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DIETARY EFFECT OF THE SUPPLEMENTATION OF PROBIOTICS (*Lactobacillus fermentum*) ON CARCASS CHARACTERISTICS OF BROILER CHICKENS

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ABSTRACT
One hundred day old Cobb 500 broiler chickens were randomly assigned to five treatments in a completely randomized design to study the effect of dietary probiotics (*Lactobacillus fermentum*) on carcass characteristics. Treatment 1 served as the control without probiotics (0.000g) while treatments 2, 3, 4, and 5 were diets supplemented with 1.875, 3.750, 5.625 and 7.500 g of probiotics per kg of feed respectively. At the end of the experiment, four birds per treatment were randomly selected for carcass evaluation. The final live body weight was recorded before slaughter. After evisceration, the carcass weight was recorded, and the weights of primal parts, internal organs and abdominal fat were all taken and expressed as a percentage of carcass weight. Data collected were subjected to one-way analysis of variance. The results obtained showed that final live weight, carcass weight, breast weight, thigh weight and abdominal fat were significantly affected ($P < 0.05$) by dietary treatments. It was observed that birds on T5 fed probiotics of 7.500 g/kg feed had a live weight of 3050.00g which was similar to T4 but significantly higher than all the other treatments. Treatment 4 had the highest carcass weight which was followed by treatment 5. Treatment 5 birds recorded the highest ($P > 0.05$) breast and thigh weight when compared to birds in other treatment groups. The birds in the control group (T1) recorded the highest ($P > 0.05$) abdominal fat than other treatments. This invariably implies that the supplementation of this probiotic could reduce abdominal fat deposits in birds.
Keywords: Probiotics, *Lactobacillus fermentum*, carcass characteristics, Cobb 500 broilers, abdominal fat

INTRODUCTION
Research studies have shown that antibiotics improve the performance of broiler chickens however, their usage has been banned in some countries, because of their harmful side effects on broiler birds and their residual effect on meat (Mehdi *et al*, 2018). The need, therefore, arises to find a safe alternative additive for use in poultry production. Using probiotics is believed to be safer and promotes health. The utilization of probiotics in poultry production may address the rising public health issues on meat quality and antimicrobial resistance development to some level, by substituting the use of sub-therapeutic antibiotics for growth promotion with probiotics (Jha *et al*., 2020). Probiotics are beneficial live microbes (bacteria, yeast or fungi) that supplement the gut flora enhancing a healthy digestive system when administered in appropriate dosage (FAO/WHO, 2006). According to Siragusa (2012) probiotics for livestock are referred to as direct-fed microbial. Probiotics can be given to poultry through feed or water or can be administered to a developing embryo through in ovo feeding technology (Pender *et al*., 2017). However, there are few research studies on the dietary effect of probiotics on the carcass characteristics of broiler chickens. Hence, this study is aimed at evaluating the effect of dietary probiotics (*Lactobacillus fermentum*) on carcass characteristics of broiler chickens.

MATERIALS AND METHODS
This experiment was carried out at the Federal University of Technology Minna, Bosso Campus, Niger State, at the Department of Animal Production Teaching and Research Farm (Poultry Unit). A total of one hundred Cobb-500 broilers, at day old were used for this study. The probiotic used was *Lactobacillus fermentum*. A completely randomized design (CRD) was used in the experiment. The birds were weighed, and then randomly allotted into five treatments. Treatment 1 served as the control

without probiotics supplement (0.000g) while treatments 2, 3, 4, and 5 were diets supplemented with 1.875, 3.750, 5.625 and 7.500g of probiotics (*Lactobacillus fermentum*) per 1kg of feed respectively. The birds were raised in a deep litter system. Before the arrival of the birds, the pen was washed and disinfected, wood shavings was evenly spread on the floor. Upon the arrival of the chicks, they were weighed to obtain their initial weights and after which they were randomly distributed to the various treatment groups. The chicks were administered anti-stress (vitalyte) through drinking water according to the manufacturer's instruction. The birds were vaccinated against gumboro disease at the end of the first week. This was repeated at 2 weeks of age. In the fourth and eighth week, Newcastle vaccine (NCV lasota) was given to the birds. The experiment was conducted for eight (8) weeks. Feed intake was measured daily while the weighing of birds was done on weekly basis. Iso-caloric and iso-nitrogenous single-phase diets were formulated for the broilers. Feed and water were provided *ad libitum*.

Evaluation of carcass characteristics

At the end of the experiment, four birds per treatment were randomly selected for carcass evaluation. The final live weight was recorded before slaughter. Birds were weighed, starved overnight to clear the gut but allowed access to fresh clean water before slaughter. The birds were slaughtered by cutting the jugular vein with a sharp knife. After evisceration, the carcass weight and the weights of internal organs (liver, gizzard, lungs, heart, spleen) and abdominal fat were all taken and expressed as a percentage of carcass weight. Primal parts like the wing, thigh, breast and drumstick were weighed and expressed as a percentage of the carcass weight. All data obtained were subjected to One-Way Analysis of Variance (ANOVA) and significant treatment means where it occurred were separated by Duncan multiple range test using (SPSS, 2017) version 16.0.

RESULTS AND DISCUSSION

Table1 shows the result of the effect of dietary *Lactobacillus fermentum* probiotics supplementation on carcass characteristics of Cobb 500 broiler chickens. The results from this research showed that there were significant differences ($P < 0.05$) in the final live weight, carcass weight, breast meat weight, thigh weight and abdominal fat of broilers. This might be as a result of the improved gut microflora as highlighted by Markowiak and Śliżewska¸ (2017) and Jha *et al*. (2020). However, there was no significant differences ($P > 0.05$) observed in the weight of drumstick, wing, heart, liver, lungs, gizzard and spleen. The birds on T4 and T5 had similar final live weight which was higher than ($P > 0.05$) the other treatments. Birds on T4 had the best ($P > 0.05$) carcass weight which was followed by T5. Treatment 5 birds recorded the highest ($P > 0.05$) breast and thigh weight when compared to birds in other treatment groups. The supplementation of the probiotic level of 7.500g/kg of feed favoured both breast and thigh weight. Tang *et al*. (2021) reported a significant increase in breast muscles of broiler chickens with probiotic supplementation which is consistent with the result of increased breast weight of birds on *Lactobacillus fermentum* probiotics treatment in this research. The birds in the control group (T1) recorded the highest ($P > 0.05$) abdominal fat than other treatments. This invariably implies that the supplementation of this probiotic was capable of reducing abdominal fat deposits in birds, thereby improving meat quality and higher feed and economic efficiency. The significant decrease in abdominal fat of broilers fed diets with probiotics obtained in this study is in line with the report of Tang *et al*. (2021) which stated that the supplementation of probiotics (*Bacillus subtilis*) led to a significant decrease in abdominal fat of broilers when compared with broilers without probiotics. Additionally, this result also agrees with the findings of Hidayat *et al*. (2016) who reported that the increase in the level of use of probiotics (*Bacillus spp*) tends to decrease the percentage of abdominal fat. Excessive abdominal fat in chicken meat is highly undesirable, most consumers prefer chicken meat with low-fat content for economic and health reasons.

Table 1 Dietary effect of *Lactobacillus fermentum* probiotics on carcass characteristics of broiler chickens

Parameter	T1	T2	T3	T4	T5	SEM	P-value
Final live weight (g)	2963.00^{b}	2935.50^{c}	2892.00^{d}	3049.50^{ab}	3050.00^{a}	21.789	0.01
Carcass weight	2214.00^{c}	2200.00^{d}	2171.00^{e}	2323.00^{a}	2295.50^{b}	19.471	0.00
Breast weight (%)	37.60^{c}	37.86^{b}	36.82^{e}	37.25^{d}	39.49^{a}	0.317	0.01
Thigh weight (%)	16.23^{d}	17.52^{b}	16.77^{c}	17.49^{b}	18.56^{a}	0.282	0.02
Drumstick (%)	12.78	11.53	12.14	11.96	11.94	0.174	0.25
Wings (%)	10.00	10.05	10.06	9.85	9.43	0.121	0.52
Heart (%)	0.47	0.42	0.36	0.41	0.38	0.017	0.33
Liver (%)	1.65	1.75	1.86	1.46	1.74	0.061	0.32
Lungs (%)	0.13	0.17	0.12	0.11	0.11	0.010	0.29
Gizzard (%)	2.38	2.52	2.33	2.21	2.47	0.061	0.66
Spleen (%)	0.40	0.40	0.34	0.44	0.52	0.025	0.25
Abdominal fat (%)	1.52^{a}	0.37^{d}	0.41^{c}	0.82^{b}	0.82^{b}	0.148	0.02

a, b, c, d, e Means with different superscripts on the same row are significantly different (P>0.05).

T1: Without *Lactobacillus fermentum* probiotics 0.00g/kg of feed (control)
T2: *Lactobacillus fermentum* probiotics of 1.875g/kg of feed
T3: *Lactobacillus fermentum* probiotics of 3.750g/kg of feed
T4: *Lactobacillus fermentum* probiotics of 5.625g/kg of feed
T5: *Lactobacillus fermentum* probiotics of 7.500g/kg of feed
SEM: Standard Error of Mean

CONCLUSION AND RECOMMENDATION

Results from this study have shown that *Lactobacillus fermentum* probiotics can serve as a growth promoter in the production of broiler chickens. The supplementation of the probiotic level of 7.500g/kg of feed is therefore recommended for improved live weight, carcass weight, breast weight and thigh weight. Further research study can be carried out using these probiotics as a dietary supplement for other poultry species.

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