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REGULAR ARTICLE

THE EFFECT OF DIFFERENT PROBIOTIC STRAINS ON FATTENING AND CARCASS PARAMETERS OF BROILER DUCKS

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ABSTRACT

The aim of this work was to verify the effect of different probiotic strains applied through a drinking water source to fattening and carcass parameters of broiler ducks. Fattening experiment was realised in half-operating conditions of experimental basis of Department of Poultry Science and Small Animal Husbandry in three-floor cage technology. Totally 90 broiler duck were divided to three groups. Experimental group 1 (n=30) received probiotic strain *Lactobacillus fermentum CCM 7158* with concentration of $1x10^9$ colony forming units (CFU) in drinking water daily addition of 0.90 g day 1 to day 56 of fattening. Experimental group 2 (n=30) received probiotic strain *Enterococcus faecium M 74* with concentration of $1x10^9$ colony forming units (CFU) in drinking water daily addition of 0.45 g day 1 to day 56 of fattening. The control group of birds (n=30) received water without any probiotics. The supplementation of probiotic strains *Lactobacillus fermentum* and *Enterococcus faecium* no significant affected ($P \geq 0.05$) final body weight, feed consumption and mortality of broiler ducks. From carcass parameters, we recorded statistically significant ($P < 0.05$) reduction in weight of abdominal fat of broiler ducks for application of tested probiotic strains.

Keywords: duck, probiotic, *Lactobacillus fermentum, Enterococus faecium*, performance,

INTRODUCTION

The use of antibiotics as routine feed additives has been banned in some countries because of public concern over possible antibiotic residual effects and the development of drug-resistant bacteria **(Hong *et al*., 2005)**.

The increased pressure on livestock industry to phase out the use of prophylactic dosages of antibacterial growth promoters (AGP) in the European Union due to microbial resistance in animals and human and the potential to do same in other parts of world has stimulated increased interest in alternative natural growth promoters **(Fature and Matanmi, 2008)**. The legislation in the European Union on probiotic micro-organisms feed additives, including safety assessment and the Qualified Presumption of Safety (QPS) concept of micro -organisms in food and feed were be notified by **Anadón *et al*. (2006)**. The same year 2006 marked the end of the use antibiotics **(Vilà *et al.*, 2009).**

Probiotics are defined as live microbial food supplements, which beneficially influence only not human (**Songisepp *et al.*, 2005**), but also poultry health, chickens (**Haščík *et al.*, 2005**), hens (**Capcarova *et al.*, 2010**), turkeys (**Capcarova *et al.*, 2008**) and waterfowl (**Weis *et al.*, 2010**). These live organisms after residing intestinal tract and their metabolites can act as immunomodulatory agent by activating specific and non-specific host immune responses in poultry, which in turn help in prevention and control of various infectious diseases **(Koenen *et al.*, 2004)**.

Probiotics come under the category of as Generally Recognized as Safe (GRAS) ingredients classified by Food and Drug Administration (FDA). They have no side and residual effects. Probiotics regulates the microbial environment in the gut, reduce digestive upsets and prevent pathogenic gut bacteria, thereby improve live weight gain, improve feed conversion ratio, reduce mortality, increase feed and conversion ratio in layers. Probiotics commercially available contains strains of genera *Lactobacillus* (mainly), *Bifidobacterium, Streptococcus, Bacillus, Bacteroides, Pediococcus, Leuconostoc, Propionibacterium, Saccharomyces cerevisiae* and *Aspergillus oryzae* **(Chaucheyras *et al*., 1995).** *In vitro* and *in vivo* studies have demonstrated that lactic acid producing bacteria are able to inhibit the growth of poultry pathogen like *Salmonella* and *E. coli* by lowering the pH of the gut **(Lee *et al*., 2003; Frizzo *et al*., 2010)**.

The objective of our study was to find out in half-operating conditions of cage technology the influence of different probiotic strain (*Lactobacillus fermentum*, *Enterococcus faecium*) on fattening and carcass parameters of broiler ducks.

MATERIAL AND METHODS

The experiment was realised in half-operation conditions of experimental basis of Department of Poultry Science and Small Animal Husbandry in three-floor cage technology (Certificate of Authorization to Experiment on Living Animals, State Veterinary and Food Institute of Slovak Republic, no. SK PC 30008).

Totally 90 ducks of White Peking Duck type were divided into three groups. Experimental group 1 of ducks (n=30) received probiotic strain *Lactobacillus fermentum* CCM 7158 with concentration of $1x10^9$ CFU and experimental group 2 received probiotic strain *Enterococcus faecium* M74 with concentration of 2.10^{10} CFU in drinking water in nipple drinker, from day 1 to day 56. Quantization of drinking water and probiotic strain are presented in Table 1. The control group of ducks (n=60) received water in same total amount as experimental groups without some any probiotic strain in drinking water.

Table 1 Dose of drinking water and probiotic strains *Lactobacillus fermentum* and *Enterococcus faecium*

Week of fattening	Total amount of drinking water per day	Dose of probiotic strain *Lactobacillus fermentum*	Dose of probiotic strain *Enterococcus faecium*
1. week	1.45 l	0.90 g	0.45 g
2. week	2.05 l	0.90 g	0.45 g
3. week	2.60 l	0.90 g	0.45 g
4. week	3.65 l	0.90 g	0.45 g
5. week	4.60 l	0.90 g	0.45 g
6. week	5.55 l	0.90 g	0.45 g
7. week	6.80 l	0.90 g	0.45 g
8. week	7.70 l	0.90 g	0.45 g

The feeding period lasted 56 days. Two types of complete feed mixtures have been distributed according to periods of fattening: HYD–19 (d1–d21) in powdery form and HYD –20 (d22–d56) in granular form, both no inclusions of anticoccidials. Nutritional value of diets is shown in Table 2. Feeding was provided on an *ad libitum* basis from containers on the front of the cages.

During the 56 days experimental period the growth performance of broiler ducks was evaluated by recording body weight in weekly intervals, total feed consumption at the end of fattening period and total mortality.

At the end of the experiment, 10 broiler ducks of similar body weight to the group average were selected from each group, weighted and slaughtered by severing of the bronchial vein. From carcass parameters we observed slaughter weight in gram, weight of offals in gram (liver, muscular stomach, heart, neck in height of sails without skin), weight of breast in gram, weight of thighs in gram, weight of back in gram, weight of wings in gram, weight of abdominal fat and carcass yield in %. Data were analyzed using analysis of variance (ANOVA) (SAS, 2001). Significant difference was used at 0.05 probability level and differences between groups were tested using the Duncan's test **(Duncan, 1955)**.

Table 2 Nutritional value of complete feed mixtures HYD-19 and HYD-20

Nutritient	**Unit**	**HYD–19**	**HYD–20**
Crude protein	g/kg	min. 200.0	min. 170.0
ME	MJ/kg	min. 12.0	min. 12.0
Lysine	g/kg	min. 10.0	min. 8.5
Methionine and cistine	g/kg	min. 8.0	min. 6.0
– from that methionine	g/kg	min. 4.5	min. 3.5
Linoleic acid	g/kg	min. 10.0	min. 10.0
Calcium	g/kg	min. 8.0	min. 11.0
Phosphorus	g/kg	min. 6.0	min. 5.0
Sodium	g/kg	1.4	1.4
Manganese	mg/kg	min. 110.0	min. 110.0
Iron	mg/kg	min. 120.0	min. 120.0
Copper	mg/kg	min. 15.0	min. 15.0
Zinc	mg/kg	min. 100.0	min. 100.0
Vitamin A	i.u./kg	min. 12000	min. 12000
Vitamin B2	mg/kg	min. 9.0	min. 9.0
Vitamin B12	µg/kg	min. 40.00	min. 40.0
Vitamin D3	i.u./kg	min. 4000	min. 4000
Vitamin E (α-tokoferol)	mg/kg	min. 250.00	min. 250.00

RESULTS AND DISCUSSION

As shown in Table 3, we found positive effect of addition of probiotic strains *Lactobacillus fermentum* and *Enterococcus faecium* in drinking water on final body weight of broiler ducks but this parameter was affected statistically non significant (P≥0.05). These results agree with the works of **Kalavathy *et al.* (2001)** and **Lima *et al.* (2003)** who recorded similar growth ability in poultry supplemented or not with probiotics. In contrast, these results are opposite to those of **Kabir *et al.* (2004)** and **Weis *et al.* (2008)** who observed improvement of final body weight of poultry at addition of probiotic preparate.

Table 3 Growth ability of broiler duck in control group and groups with probiotic strains

Day of fattening	Group		
	Control	*Lactobacillus fermentum*	*Enterococus faecium*
1.	61.33±1.80	61.60±2.00	60.70±1.36
7.	167.34±7.02	170.03±7.14	180.77±9.36^{ac}
14.	608.50±30.42	641.92±30.91^{ab}	647.67±45.30^{ac}
21.	1113.75±84.94	1201.33±48.23	1250.67±52.29^{b}
28.	1857.25±75.83	1958.75±112.42	1984.00±78.87
35.	2413.00±138.67	2434.17±106.80	2532.33±130.72
42.	2773.58±262.54	2826.58±288.01	2893.67±261.08
49.	3005.92±261.05	3045.17±182,38	3073.33±189.27
56.	3199.50±236.18	3232.00±158.00	3291.33±176.53

a, b, c - Means followed by different letters in the same column are different by the the Duncan's test (P<0.05).

In our experiment we found that body weight of broiler ducks in experimental groups have been increased in comparison to control ducks. The results obtained in this experiment are in accordance with those reported by **Yeo and Kim (1997)** who in experiment with poultry fed probiotic, have found that body weight gain have been increased in first three weeks of fattening period.

Total feed consumption was different between groups (2.92, respectively 2.94 kg) in benefit of experimental groups in comparison with control group (2.96 kg). Similar results for feed consumption poultry fed probiotics were reported by **Mountzouris *et al.* (2007)**. The mortality was recorded in group with probiotic strain *Lactobacillus fermentum* and in

control group (3.33%), in group with probiotic strain *Enterococus faecium* we did not find mortality. This is in agreement with the findings of **Weis *et al.* (2011)** about reduction of mortality by application of probiotics.

Table 4 Carcass parameters of broiler duck in control and groups with probiotic strains

Parameter	Group		
	Control	*Lactobacillus fermentum*	*Enterococus faecium*
Slaughter weight (g)	3217.29±109.23	3246.82±115.38	3274.83±116.29
Offals (g)	302.67±17.47	308.47±19.09	310.17±19.96
Weight of breast (g)	556.51±71.32	562.42±84.89	568.64±75.53
Weight of thighs (g)	507.13±44.54	512.0±47.82	513.57±42.49
Weight of back (g)	669.85±88.53	675.97±92.14	676.19±88.46
Weight of wings (g)	303.49±23.87	306.57±26.19	307.23±23.39
Abdominal fat (g)	53.78±8.24	44.85±8.81^{ab}	45.23±7.08a^{ac}
Carcass yield (%)	72.96±2.61	73.07±2.88	73.34±2.67

a, b, c - Means followed by different letters in the same column are different by the Duncan's test ($P<0.05$).

Data presented in Table 4 show that slaughter weight, weight of offals**,** weight of thighs, wings and carcass yield were not affected by using probiotic strain ($P\geq0.05$). We found statistically significant reduction ($P<0.05$) of % abdominal fat in benefit of supplementation of probiotic strains. Similar value of the slaughter are in contrast with results drawn from the study of **Haščík *et al.* (2007)** who concluded that there is statistically significant influence of the supplementation of probiotics on slaughter weight of poultry. Similar trend affecting of values of carcass yields in broiler chickens supplemented or not with probiotics were found by **Pelicano *et al.* (2004)**. Also, **Kalavathy *et al.* (2006)** observed significant reduction of the supplementation of probiotic on abdominal fat content of the poultry.

CONCLUSION

The results from this study show that supplementation of probiotic strains *Lactobacillus fermentum*, *Enterococcus faecium* in drinking water statistically non significant

affected fattening and carcass parameters of broiler duck. Improvement of carcass parameters we found also in case reduction of weight of abdominal fat in carcass body.

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