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EFFECT OF PROBIOTIC STRAIN *LACTOBACILLUS FERMENTUM* CCM 7158 SUPPLEMENT ON PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

VPLYV PRÍDAVKU PROBIOTICKÉHO KMEŇA *LACTOBACILLUS FERMENTUM* CCM 7158 NA ÚŽITKOVOSŤ A JATOČNÉ VLASTNOSTI BROJLEROVÝCH KURČIAT

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The aim of the present study was to evaluate the effect of addition of *Lactobacillus fermentum* in drinking water on performance and carcass characteristics of broiler chickens. The experiment was conducted on hybrid combination Hubbrad JV (n = 120). The feeding period lasted 42 days. Experimental group of chickens (n = 60) received probiotic strain *Lactobacillus fermentum* CCM 7158 with a concentration of 1×10^9 colony forming units (CFU) in drinking water from day 1 to day 42 of fattening. The control group of chickens (n = 60) received water without any additives. The supplementation of *Lactobacillus fermentum* CCM 7158 affected positively final body weight of broiler chickens (2 060.56 vs. 2 255.49 g; $p < 0.01$) and total feed consumption (1.74 vs. 1.80 kg). Mortality was similar in both groups (6.67 %). There were no significant differences ($p > 0.05$) between groups in carcass yield, percentage of breast and thigh. Statistically significant differences were determined in slaughter weight (2 049.13 vs. 2241.39g; $p < 0.01$) and weight of abdominal fat (41.67 vs. 33.58g; $p < 0.05$).

Key words: chicken, *Lactobacillus fermentum*, nutrition, performance, carcass yield

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 humans and the potential to cause the same in other parts of world has stimulated an increased interest in alternative natural growth promoters (Fature and Matanmi, 2008). The legislation of 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 comprehensibly by Anadón et al. (2006). The same year 2006 marked the end of the use of probiotic micro-organisms (Vilà et al, 2009)

Probiotics are defined as living microbial food supplements, which beneficially influence not only humans (Songisepp et al., 2005), but also poultry health, chickens (Haščík et al., 2005), hens (Capcarova et al., 2010), turkeys (Capcarova, 2008) and waterfowl (Weis et al., 2010).

Mechanisms by which probiotic bacteria affect the microecology of the gastrointestinal tract are not well understood, but at least three mechanisms of action have been proposed: production/presence of antibacterial substances (e.g., bacteriocins or colicins), modulation of immune responses and specific competition for adhesion receptors to intestinal epithelium. The rapid establishment of bacterial communities has been thought to be essential for the prevention of colonization by pathogenic bacteria (Nava et al., 2005).

The objective of this study was to evaluate the effect of addition of *Lactobacillus fermentum* in drinking water on performance and carcass characteristics of broiler chickens.

Material and methods

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

Totally, 120 chickens of hybrid Hubbard JV were divided to two groups. Experimental group of birds (n = 60) received probiotic strain *Lactobacillus fermentum* CCM 7158 with a concentration of 1×10^9 colony forming units (CFU) in drinking water in nipple drinker from day 1 to day 42.

Table 1 Dosage of drinking water and probiotic strain in the experimental group

Week of fattening (1)	Total amount of drinking water per day in l (2)	Dose of probiotic preparate in g (3)	CFU in 1 ml of drinking water (4)
1.	2.50	6.60	2.64×10^5
2.	3.50	6.60	1.90×10^5
3.	4.60	3.70	8.04×10^5
4.	6.70	3.70	5.52×10^5
5.	8.60	3.70	4.30×10^5
6.	10.60	3.70	3.49×10^5

Tabuľka 1 Dávkovanie pitnej vody a probiotického kmeňa v pokusnej skupine
(1) týždeň výkrmu, (2) celkové množstvo pitnej vody za deň (l), (3) dávka probiotického preparátu, (4) množstvo kolónií tvoriacich jednotiek (KTJ) v 1 ml pitnej vody

Table 2 Nutritional value of complete feed mixtures

Nutrient (1)	Unit (2)	HYD–01	HYD–02
Crude protein (3)	g/kg	min. 210	min. 190
ME (4)	MJ/kg	min. 12	min. 12
Lysine (5)	g/kg	min. 11	min. 9.5
Methionine and cistine (6)	g/kg	min. 7.5	min. 7.5
– from that methionine (7)	g/kg	min. 4.5	min. 4
Linoleic acid (8)	g/kg	min. 10	min. 10
Calcium (9)	g/kg	min. 8	min. 7
Phosphorus (10)	g/kg	min. 6	min. 5
Sodium (11)	g/kg	1.2–3.0	1.2–2.5
Manganese (12)	mg/kg	min. 50	min. 50
Iron (13)	mg/kg	min. 60	min. 60
Copper (14)	mg/kg	min. 6	min. 6
Zinc (15)	mg/kg	min. 50	min. 50
Vitamin A (16)	i.u./kg	min. 10 000	min. 8 000
Vitamin B2 (17)	mg/kg	min. 4	min. 3
Vitamin B12 (18)	μg/kg	min. 20	min. 20
Vitamin D3 (19)	i.u./kg	min. 1 200	min. 1 200
Vitamin E (20)	mg/kg	min. 15	min. 15

Tabuľka 2 Výživná hodnota kompletných kŕmnych zmesí
(1) živina, (2) merná jednotka, (3) dusíkaté látky, (4) metabolizovateľná energia, (5) lyzín, (6) metionín a cistín, (7) metionín, (8) kyselina linolová, (9) vápnik, (10) fosfor, (11) sodík, (12) magnesium, (13) železo, (14) meď, (15) zinok, (16) vitamín A, (17) vitamin B2, (18) vitamin B12, (19) vitamin D3, (20) vitamin E

Quantization of drinking water and probiotic preparate are presented in Table 1. The control group of birds (n = 60) received water in same total amount as the experimental group, without any additives.

The feeding period lasted 42 days. Two types of complete feed mixtures have been distributed according to periods of fattening: HYD–01 (d1–d21) in powdery form and HYD–02 (d22–d42) in granular form, both with no inclusions of anticoccidials. Nutritional value of diets is shown in Table 2. Feeding was provided on an ad libitum basis from containers in front of cages.

Birds were stabled in a 3-etage cage technology consisting of 18 cages with proportions 75 × 50 cm (0.375 m^2).

During the 42 days experimental period the growth performance of broiler chickens was evaluated by recording the 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 chickens of the body weight similar to the group average were selected from each group, weighted and killed by severing of the bronchial vein. The weights of carcass, breast, thigh and abdominal fat were recorded individually. The statistical analysis was performed, using ANOVA.

Results and discussion

Table 3 provides body weights of broiler chickens of both groups during the fattening period. The final body weight was significantly influenced (p < 0.01) by supplementation of probiotic strain *Lactobacillus fermentum*. These results agree with the work of Kabir et al. (2004) who observed improvement of final body weight of broiler chickens by addition of a probiotic preparate. In contrast, these results are opposite to those of

Table 3 Growth ability of broiler chickens in the control and the experimental group

Day of fattening (1)	Control group (2)	Experimental group (3)	P
1.	45.03±4.34	46.18±4.02	ns
7.	117.46±16.44	129.19±17.61	*
14.	280.12±38.39	333.70±44.63	*
21.	640.07±72.60	729.44±80.88	**
28.	1 140.86±131.41	1 243.28±144.01	**
35.	1 650.19±152.06	1 766.44±169.43	**
42.	2 060.56±191.24	2 255.49±202.79	**

ns = p > 0.05; * = p < 0.05, ** = p < 0.01
values shown are mean ± SD (standard deviation) hodnoty vyjadrujúce priemer ± smerodajnú odchýlku

Tabuľka 3 Rastová schopnosť brojlerových kurčiat v kontrolnej a pokusnej skupine
(1) deň výkrmu, (2) kontrolná skupina, (3) pokusná skupina

Table 4 The effect of the groups on slaughter weight, carcass yield and abdominal fat of broiler chickens

	Control group (6)	Experimental group (7)	P
Slaughter weight in g (1)	2 049.13±60,69	2 241.39±79.12	**
Carcass yield in % (2)	77.56±1.89	77.79±2.15	ns
Breast in % (3)	29.86±2.34	30.14±2.87	ns
Thigh in % (4)	31.42±2.08	31.18±1.85	ns
Abdominal fat in g (5)	41.67±4.78	33.58±3.99	*

ns = p > 0.05; * = p < 0.05, ** = p < 0.01
values shown are mean ± SD (standard deviation) hodnoty vyjadrujúce priemer ± smerodajnú odchýlku

Tabuľka 4 Vplyv skupiny na porážkovú hmotnosť, jatočnú hmotnosť a abdominálny tuk brojlerových kurčiat
(1) porážková hmotnosť, (2) jatočná výťažnosť, (3) prsia, (4) stehno, (5) abdominálny tuk, (6) kontrolná skupina, (7) pokusná skupina

Vargas et al. (2001) and Lima et al. (2003) who recorded similar growth ability in poultry without an influence of probiotics supplementation. Total feed consumption was different between the groups (1.74 vs. 1.80 kg) in favour of the experimental group and this tendency was also observed by Dematte Filho (2004).

The mortality rate in both groups was identical (6.67 %). Siwicki et al. (2005) proved a reduction of mortality rate due to the addition of probiotics in feed of broiler chickens.

The effect of supplementation of *Lactobacillus fermentum* CCM 7158 strain on the composition of broiler chickens is shown in Table 3.

The slaughter weight of the broiler chickens in the experimental group was significantly higher ($p < 0.01$) compared to the control group. These results are compatible with the results drawn from the study of Haščík et al. (2007) who concluded that there is a statistically significant influence of the supplementation of probiotics on slaughter weight.

There were no differences ($p > 0.05$) between the groups in carcass yield of broiler chickens. Similar values of carcass yields in broiler chickens supplemented or not with probiotics were found by Pelicano et al. (2004). The differences in breasts and thighs of chickens from the control and the experimental group were not statistically significant ($p > 0.05$).

In 42 days of fattening, broiler chickens fed by the diet with probiotic strain *Lactobacillus fermentum* had significantly less ($p < 0.05$) abdominal fat than those fed without the probiotics. Kalavathy et al. (2006) also observed a significant reduction of the supplementation of probiotics on abdominal fat content of the chickens.

Súhrn

Cieľom tejto štúdie bolo zhodnotiť vplyv prídavku *Lactobacillus fermentum* v pitnej vode na úžitkovosť a jatočné vlastnosti brojlerových kurčiat. Experiment bol realizovaný na hybridnej kombinácii Hubbrad JV ($n = 120$). Výkrmové obdobie trvalo 42 dní. Kurčatá v experimentálnej skupine ($n = 60$) dostávali probiotický kmeň *Lactobacillus fermentum* CCM 7158 s koncentráciou 1×10^9 kolóniu jednotiek tvoriacich (CFU) v pitnej vode od 1. do 42. dňa výkrmu. Kontrolná skupina kurčiat ($n = 60$) prijímala vodu bez akýchkoľvek aditív. Prídavok *Lactobacillus fermentum* CCM 7158 sa pozitívne premietol do finálnej živej hmotnosti brojlerových kurčiat (2 060,56 oproti 2 255,49 g, $P < 0,01$) a celkovej spotrebe krmiva (1,74 oproti 1,80kg). Úhyn bol v oboch skupinách rovnaký (6,67%). Neboli zistené žiadne významné rozdiely ($p > 0,05$) medzi skupinami v jatočnej výťažnosti a v percentuálnom podiele pŕs a stehna. Zistili sme štatisticky významné rozdiely v porážkovej hmotnosti (2 049,13 oproti 2 241,39 g, $P < 0,01$) a hmotnosti abdominálneho tuku (41,67 oproti 33,58 g, $P < 0,05$).

Kľúčové slová: kurča, *Lactobacillus fermentum*, výživa, úžitkovosť, jatočná výťažnosť

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