Effect of prebiotic on performance and slaughter traits of broiler chickens fed lower protein diets

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Abstract

The goal of this research was to investigate the influence of a prebiotic added into the low protein diet of fattening chickens. A prebiotic known as TechnoMos (*mannanoligosaccharides*) has been added at the level of 0.1% as a constituent of a feeding mixture given to the experimental group of day old chickens, with 2% lower protein content (19%) in comparison with the mixture for the second group of chickens, that contained recommended level of proteins (21%) which served as a positive control. An additional group of chickens received a mixture of lower protein content and served as a negative control group. During the trial body weight, daily weight gain, feed consumption and conversion were recorded. Body weight in the negative control group was 1820.2 (daily weight gain 42.3) grams, prebiotic group 1943.9 (daily weight gain 45.27) grams, and in the positive control group 2080,6 (daily weight gain 48.52) grams. Feed conversion ratio in the positive control group was 2.30 kg, prebiotic group 2.49 and in the negative control group of chickens 2.65 kg. Prebiotic showed positive effect on body weight, daily weight gain and feed conversion ($P<0.05$) in comparison with the negative control. At the end of experiment control slaughter was performed, choosing the chickens that in the best way represent an average weight of their groups. Prebiotic effect on carcass composition, drumstick and thigh yield was not statistically significant ($P>0.05$) while only effect determined was the effect of protein supplementation on breast part yield which was significantly higher in positive control group of chickens ($P<0.05$). The results indicate that prebiotics could be a fine solution for alleviating problems connected with variable environmental conditions within a farm, as in regard to feeding mixtures quality, so in regard to the control of intestinal disorders.

Key words: broiler; prebiotic; low protein diet; TechnoMos

Introduction

An intensive production of healthy and high value food of animal origin, sets the high recommendation for animal husbandry and industry of animal food. The ban of European Union for use of antibiotics, as growth promoters, from the 1st January, 2006, onwards, provoked many investigations to find alternatives without antibiotic's sides' effects, such as resistance, genotoxic effects, and presence of residua in food of animal origin. The most used so called "alternatives to antibiotics", at last decade, became probiotics and prebiotics (Milenkovic et al., 2011).

The quality and proportion of microorganism in the gut are relatively constant and typical for the particular periods of life and part of the intestine (Jensen, 1998), depending on animal species, environment, consumed feeds (Pelicano et al., 2004) or feed additives. Prebiotics can be classified as non-digestible food ingredients that affect the host beneficially by the revision of bacterial composition in the intestinal tract, where oligosacharides and polysacharides were mostly investigated in different animal specie (Baurhoo et al., 2007; Canibe et al. 2007).

Several investigations towards estimation of possible influence on production abilities of poultry showed effectiveness of probiotics and prebiotics especially in regard to higher body weight, daily weight gains, better feed conversion (Ammerman et al., 1989; Tokic et al., 2007; Mildilli et al., 2008). Having in mind potentially positive effects of prebiotics, the aim of this research was to examine the effects of the prebiotic Techno Mos on the production abilities of fattening chickens during the 6 weeks of feeding.

Material and Methods

The experiment covered 300 one day old Cobb hybrid chickens divided into three groups with 100 animals with 5 replications of 20 animals in each. A prebiotic known as TechnoMos (Sacharomyces cerevisiae) has been added at the level of 0.1% (EP group) as a constituent of a feeding mixture (Table 1) given to the experimental group of day old chickens, with 2% lower protein content (19%) in comparison with the mixture for the second group of chickens, that contained recommended level of proteins (21%) which served as a positive control (CP group). An additional group of chickens received a mixture of lower protein content and served as a negative control group (CN group).

Table 1. Diet mixtures composition used during the trial

Group	CP	CN	EP	CP	CN	EP
	Starter			Finiser		
Corn	34.25	33.70	33.70	34.20	33.70	33.70
Wheat	10.00	15.00	15.00	20.00	15.00	15.00
Corn meal	10.00	10.00	10.00	10.00	10.00	10.00
Soybean meal	22.50	13.00	13.00	10.00	13.00	13.00
Sunflower meal	-	7.00	7.00	9.00	7.00	7.00
Soybean gritz	18.60	15.00	15.00	9.00	15.00	15.00
Corn sprouts	2.00	3.00	3.00	4.00	3.00	3.00
Premix	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.50	0.30	0.30	1.50	0.30	0.30
Grit	0.25	1.00	1.00	1.00	1.00	1.00
MCP	0.90	1.00	1.00	0.30	1.00	1.00
CP (%)	21.64	19.48	21.64	19.50	17.50	19.50
ME (kj/kg)	13.35	13.03	13.35	13.03	12.82	13.03
Techno Mos (%)	-	-	0.1	-	-	0.1

During the experiment, that lasted until 42 days of life, all neccesary housing conditions were provided and were identicall for all animals. Chicken weight was measured every seven days during the trial together with replicate feed consumption.

At the end of experiment, which lasted 42 days control slaughter was performed (10 chickens per group), choosing the chickens that in the best way represent an average weight of their groups. Chickens were slaughtered after 12 hours of food deprivation. The carcass yield and meat quality were determined by cutting. In order to determine the meat quality, by cutting, the carcass weight, and weight of the component parts: drumstick, thigh and breast were determined, and presented as a percent of carcass.

The data were statistically analyzed by analysis of variance and tested by Tukey-Kramer Multiple Comparisons Test using software Graphpad Instat.

Results and Discussion

Average values of chicken body weights are presented in table 2. At the beginning of the trial chickens were uniform regarding the body weight in all experimental groups ($P>0.05$). At the age of 35 days and at the end of the experiment it is obvious that experimental groups of chickens achieved lower body weight with added prebiotic (EP) and without an addition of prebiotic (CN) in comparison with positive control group (CP) . Difference between groups is statistically significant ($P>0.05$).

Effect of protein levels on body weight gain was significant in all periods of the trial. Commercial diet caused heavier body weights than other low protein diets (CN and CP groups), however, addition of prebiotic to low protein diet significantly improved body weight and weight gain during the experiment in comparison with negative control group (P<0.05).

Table 2. Mean values and standard deviations of body weights and feed utilization

Group	CN	CP	EP	P
Body weight-day 1 (g)	43.43±3.81	42.75±4.28	42.35±4.04	P=0.39 ^{NS}
Body weight-day 35 (g)	1302.55±199.68^{a}	1517.3±187.74^{b}	1379.2±214.26^{c}	P<0.05*
Body weight-day 42 (g)	1820.2±270.36^{a}	2080.6±230.04^{b}	1943.9±249.43^{c}	P<0.05*
Daily weight gain 1-42 (g)	42.3±6.44^{a}	48.52±5.5^{b}	45.27±5.94^{c}	P<0.05*
Feed conversion (kg)	2.65±0.1577^{a}	2.30±0.1612^{b}	2.49±0.1223^{a}	P<0.05*

*values within rows with different superscript letter are significantly different (P<0.05)

Low protein diets caused differences that were expected because lower protein and amino acids content (lysine, methionine and threonine) influenced weight gain and performance. Yet, prebiotic in low protein diets expressed positive effect because these diets (EP and CN) were formulated to supply the same amount of protein and amino acids. By comparing the low protein diets we can determine 6.79% increase in body weight and 7.02% increase in body weight gain. Prebiotic increased feed consumption in low protein diet, which explains difference in body weight gain.

Table 3. Mean values and standard deviations of carcass and parts yield

Group	**CN**	**CP**	**EP**	**P**
Carcass	70.18±4.12	73.04±1.82	70.62±2.04	P=0.07 ^{NS}
Drumstick	14.83±1.46	14.81±1.15	15.72±1.10	P=0.19 ^{NS}
Thigh	16.81±1.44	16.87±0.91	17.76±1.17	P=0.15 ^{NS}
Breast	27.59±2.95^{a}	30.34±1.73^{b}	26.83±1.85^{a}	P<0.05 *

*values within rows with different superscript letter are significantly different (P<0.05)

Chickens' carcass yield in the positive control group (CP) was 73.04%, which is in relation to the negative control group (CN) better for 4.07%, while the experimental prebiotic group (EP) achieved carcass yield of 70.62% which was very similar to CN group. Prebiotic effect on carcass composition, drumstick and thigh yield was not statistically significant (P>0.05) while only effect determined was the effect of protein supplementation on breast part yield which was significantly higher in positive control group of chickens (P<0.05) in comparison with low protein diets groups.

Similar results of prebiotic dietary influence on performance of chickens in a similarly designed experiment were achieved by using a prebiotic called Fermacto (Ghiyasi et al., 2007). The results of that experiment showed that addition of prebiotic to broiler diets containing 90% of NRC protein recommendation had same effect with control diet on performance of broiler chicks. Additionally, Zhang (2000) in an another study with 0.2 or 0.4% prebiotic isomaltooligosaccharide could improve broiler performance. Improved body weight gain when broilers are fed diet supplemented with prebiotics can be found in other studies (Ammerman et al. 1989; Yusrizal and Chen, 2003). Generally, supplementation of prebiotics in the diet of broilers, layers and pigs leads to improved performance through improving gut microflora (Spring et al. 2000; Xu et al., 2003; Pelicano et al., 2004; Awad, et al., 2009).

Conclusions

Prebiotic expressed positive effect on body weight, daily weight gain and feed conversion without in comparison with the negative control group of chickens. The results indicate that prebiotics could be a fine solution for alleviating problems connected with variable environmental conditions within a farm, as in regard to feeding mixtures quality, so in regard to the control of intestinal disorders. Further research is necessary in order to define proper dose and period of application of prebiotics, according the management solutions at the farm level.

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