Effect of Three-strains Probiotic on Productive Performance and Carcass Characteristics of Broiler Chickens

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Abstract
The aim of the experiment was to determine the influence of probiotic preparation on productive parameters and carcass characteristics of broiler chickens. Totally 60 one-day-old chickens of Ross 308 were divided in two groups: control group (n=30) received drinking water without any additives and experimental group (n=30) received probiotic preparation in dose 2 ml per 1 l of drinking water from day 1 to day 42 of fattening. The probiotic preparation contained the strains of *Lactobacillus casei CCM 3775* ($3.86x10^6$ CFU.g^{-1}), *Lactobacillus plantarum 24001* ($3.86x10^6$ CFU.g^{-1}) and *Saccharomycces cerevisiae MUCL 39885* ($7.00x10^3$ CFU.g^{-1}). Broiler chickens were feeding ad libitum with commercial feed mixtures. Individual body weights of all birds, feed conversion ratio per group were determined in 21 and 42 day, total mortality rate we recorded in 42 day of fattening period. Carcass quality of broiler chickens was determined at the end of the experiment. The supplementation of probiotic affected positively body weight ($p<0.05$) in broiler chickens in 21 and 42 day of fattening. Feed conversion ratio in 21 and 42 day was similar in control and experimental groups. Total mortality in 42 day was positive affected ($p<0.05$) by supplementation of probiotic preparation in drinking water. The probiotic no significant ($P>0.05$) affected percentage of breast and thighs from carcass body, weight of giblets and carcass yield. The addition of probiotic significantly ($P<0.05$) reduced the content of abdominal fat in carcass body.

Keywords: broiler chicken, carcass parameters, fattening, performance, probiotic.

1. Introduction

High levels of production and efficient feed conversion are the need of the modern broiler industry which to a certain extent could be achieved by the use of specific feed additives. Antibiotic growth promoters and antibiotic resistance are clearly connected and increased concern about the potential for antibiotic resistant strains of bacteria has compelled the researchers to use other non therapeutic alternatives like organic acids, enzymes, probiotics, prebiotics, herbs, essential oils, immunostimulants as feed additives in poultry production [1].

The impact of biotechnology in poultry nutrition is of significant importance. Biotechnology plays a vital role in the poultry feed industry. Nutritionists are continually putting their efforts into producing better and more economical feed. Good feed alone will not serve the purpose but its better utilization is also very essential. Dietary changes, as well as, lack of a healthy diet can influence the balance of the microflora in the gut thus predisposing it to digestion upsets. A well-balanced ration sufficient in energy and nutrients

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is also of great importance in maintaining a healthy gut [2-4].

Many types of microorganisms have been used as probiotics. Lactic acid bacteria are predominating in probiotic preparations particularly *Lactobacillus* species. These are *Lactobacillus acidophilus*, *Lactobacillus lactis*, *Lactobacillus delbrucekii*, *Lactobacillus salivarius*, *Lactobacillus plantarum*, *Lactobacillus paracasei*, *Streptococcus thermophilus*, *Enterococcus faecalis*, *Bifidobacterium* spp. *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, are yoghurt starter organisms while other organisms are prevailing in the intestines [5].

There are many genera of lactic acid bacteria these include L*actobacillus*, *Enterococcus*, *Bifidobacterium*, *Lactococcus*, *Lactosphaera*, *Leuconostoc*, *Melissococcus* and *Streptococcus*. These are Gram-positive, non-spore forming, anaerobic but aero-tolerant, acid-tolerant and produce no catalase enzyme. They cause fermentation of sugar and secrete lactic acid as end product [3,6,7].

These are distributed widely in nature and found abundantly in gastrointestinal tract of human and animals [8].

Lactobacillus and *Bifidobacterium* spp. are dominant in the intestinal tracts of mammals and avian [9].

One such alternative is the addition of yeast and yeast products to poultry diets. The inclusion of non-pathogenic yeast, *Saccharomyces cerevisiae*, in the diet has been shown to improve bird performance and decrease mortality [10-13].

The objective of the present study was to determine the effect of probiotic preratete with two *Lactobaciluus* species and *Saccharomyces cerevisiae* basic on productive parameters and carcass characteristics of commercial broiler chickens.

2. Materials and methods

Chickens were housed in an environmentally controlled house in pens with deep litter with housing density 30 kg.m^{-2}.

During the experiment, 24-h continuous illumination was provided. Ambient temperature was maintained at 34 °C between days 1 and 3, at 30°C between days 4 and 14, and at 27 °C between days 15 and 42. Heating was provided with electric radiant heaters, and ventilation was achieved with windows and fans that were controlled. Broiler chickens were fed commercial feed mixtures (PD Prašice, Slovak Republic): starter (days 1 to 21), grower (days 22 to 35) and finisher (days 36 to 42). Feed and water were given to the chickens *ad libitum*. The nutritive values of the feed mixtures are presented in Table 1.

Table 1. Nutritional value in 1 kg complete feed mixture

Nutrient	Unit	Starter	Grower	Finisher
Crude protein	%	min. 20.00	min. 18.30	min. 17.00
Fat	%	min. 4.80	min. 4.00	min. 6.00
Fibre	%	max. 4.00	max. 5.00	max. 5.00
Methionine	%	min. 1.20	min. 1.10	min. 0.90
Calcium	%	min. 0.52	min. 0.48	min. 0.45
Phosphorus	%	min. 0.80	min. 0.80	min. 0.55
Sodium	%	min. 0.55	min. 0.55	min. 0.50
Cooper	mg	min. 0.12	min. 0.12	min. 0.12
Zinc	mg	min. 15.00	min. 15.00	min. 15.00
Manganese	mg	min. 80.00	min. 80.00	min. 80.00
Iron	mg	min. 120.00	min. 70.00	min. 100.00
Selenium	mg	min. 0.20	min. 0.10	min. 0.10
Vitamin A	m.j.	min. 12000	min. 10000	min. 10000
Vitamin D3	m.j.	min. 5000	min. 5000	min. 5000
Vitamin E	mg	min. 60.00	min. 50.00	min. 50,00
Natrium salinomycinate	mg	60.00	60.00	-
Endox	mg	125.00	125.00	125.00

Broiler chickens in the control (C) and experimental groups (E) received a feed of the same nutritional value.

Chickens from experimental group were supplemented drinking water by probiotic preparate (PHU EKO-AGROTECH, Poland) with strains *Lactobacillus casei CCM 3775* ($3.86x10^6$ CFU.g^{-1}), *Lactobacillus plantarum 24001* ($3.86x10^6$ CFU.g^{-1}), *Saccharomycces cerevisiae MUCL 39885* ($7.00x10^3$ CFU.g^{-1}) and molasses from sugar cane (48 g.100 g^{-1}).

During the experiment broiler chickens were weighted for individual body weight at 1, 7, 14, 21, 28, 35 and 42 days of age, feed consumption and mortality were recorded at the end of fattening period.

In 42 day of fattening, 5 male and 5 females with body weight similar to the mean were chosen from each group for slaughter weighed and subjected to a 12-hours feed withdrawal. After slaughter, carcasses were chilled, weighed and subjected to simplified dissection. Abdominal fat, edible giblets and breast and leg muscles were collected and weighed. The results obtained were used to calculate dressing percentage and the percentage of carcass components.

Data were analyzed using analysis of variance [14]. Significant difference was used at 0.05 probability level and differences between groups were tested using the Duncan's Multiple Range Test [15].

3. Results and discussion

Table 2 provides body weights of broiler chickens of both groups during fattening period.

Table 2. Effect of probiotic on body weight of broiler chickens

Day of fattening	Control	Experimental
1.	45.77±4.89	46.05±4.22
7.	118.47±17.26	124.38±17.86
14.	290.65±39.28	318.24±41.37
21.	840.07±72.60	727.68±79.11[a]
28.	1127.35±134.49	1241.76±136.53[a]
35.	1642.18±151.73	1764.92±155.04[a]
42.	2168.76±199.72	2275.38±204.15[a]

Values shown are mean±SD (standard deviation)
[a] means in a row with different superscript differ significantly

The final body weight was significantly influenced ($P<0.01$) by supplementation of tested probiotic preparate.

These results agree with the work of [16-23] who observed improvement of final body weight of broiler chickens at addition of probiotics. In contrast, they are opposite to those of [24-29], who found that the use of probiotic products in the feed had no significant effect on body weight of broiler chickens.

Probiotic provides nutrients, effectively stimulates the growth of beneficial microflora in the small and large intestines resulting in the better balance of bacterium population [4,30-32].

The increased body weight gain of broiler chickens fed probiotic may be due to improvement in digestibility and availability of many nutrients such as proteins, fats and carbohydrates, as well as, some mineral elements and vitamins [33]. [34] recorded that addition of *Saccharomyces cerevisiae* significantly influenced body weight of broiler chickens. The beneficial effect of *Saccharomyces cerevisiae* is attributed to the fact that it is a naturally rich source of proteins, minerals and B-complex vitamins [35]

Totally feed consumption was similar between groups of broiler chickens (1.81kg in control and 1.80 kg in experimental group). Some authors [36-38] found decrease of feed consumption while others suggest no such effect on feed utilization [39-42]. *Saccharomyces cerevisiae* is considered as one of the live microorganisms probiotic that, when administered through the digestive tract, have a positive impact on the hosts health through its direct nutritional effect [43].

The mortality rate in the both groups was improved in group with supplementation of probiotic in drinking water (3.33% vs. 6.67%). Also [22,44] proved a reduction of mortality rate due to the addition of probiotic in feeding of broiler chicken.

As shown in Table 3, there were no differences ($P>0.05$) between groups on carcass yield of broiler chickens. Similar values of carcass yields in broiler chickens supplemented or not with probiotics were found by [21,22,45]. Differences in breasts and thighs of chicken from control and experimental group were not statistically significant ($P>0.05$).

Table 3. Effect of probiotic on body weight of broiler chickens

Parameter	Control	Experimental
Breast (%)	30.26±1.79	30.29±1.75
Thighs (%)	31.73±2.14	31.71±2.16
Carcass yield (%)	77.24±2.36	77.28±2.41
Abdominal fat (g)	46.45±5.02[a]	31.59±4.61
Edible (g)	115.88±24.87	116.34±26.49

Values shown are mean±SD (standard deviation)
[a] means in a row with different superscript differ significantly

In 42 day of fattening, broiler chickens fed diet with probiotic had significantly less ($P<0.05$) abdominal fat than those fed without the probiotic. Equally, [21,46] observed significant reduction of the supplementation of probiotic on abdominal fat content of the chicken.

4. Conclusions

The results from this experiment show that supplementation of tested probiotic preparate in drinking water statistically significant affected final body weight and total mortality of broiler chickens. Subsequently, we recorded similar feed consumption in the end of experiment. The probiotic had a no significant effect on percentage of breast and thighs from carcass body, weight of giblets and carcass yield. From carcass parameters we found only reduction of weight of abdominal fat in group with addition of probiotic.

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