0.73 to 0.81 g in experimental groups in comparison with our experiment. Slightly higher water content from 74.68 to 74.84 g in 100 g of breast muscle were observed by Haščík *et al.* (2009a, d) in hybrid Hubbard JV and Ross 308 (75.36 to 75.65 g.100 g^{-1}) and similarly higher water content from 74.60 to 75.75 grams were found in various genetic crossbreeds, commercial and domestic chickens (Wattanachant et al., 2004; Lark *et al.*, 2010 and Ivanko *et al.*, 2011).

The water content (Table V) was lower in thigh muscle of cocks in all hybrid combinations of the experiment compared with the breast muscle, whereas it was appreciated as well as skin and subcutaneous fat. The lowest water content in 100 g of thigh muscle was in hybrid Ross 308 (69.82 g), higher in hybrid Cobb 500 (70.28 g) and highest in hybrid Hubbard JV (70.95 g) at average. Statistical comparison of water content in the hybrid combination, weren't found significant differences ($P \geq 0.05$), but significant differences ($P \leq 0.01$ to 0.001) were found between (Table VI) Cobb 500 hybrids, Hubbard JV and Hubbard, JV Ross 308 in the thigh muscle, respectively. The lower water content of the femur in comparison with chicken breast muscle with was reviewed in various hybrid combinations also confirmed the conclusions of Suchý *et al.* (2002), Al-Sultan (2003) and Haščík *et al.* (2009a, d), but Wattanachant *et al.* (2004) and Ševčíková *et al.* (2006) found the opposite trend, i.e. higher water content in thigh meat than breast muscle.

Suchý *et al.* (2002) and Haščík *et al.* (2009d) found the higher water content in thigh meat from 72.14 to 72.32 g.100 g^{-1} in hybrid Ross 308 and Kim *et al.* (2009) and Ivanko *et al.* (2011) found water content from 73.73 to 76.80 g. In comparison, slightly higher water content (70.95 g) in thigh meat with values from 66.30 to 68.82 g.100 g^{-1} detected Haščík *et al.* (2009d) and Latshaw and Moritz (2009) of cocks Hubbard JV.

Cobb 500 cocks had comparable levels of water in the thigh muscle (70.28 g) with chicks of the same hybrid in the experiment of Suchý *et al.* (2002) with a value of 70.62 g.100 g^{-1}, but higher in comparison with Latshaw and Moritz (2009), which found the water content of 66.30 g.100 g^{-1}.

Benková *et al.* (2005), Duclos *et al.* (2007) and Berri *et al.* (2008) notes that in the chemical composition of animal meat is the most important content of protein and fat. The protein content in 100 g of breast muscle was the lowest in the control group in Ross 308 cocks (23.45 g), higher in Cobb 500 (23.82 g) and highest at Hubbard JV (24.10 g).

For the application of probiotics which was based on strain *Lactobacillus fermentum* increased protein content in 100 g of breast muscle in the first experimental group in Ross 308 cocks 23.83 and in Cobb 500 hybrids 24.00 g, but in Hubbard JV cocks protein content decreased slightly 23.30 g in comparison with the control group.

In the application of lower doses of probiotics during feeding through the water source, the protein content increased in all hybrid combination of in comparison with the control group (Ross 308 + 0.48 g; Hubbard JV + 0.30 g; Cobb 500 + 0.06 g.100 g^{-1}) in 2^{nd} experimental group. The evaluation of applications of probiotics (Table III) reached the highest content of protein in 100 g of breast muscle on average in hybrid combination Cobb 500 (23.94 g), lower in Ross 308 (23.88 g) and lowest in Hubbard JV (23.85 g). Statistical evaluation and comparison of protein content in 100 g of breast muscle in ambit of hybrid combinations (Table III) as well as comparisons between the groups of hybrid combinations (Table IV) did not reach statistical significant differences ($P \geq 0.05$). The protein content of breast muscle was in the hybrid combination of our experiment higher in comparison with the results Simeonovová (1999), Suchý *et al.* (2002), Al-

V: *Chemical composition femoral muscle of cocks different hybrid combinations*

Index	Hybrid combination	Group	Mean ± S.D.	CV%
Content of water (g.100g⁻¹)	Ross 308	Control	70.70a ± 0.76	1.08
		1st experimental	69.47b ± 0.28	0.39
		2nd experimental	69.30ab ± 1.36	1.96
	Hubbard JV	Control	70.32a ± 0.34	0.48
		1st experimental	71.85b ± 0.71	0.98
		2nd experimental	70.67ab ± 1.15	1.63
	Cobb 500	Control	71.00a ± 1.32	1.86
		1st experimental	69.55a ± 0.61	0.88
		2nd experimental	70.30a ± 1.31	1.87
Content of proteins (g.100g⁻¹)	Ross 308	Control	18.25a ± 0.68	3.70
		1st experimental	18.95a ± 0.71	3.77
		2nd experimental	18.48a ± 0.69	3.71
	Hubbard JV	Control	18.07a ± 0.92	5.07
		1st experimental	17.60a ± 0.95	5.39
		2nd experimental	16.95a ± 0.97	5.71
	Cobb 500	Control	18.60a ± 0.18	0.98
		1st experimental	18.70a ± 0.61	3.24
		2nd experimental	17.98a ± 0.72	3.99
Content of fat (g.100g⁻¹)	Ross 308	Control	10.05a ± 1.32	13.11
		1st experimental	10.48a ± 0.99	9.49
		2nd experimental	11.22a ± 1.71	15.19
	Hubbard JV	Control	10.60a ± 1.16	10.95
		1st experimental	9.55a ± 1.10	11.52
		2nd experimental	11.37a ± 1.45	12.73
	Cobb 500	Control	9.40a ± 1.23	13.11
		1st experimental	10.75a ± 0.94	8.74
		2nd experimental	10.72a ± 1.93	17.96
Energy value (kJ.100g⁻¹)	Ross 308	Control	684.37a ± 39.70	5.80
		1st experimental	715.87a ± 20.05	2.80
		2nd experimental	732.41a ± 57.40	7.84
	Hubbard JV	Control	702.16a ± 28.98	4.13
		1st experimental	654.64a ± 30.86	4.71
		2nd experimental	712.52a ± 46.47	6.52
	Cobb 500	Control	665.74a ± 47.80	7.18
		1st experimental	718.28a ± 28.38	3.95
		2nd experimental	705.19a ± 61.89	8.78

Sultan (2003), Haščík *et al.* (2009b, d) and Kim *et al.* (2009), which note in Ross 308 chickens from 21.95 g to 22.67 g for the hybrid Hubbard JV in average 22.56 g and chicken hybrid combination Cobb 500 from 22.57 to 23.08 g of protein in 100 g of breast muscle.

Wattanachant *et al.* (2004) found lower protein content from 20.59 to 22.05 g in 100 g of breast muscle in a commercial hybrid and CP707 hybrid and Ševčíková *et al.* (2006) found values in Ross 308 chickens from 21.46 to 21.52 g.100 g^{-1}. Xiong *et al.* (1993) and Berri *et al.* (2001) found approximately the same protein content in breast muscle from 23.52 to 23.76 g. 100 g^{-1} in chickens of various genetic crossbreeds as well as commercial chickens. Angelovičová *et al.* (2006) found higher content (24.47 grams) of Cobb 500 hybrid combinations and in Ross 308 chickens (24.30 to 24.70 g) Ivanko *et al.* (2011), respectively. Baéza *et al.* (1999) also found that the water content decreases with age-old chickens and protein content increases, and this factor also has affects on the ripeness of the meat.

The protein content of 100 g thigh muscle with skin and subcutaneous fat (Table V) were, on average, regardless of the group at the lowest Hubbard JV (17.54 g), higher in Cobb 500 (18.42 g) and highest

Mean values in the same columns with different superscripts (a, b) are significant at the P ≤ 0.05 level

VI: *Statistical comparison (P-value) of the average chemical composition of femoral muscle of cocks between hybrid combinations and the same groups*

Hybrid combination	Experimental group	Water content (g.100g^{-1})	Protein content (g.100g^{-1})	Fat content (g.100g^{-1})	Energy value (kJ.100g^{-1})
Cobb 500: Hubbard JV	K:K	0.359^{-}	0.305^{-}	0.206^{-}	0.240^{-}
	P1:P1	0.002^{++}	0.098^{-}	0.148^{-}	0.022^{+}
	P2:P2	0.682^{-}	0.139^{-}	0.608^{-}	0.856^{-}
Cobb 500 : Ross 308	K:K	0.707^{-}	0.356^{-}	0.498^{-}	0.571^{-}
	P1:P1	0.831^{-}	0.612^{-}	0.711^{-}	0.894^{-}
	P2:P2	0.330^{-}	0.352^{-}	0.711^{-}	0.543^{-}
Hubbard JV : Ross 308	K:K	0.403-	0.769^{-}	0.554^{-}	0.496^{-}
	P1:P1	0.0007^{+++}	0.063^{-}	0.254^{-}	0.016^{+}
	P2:P2	0.173^{-}	0.042^{+}	0.897^{-}	0.609^{-}

K - control group, P1 - 1-st experimental group, P2 - 2-nd experimental group, $^{-}$ (P ≥ 0.05), $^{+}$ (P ≤ 0.05), $^{++}$ (P ≤ 0.01), $^{+++}$ (P ≤ 0.001)

in Ross 308 (18.56 g), without statistically significant differences (P ≥ 0.05) in the evaluation group of the hybrid combination. Significant differences (P ≤ 0.05) in the protein content of the femur were found between hybrids and the same groups were obtained in 2nd experimental group between Hubbard JV and Ross 308. Ross 308 cocks were show higher levels of protein in the thigh part in confrontations with the results Haščík *et al.* (2009d), which found the content at 17.00 g.100 g^{-1}.

The lower values of 18.12 to 18.33 g.100 g^{-1} were also detected by Suchý *et al.* (2002), Ševčíková *et al.* (2006), Haščík *et al.* (2009b), respectively. Conversely AL-Sultan (2003), Wattanachant *et al.* (2004), Kim *et al.* (2009) and Ivanko *et al.* (2011) found higher protein content from 19.08 to 22.92 g.100 g^{-1}. Haščík *et al.* (2009d) found that Hubbard JV cocks reached slightly lower levels of the protein content of the femur (17.54 g), which achieved their level by an average 18.34 g.100 g^{-1}. In compared with the results of Suchý *et al.* (2002) reached Cobb 500 hybrid combination of our experiment, higher protein content of 0.28 g.100 g^{-1}. Statistical evaluation after the application of probiotics in the diet of Ross 308 cocks was noted in terms of protein content in 100 g were increase of thigh muscle and slight decrease in Hubbard JV and in Cobb 500 with a higher dose of probiotics were a slight increase and in the application of a lower dose were a slight decrease compared with the control group but without significant differences between groups (P ≥ 0.05).

The fat in meat is considered a major reservoir of energy and is important in terms of sensory quality of meat, which affects the juiciness, tenderness and taste (Suchý *et al.*, 2002).

The fat content in 100 g breast muscles (Table III) was highest in the control group of Ross 308 cocks (1.50 g), lower in Cobb 500 hybrids (1.28 g) and lowest at Hubbard JV cocks (1.23 g). The results in the first experimental groups (higher doses of probiotics during the feeding period) were increased only in fat of Hubbard JV cocks by 0.37 g.100 g^{-1}, but the Ross 308 and Cobb 500 hybrid reached the opposite trend, i.e. reduce fat content by 0.17 g.100 g^{-1} (Ross 308) and 0.30 g.100 g^{-1} at Cobb 500 cocks in comparison with the control group within the study of hybrid combinations of cocks. In the second experimental groups (lower dose of probiotics during the feeding period) were noted a reduction in all hybrid combined in fat content compared to the control and 0.27 g (Ross 308), of 0.20 g (Hubbard JV) and 0.26 g (Cobb 500) in 100 g of breast muscle. The lowest levels in the fat content in 100 g of breast muscle were in experimental groups of Cobb cocks 500 (0.98 g – 1st experimental group, 1.02 g – 2nd experimental group). Statistical evaluation in hybrids (Table III) showed significant differences (P ≥ 0.05) in fat content in 100 g of breast muscle between groups, except for the first and second experimental group Hubbard JV cocks (P ≤ 0.01).

In the comparison of the same groups between hybrid combinations of cocks (Table IV) were reached significant differences (P ≤ 0.05) in fat content in breast muscle only between Cobb 500 hybrids (0.98 g.100 g^{-1}) and Hubbard JV (1.60 g.100 g^{-1}) in the first test groups. The fat content of breast muscle of evaluated cocks hybrids were found lower than note of Hook *et al.* (2002) and Haščík *et al.* (2009b, d), whose values were from 1.69 g (Ross 308) to 2.73 g.100 g^{-1} (Cobb 500), but higher than found Al-Sultan (2003) and Ivanko *et al.* (2011) with values from 0.40 to 0.94 g.100 g^{-1}. Wattanachant *et al.* (2004) and Ševčíková *et al.* (2006) found similar levels of fat in breast muscle (1.03 to 1.10 g.100 g^{-1}) of hybrid combinations Ross 308, Cobb 500 and Hubbard JV were in commercial and domestic chickens in comparison of our experiment. Xiong *et al.* (1993) found compared with the results of the experiment higher levels of fat in breast muscle (over 2 g.100 g^{-1}) in various genetic crossbreeds of broilers.

In the thigh part (Table V) were noted the highest average of fat content, like the breast muscle of Ross 308 cocks (10.58 g), lower in Hubbard JV (10.51 g) and lowest in Cobb 500 (10.29 g). We found no statistically significant differences (P ≥ 0.05) between groups in the hybrid combinations and hybrids between the same groups (Table VI).

The fat content increased has been confirmed after the application of probiotics (P ≥ 0.05) only in Ross 308 cocks and Cobb 500 cocks; while in chickens Hubbard JV (P ≥ 0.05) was confirmed only in 2nd experimental group in comparison with control group. The lower fat content in 100 g of the thigh part compared with the results of our experiment in Ross 308 cocks (7.69 g to 9.04 g) and in Cobb 500 cocks (10.21 g) was found by Suchý *et al.* (2002). Haščík *et al.* (2009b), Latshaw and Moritz (2009) found the opposite, i.e. higher fat content in this part in cocks of different hybrids with levels of 11.50 to 13.63 g.100 g^{-1}.

The energy value of meat depends on the fat and protein content. In the breast muscle was the value highest in the control group of Hubbard JV cocks (449.83 kJ.100 g^{-1}), lower in Ross 308 hybrids (449.31 kJ.100 g^{-1}) and lowest in Cobb 500 cocks (447.11 kJ. 100 g^{-1}), whereas the fat content is largely reduced in 100 g of breast muscle in all experimental groups except the first experimental group of Hubbard JV cocks in comparison with control group (Table III) was observed in these groups, and lower energy value. Statistical evaluation and comparison of groups within each hybrid combinations of cocks (Table III), as well as comparing the same groups between hybrids (Table IV) in this indicator, we found significant differences (P ≥ 0.05).

Attained levels of energy in the breast muscle of hybrid combination of cocks were compared with Haščík *et al.* (2009b) and slightly lower than found Hook *et al.* (2002), respectively. The lower energy content found from Wattanachant *et al.* (2004) from 370.50 to 422.08 kJ.100 g^{-1} in breast muscle.

The thigh meat with skin and subcutaneous fat (Table V) was the highest average energy value for Ross 308 cocks (710.88 kJ.100 g^{-1}), lower in Cobb 500 hybrids (696.40 kJ.100 g^{-1}) and lowest at Hubbard JV 500 (689.77 kJ.100 g^{-1}). Statistical comparison of the energy value of 100 g of the thigh part between the groups of hybrids of cocks weren't found significant differences (P ≥ 0.05), but differences were found (P ≤ 0.05) when comparing this indicator in the first experimental groups (Table VI) between Cobb 500 hybrids and Hubbard JV and between Hubbard JV and Ross 308.

The energy value in 100 g of the thigh meat in different hybrid combination cocks of commercially produced feed mixtures as supplement probiotics in their diet (Table V) is higher and in compared with Suchý *et al.* (2002) detected comparable values (623.50 to 697.99 kJ.100 g^{-1}). The lower value (781.85 kJ.100 g^{-1}) of energy content found Haščík *et al.* (2009b).

CONCLUSION

In the experiment was evaluated and compared the chemical composition of breast muscle and thigh muscle with skin and subcutaneous fat of cocks hybrid combination Ross 308, Cobb 500 and Hubbard JV without and after application of probiotic preparation created on the basis of strain *Lactobacillus fermentum* 1.10^9 cfu.g^{-1} through the water source in their diet throughout the feeding period. Significant differences (P ≤ 0.05) was found only in the chemical composition of the thigh meat in water content between control and 1st experimental group in Ross 308 hybrid and Hubbard JV. The content of protein, fat and energy value between the experimental and control group of hybrid combinations were not found significant differences (P ≥ 0.05) in breast muscle and thigh parts. By comparing the chemical composition of breast muscle groups of the same and different hybrid combination of cocks were noted significant differences (P ≤ 0.05) only among the first groups of experimental hybrid combination of Cobb 500 and Hubbard JV in fat content. In the thigh parts were found significant differences (P ≤ 0.01 to P ≤ 0.001) in water content and energy value (P ≤ 0.05) among the first experimental groups between Cobb 500 and Hubbard JV hybrids, Hubbard and JV Ross 308, respectively. Significant differences (P ≤ 0.05) were found in protein content between groups of experimental hybrids Hubbard and JV Ross 308. In terms of fat content in breast muscle and thigh parts were the lowest values in the 2nd experimental group of cock's hybrid combination of Cobb 500, so the meat of this hybrid can be considered like the most dietetic. Revision in probiotic preparations in the final analysis are not affected negatively on the chemical composition of the most valuable parts of the carcase chickens hybrid combination Ross 308, Cobb 500 and Hubbard JV. Appropriate for the chemical composition of the most valuable parts of the application appears in a quantity 3.3 ml. 60 pieces per day.

SUMMARY

The aim of the experiment was to verify the effect of probiotic preparations applied through the water source for feeding of cock's hybrids Ross 308, Hubbard JV and Cobb 500 on the chemical composition of breast muscle and thigh muscle with skin and subcutaneous fat. The experiment was implemented in test poultry station of department of poultry and small farm animals at the Faculty of Agrobiology and Food Resources at Slovak Agricultural University in Nitra. The experiment enrolled 180 pieces of one day cocks hybrid combination Ross 308, Cobb 500 and Hubbard JV. The cocks were reared in cage technology from company MBD (Czech Republic). Custom feeding of cocks abided 42 days. Cocks were fed to 21th day of age an *ad libidum* with the same starter feed mixture HYD-01 (powdery form) and from 22nd to 42nd day of age fed with the growth feed mixture HYD-02 (powdery form) in the monitored groups. The fed feed mixture HYD-01 and HYD-02 have been produced without antibiotic preparations and coccidiostats. In the experiment has been used probiotic preparation administered through a self fount that was based on the strain *Lactobacillus fermentum* containing 1.10^{9} cfu in 1 g of medium with ingredient of maltodextrin and oligofructose incorporated in probiotic preparations in 1% concentration. The daily dosage of probiotic preparation in experimental groups (60 pieces) were 6.6 ml to 2nd week of feeding and 3.7 ml of 3rd week until the end of feeding (1st experimental group) and 3.3 ml during the feeding period (2nd experimental group). The chemical composition of breast muscle were reached values without skin and thigh muscle with skin and subcutaneous fat cock's hybrid combinations Ross 308, Cobb 500 and Hubbard JV (30 pieces) were evaluated using a device INFRATEC 1265 (NSR), where we detect the water content, fat and protein in g.100 g^{-1}. Energy value in kJ.100 g^{-1}, we have searched through the calculation of conversion factors for fat and protein (Strmiska *et al*., 1988). With the chemical analysis, we found that the average of protein content of breast muscle was highest in Hubbard JV (23.93 g.100 g^{-1}), lower in Cobb 500 (23.90 g.100 g^{-1}) and lowest in Ross 308 (23.73 g.100 g^{-1}), without significant differences ($P \geq 0.05$) between hybrids and their groups. The effect of probiotics increased protein content ($P \geq 0.05$) in breast muscle of Ross 308 and Cobb 500 and Hubbard JV only in the application of lower doses (3.3 ml.60 pieces per day) during the feeding. The protein content of thigh muscle was highest in Ross 308 (18.56 g.100 g^{-1}), lower in Cobb 500 (18.42 g.100 g^{-1}) and lowest at Hubbard JV (17.54 g.100 g^{-1}) without significant differences ($P \geq 0.05$). Significant differences ($P \leq 0.05$) in the protein content of the femur were found at a lower dose of probiotics (3.3 ml.60 pieces per day) between cocks Hubbard JV (16.95 g.100 g^{-1}) and Ross 308 (18.48 g.100 g^{-1}). The average of fat content in breast muscles was highest in the control group of Ross 308 cocks (1.35 g), lower in Hubbard JV cocks (1.28 g) and lowest at Cobb 500 hybrids (1.09 g). Probiotic had fat reduce effects in breast muscle of Ross 308 (1.33 and 1.23 g.100 g^{-1}), Cobb 500 (0.98 and 1.02 g.100 g^{-1}) and in second experimental group at Hubbard JV (1.03 g.100 g^{-1}) without significant differences ($P \geq 0.05$) with comparation of control group, but significantly ($P \leq 0.05$) between hybrids Cobb 500 and Hubbard JV in the first test groups. The average of fat content in thigh muscles was highest in Ross 308 cocks (10.58 g.100 g^{-1}), lower in Hubbard JV cocks (10.51 g.100 g^{-1}) and lowest at Cobb 500 hybrids (10.29 g.100 g^{-1}) without significant differences ($P \geq 0.05$) between hybrids and group. In terms of fat content in breast muscle and thigh parts were the lowest values in the 2nd experimental group of cock's hybrid combination of Cobb 500, so the meat of this hybrid can be considered like the most dietetic. The energy value in 100 g of the breast meat was highest in Hubbard JV (449.24 kJ), lower in Ross 308 (448.40 kJ) and lowest at Cobb 500 hybrids (441.45 kJ), without significant differences ($P \geq 0.05$) between hybrids and group in average. Higher fat and protein content in 100 g of thigh muscle was in Ross 308 which ensure the highest energy value (710.88 kJ), lower in Cobb 500 (696.40 kJ) and lowest at Hubbard JV (689.77 kJ) without significant differences ($P \geq 0.05$) between hybrids and groups. Revision in probiotic preparations in the final analysis are not affected negatively on the chemical composition of the most valuable parts of the carcase chickens hybrid combination Ross 308, Cobb 500 and Hubbard JV. Appropriate for the chemical composition of the most valuable parts of the application appears in a quantity 3.3 ml. 60 pieces per day.

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