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Effect of probiotics supplementation on giblet and dressing percentage in caged broilers

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Abstract

The present investigation was conducted to evaluate the effects of probiotics supplementation on giblet weight and dressing percentage of caged broilers. A total of 96, day-old chicks were randomly divided into four groups (T_0, T_1, T_2, and T_3) with 8 replicates i.e., 24 chicks in each group. The control (untreated) group was fed the basal diet, T_1 was supplemented with *Bacillus coagulans* @40ppm along with basal diet, T_2 was given *Bacillus subtilis* @50ppm mixed in basal diet whereas T_3 was given basal diet + *Bacillus licheniformis* & *Bacillus coagulans* @20ppm. After 35 days of the trial period, weighing of the giblet and dressing percentage of four at random selected birds from each group were calculated. The mean value of liver weight recorded T_0-46.420g, T_1-42.352g, T_2-45.275g, and T_3-40.521g, respectively. However, the analysis revealed that the variations in these values were not statistically significant. The mean value of Heart weight recorded was T_0-14.445g, T_1-9.557g, T_2-10.999g, and T_3-12.940g, respectively. However, the investigation unveiled that the discrepancies in these values exhibited statistical significance ($P<0.05$). The mean value of Gizzard weight recorded was T_0-24.017g, T_1-25.327g, T_2-28.088g, and T_3-31.040g, respectively. However, the analysis revealed that the variations in these values were not statistically significant. The mean value of dressing percentage weight recorded was T_0-58.38 %, T_1-57.57 %, T_2-58.64 %, and T_3-59.06 % respectively which were not statistically significant.

Keywords dressing percentage, giblet, gizzard, heart, liver, probiotics

Introduction

The utilization of natural growth promoters as substitutes for antibiotics holds significant potential for the advancement of chicken production in the foreseeable future. Commencing in the year 2006, Probiotics have been officially classified by the United Nations Food and Agriculture Organization and the World Health Organization as "living microorganisms that, when administered in sufficient quantities, provide health advantages to the host"[1]. The practice of adding antimicrobial growth promoters in animal feed for prophylactic purposes has been prohibited as a result of the escalating resistance exhibited by pathogenic bacteria towards antibiotics. International institutions and organizations focused on public health are expressing significant concern about the need to decrease the utilization of antibiotics in animal and poultry feed. The utilization of probiotics or prebiotics as an unconventional to antibiotics has been increasingly employed to enhance the beneficial bacteria community within the gastrointestinal system [2]. Probiotics refer to live microbial feed supplements that exert favorable effects on the host animal by enhancing its intestinal equilibrium [3]. This enhancement is achieved through the correction of the bacterial population residing in the gastrointestinal (GI) tract [4]. *S. cerevisiae*, L. acidophilus, *S. faecium*, and *B. subtilis* are some of the probiotics that are used in food for both humans and animals [5-7]. A synbiotic refers to a combination of probiotics and prebiotics that has a positive impact on the host. This impact is achieved by enhancing the survival and establishment of live microbial dietary supplements in the gastrointestinal tract. Additionally, synbiotics selectively stimulate the growth and/or activate the metabolism of bacteria that promote health, ultimately leading to an improvement in the well-being of the host [8]. Probiotics are commonly manufactured within the feed industry via the procedures of isolation, culture, and fermentation. These probiotics can then be employed as additives during the production of feed [9-10]. Numerous literary sources have documented the manifold advantages associated with the administration of probiotics to facilitate the breeding of commercially reared animals. These benefits encompass enhancements in feed conversion ratio (FCR) and weight gain, as well as improvements in egg and milk yield. Additionally, probiotic supplementation has been found to effectively mitigate morbidity and death rates [11-13]. Probiotics have been found to positively impact various aspects of broiler chicken production. These include promoting growth performance, enhancing nutrient digestibility, and improving feed conversion ratio (FCR). Additionally, probiotics have been observed to improve the micro-ecological environment of the gastrointestinal tract, bolster internal immunity, and enhance antioxidant capacity. Consequently, the presence of probiotics inhibits the adhesion of pathogenic bacteria in broiler chickens [14-16].

Methodology

This experiment was conducted at the Small Animal Lab (Livestock Unit) of the Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj to investigate the effects of probiotics supplementation on giblet and dressing percentage of caged broilers. A total of 96, day-old chicks were at random divided into four groups (T_0, T_1, T_2, and T_3) with 8 replicates i.e., 24 chicks in each group (Table 1).

Table 1. Details of dietary treatments

Group	Dietary Treatments
T_0 (Control)	Basal diet
T_1	Basal diet + *Bacillus coagulan*s (40ppm)
T_2	Basal diet + *Bacillus subtilis* (50ppm)
T_3	Basal diet + *Bacillus licheniformis* & *Bacillus coagulans* (20ppm)

The control (untreated) group was fed the basal diet, T_1 was supplemented with *Bacillus coagulans* @40ppm along with basal diet, T_2 was given *Bacillus subtilis* @50ppm mixed in basal diet whereas T_3 was given basal diet+*Bacillus licheniformis* & *Bacillus coagulans* @20ppm. After 35 days of the trial period, weighing of the giblet and dressing percentage of 04 birds selected at random from each group was calculated and data was analyzed using the RBD analysis method. Using the RBD analysis method will limit systematic errors and effects caused by differences between blocks. It will also reduce sample errors and differences within treatment conditions, and it has a control group.

Carcass yield

After each replicate's birds were weighed live and slaughtered at the end of the experiment, the organ weight and carcass traits of the broiler chickens were examined. The weight of the neck, abdomen fat, liver, gizzard, and heart were weighed using a digital scale. The dressing percentage was computed using the carcass weight expressed as a percentage of the slaughter weight multiplied by one hundred.

Results and Discussion

Liver

Upon examination of the data presented in Table 2 on the weight of the liver in birds at the age of five weeks, it was noted that regardless of the various treatments, the liver weight ranged from 30.764 to 60.491 g. The liver weight of birds at five weeks of age had the highest mean value in treatment group T_0, with a recorded value of 46.420 g. This was followed by treatment group T_2, which had a mean liver weight of 45.275 g. Treatment group T_1 had a slightly lower mean liver weight of 42.352 g, while treatment group T_3 had the lowest mean liver weight of 40.521 g. However, the analysis revealed that the variations in these values were not statistically significant (Table 3). This suggests that the treatments had a non-significant effect on the liver of birds at five weeks of age.

A similar outcome was identified in the study conducted by Rehman et al., [17]. No significant interaction or individual effect of probiotics and prebiotics was seen on the weights of the carcass, breast, gizzard, liver, heart, and thigh.

Table 2. Average weight of Liver (g) of birds after five weeks of age in different treatments

Replication	Treatments				
	T_0	T_1	T_2	T_3	Mean
R_1	52.842	32.318	39.825	38.233	**40.804**
R_2	46.849	60.491	41.546	36.72	**46.401**
R_3	44.993	30.764	56.452	34.681	**41.722**
R_4	40.997	45.838	43.28	52.451	**45.641**
Mean	**46.420**	**42.352**	**45.275**	**40.521**	

Table 3. Analysis of variances (ANOVA) for the data on weight of Liver (g) of birds after five week of age contained

ANOVA						
Source of Variation	SS	Df	MS	F Cal	P-value	F crit
Rows	93.3949	3	31.13163	0.303151	0.822526	3.862548
Columns	87.15623	3	29.05208	0.282901	0.836564	3.862548
Error	924.2412	9	102.6935			
Total	1104.792	15				

Heart

Upon examining the weight of the Heart in birds at the age of five weeks (Table 4), it was noted that regardless of the various treatments, the Heart weight ranged from 8.073 to 15.921 g. The Heart weight of birds at five weeks of age had the highest mean value in treatment group T_0, with a recorded value of 14.445 g. This was followed by treatment group T_3, which had a mean Heart weight of 12.940 g. Treatment group T_2 had a slightly lower mean Heart weight of 10.999 g, while treatment group T_1 had the lowest mean Heart weight of 9.557 g. However, the investigation unveiled that the discrepancies in these values exhibited statistical significance ($P<0.05$) (Table 5). This finding indicates that the administered probiotics had a significant efficacy on the cardiac health of avian subjects at the age of five weeks.

A similar outcome was identified in the study conducted by Akter et al., [18]. The study found that the dressing percentage, gizzard, breast, back, liver, heart, neck, and thigh were significantly affected.

Table 4. Average weight of Heart (g) of birds after five weeks of age in different treatments

Replication	Treatments				
	T_0	T_1	T_2	T_3	Mean
R_1	15.921	10.44	12.481	12.117	**12.739**
R_2	15.2	11.06	8.869	13.723	**12.213**
R_3	13.168	8.073	9.867	12.547	**10.913**
R_4	13.492	8.655	12.782	13.375	**12.076**
Mean	**14.445**	**9.557**	**10.999**	**12.940**	

Table 5. Analysis of variances (ANOVA) for the data on weight of Heart (g) of birds after five weeks of age contained

ANOVA						
Source of Variation	SS	Df	MS	F Cal	P-value	F crit
Rows	7.10995	3	2.369983	1.250286	0.348074	3.862548
Columns	55.32684	3	18.44228	9.729238	0.00348	3.862548
Error	17.05997	9	1.895552			
Total	79.49676	15				

Gizzard

Upon examining the weight of the Gizzard in birds at the age of five weeks (Table 6), it was noted that regardless of the various treatments, the Gizzard weight ranged from 19.936 to 38.88 g. The Gizzard weight of birds at five weeks of age had the highest mean value in treatment group T_3, with a recorded value of 31.040 g. This was followed by treatment group T_2, which had a mean Gizzard weight of 28.088 g. Treatment group T_1 had a slightly lower mean Gizzard weight of 25.327 g, while treatment group T_0 had the lowest mean Gizzard weight of 24.017 g. However, the analysis revealed that the variations in these values were not statistically significant (Table 7). This suggests that the treatments had a non-significant effect on the Gizzard of birds at five weeks of age.

A similar outcome was identified in the study conducted by Ghafari et al., [19] who stated that the supervision of protexin and Ephedra funereal resulted in a rise in the weight of both the gizzard and gut.

Table 6. Average weight of Gizzard (g) of birds after five weeks of age in different treatments

Replication	Treatments				
	T_0	T_1	T_2	T_3	Mean
R_1	24.143	27.144	23.811	24.796	**24.973**
R_2	30.568	27.166	25.871	30.516	**28.530**
R_3	19.936	21.325	26.336	38.88	**26.619**
R_4	21.424	25.674	36.334	29.971	**28.350**
Mean	**24.017**	**25.327**	**28.088**	**31.040**	

Table 7. Analysis of variances (ANOVA) for the data on weight of Gizzard (g) of birds after five weeks of age contained

ANOVA						
Source of Variation	SS	Df	MS	F Cal	P-value	F crit
Rows	33.44701	3	11.149	0.398453	0.757481	3.862548
Columns	116.5888	3	38.86294	1.388917	0.308003	3.862548
Error	251.8268	9	27.98076			
Total	401.8626	15				

Dressing percentage

The dressing percentage was determined by multiplying the weight of the carcass by 100 and dividing it by the weight of the living animal [20].

$$\text{Dressing Percentage} = \frac{\text{Carcass Weight (g)}}{\text{Live Weight (g)}} \text{X } 100$$

Upon examining the weight of the dressing percentage in birds at the age of five weeks (Table 8), it was noted that regardless of the various treatments administered, the Dressing percentage ranged from 54.85 to 62.5 %. The dressing percentage of birds at five weeks of age had the highest mean value in treatment group T_3, with a recorded value of 59.06 %. This was followed by treatment group T_2, which had a mean Dressing percentage of 58.64 %. Treatment group T_0 had a slightly lower mean dressing percentage of 58.38 %, while treatment group T_1 had the lowest mean Dressing percentage of 57.57 %. However, the analysis revealed that the variations in these values were not statistically significant (Table 9). This suggests that the treatments had a non-significant effect on the Dressing percentage of birds at five weeks of age.

Table 8. Average dressing percentage (%) of birds after five weeks of age in different treatments

Replication	**Treatments**				
	T_0	**T_1**	**T_2**	**T_3**	**Mean**
R_1	55.61	60.35	61.18	57.27	**58.60**
R_2	59.8	54.85	57.09	62.5	**58.56**
R_3	60.19	58.04	60.7	58.74	**59.41**
R_4	57.94	57.04	55.62	57.75	**57.08**
Mean	**58.38**	**57.57**	**58.64**	**59.06**	

Table 9. Analysis of variances (ANOVA) for the data on dressing percentage (%) of birds after five weeks of age contained

ANOVA						
Source of Variation	SS	Df	MS	F Cal	P-value	F crit
Rows	11.29372	3	3.764573	0.598948	0.631629	3.862548
Columns	4.765869	3	1.588623	0.252752	0.857485	3.862548
Error	56.56776	9	6.285306			
Total	72.62734	15				

A similar outcome was identified in the study conducted by Devi et al., [21]. The dressing % and carcass yield exhibited superior performance in treatment T_4. The dressing percentage in all the groups varied non-significantly with the highest being in group T_3- 59.06% followed by T_2-58.64%, T_0-58.38%, and T_1-57.57% (Table 10).

Table 10. Effect of probiotic supplementation on giblet & dressing percentage

Parameter	Treatments				P Value	Results
	T_0	**T_1**	**T_2**	**T_3**		
Liver (g)	46.420	42.352	45.275	40.521	0.28290	**NS**
Heart (g)	14.445	9.557	10.999	12.940	0.00348	**S**
Gizzard (g)	24.017	25.327	28.088	31.040	0.30800	**NS**
Dressing Percentage (%)	58.38	57.57	58.64	59.06	0.85748	**NS**

Conclusion

From the above data, it can be concluded that probiotics supplementation does not statistically significant effect on liver and gizzard weight but has a significant effect ($P<0.05$) on heart weight. The dressing percentage in all the groups varied non-significantly with the highest being in group T_3-59.06% followed by T_2-58.64%, T_0-58.38%, and T_1-57.57%.

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