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Effect of Sodium Butyrate Supplementation on Carcass Traits and Visceral Organ Weights in Commercial Broiler

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ABSTRACT

A total of 200, day old broiler chicks were divided into 4 treatments consisting of 5 replicates in each group and ten chicks in each replicate. Basal diet (T1) prepared following BIS (2007) standards and the experimental diets were prepared by incorporating antibiotic 0.02 % of BMD (T2), 0.1% sodium butyrate in pre-starter, 0.05 % in starter and 0.025% in finisher (T3) and 0.02 % of antibiotic BMD and 0.1% sodium butyrate in pre-starter, 0.05% in starter and 0.025 % in finisher (T4). The results revealed that sodium butyrate and combination of sodium butyrate along with antibiotic BMD resulted in significant improvement ($P \leq 0.05$) in carcass characteristics like dressing percentage, breast yield, thigh yield, drumstick yield, abdominal fat percentage, relative weight of liver and gizzard in sodium butyrate supplemented groups when compared and non-significant difference ($P > 0.05$) in relative weight of heart and proventriculus was observed.

HIGHLIGHTS

- Studied the sodium butyrate supplementation effect on the growth of broiler chickens.
- Sodium butyrate showed significant effect on the overall growth of the chickens.

Keywords: Sodium butyrate, carcass traits, visceral organ weights

Acidifiers are made up of specific organic acids that have antibacterial effects and can change the pH in the gut. These include their salts and the following acids: acetic acid, propionic acid, butyric acid, citric acid, formic acid, lactic acid, fumaric acid, etc. Actually, it is a manufactured mixture of salts and organic acids (Vegad, 2004). Organic acids that are included into chicken feed can help to improve gastrointestinal conditions for effective feed digestion. These feed additives are biotechnological instruments that are crucial in altering the digestion or metabolism of the feed in order to hasten the availability of nutrients to the birds. Organic acids in poultry serve a variety of purposes, including improving protein and energy digestibilities by minimizing microbial competition with host nutrients, stimulating feed consumption and inhibiting the growth of pathogenic bacteria thereby improve their performance.

Panda *et al.* (2009) supplied broilers with varying amounts of butyric acid (0.2, 0.4 and 0.6 %) and furazolidone (0.05%) and discovered that, when compared to the control or furazolidone group, the butyrate supplied groups had significantly higher dressing percentage and lower abdominal fat content. The dietary treatments had no effect ($P \leq 0.05$) on the relative weights of giblets or breast meat.

Gomathi *et al.* (2018) investigated the effect of supplementation of cinnamon oil and sodium butyrate on carcass characteristics and meat quality of broiler chicken compared with the antibiotic supplementation. The carcass characteristics such as ready-to-cook yield, eviscerated weight and weight of heart, liver, gizzard,

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giblet and abdominal fat as a percent of live body weight were not influenced by supplementation of cinnamon oil and coated butyrate at the levels attempted or by antibiotic supplementation in broilers at the end of the 35th day.

MATERIALS AND METHODS

Total of two hundred, day-old commercial broiler chicks were procured commercially from Venkateshwara hatcheries. Chicks were weighed; wing banded and allocated to four experimental groups each consisting of five replicates with ten chicks each. Basal diet (control) T1 was prepared without antibiotics from day one to 42 days of experimental period as per BIS (2007) standard. For the treatment groups T2, were fed with basal diet (control) along with 0.02 % of antibiotic BMD from day one to 42 days and for the treatment groups T3, were fed with basal diet (control) along with 0.1 % sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher upto 42 days. For the treatment groups T4 were fed with basal di*et al*ong with 0.02 % of antibiotic BMD and 0.1 % sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher with upto 42 days. Standard vaccination schedule was followed for immunizing the birds. Feed and water was provided ad libitum. Birds were reared under standard managemental practices.

RESULTS AND DISCUSSION

The results of the effect of sodium butyrate on different carcass traits and visceral organ weight on 42nd day in commercial broilers were presented in Table 1 and Table 2, respectively.

At the end of 42nd day of the experiment, the mean dressing percentage in groups T1, T2, T3 and T4 were 68.94, 68.02, 73.03 and 73.00 per cent, respectively. The group T3 and T4 recorded the highest dressing percentage and were significantly ($P \leq 0.05$) higher compared to T1 and T2 groups. However, there was no significant ($P > 0.05$) difference in the dressing percentage between the treatments T3 and T4 and also among the groups T1 and T2.

Breast yield (%) in groups T1, T2, T3 and T4 at 42nd day were 31.46, 33.78, 36.77 and 36.36, respectively. Statistical analysis revealed significant ($P \leq 0.05$) difference in yield of breast between the treatments. The groups T3 and T4 recorded the highest breast yield and were significantly ($P \leq 0.05$) different from T1 and T2 and also significant ($P \leq 0.05$) difference in yield of breast between T1 and T2. However, there was no significant ($P > 0.05$) difference in yield of breast between the treatments T3 and T4.

The yield of thigh (%) in groups T1, T2, T3 and T4 at 42nd day were 13.27, 14.18, 16.87 and 17.10 respectively. ANOVA revealed significant ($P \leq 0.05$) difference in yield of thigh between the treatments. The groups T3 and T4 recorded the highest thigh yield and were significantly ($P \leq 0.05$) different from T1 and T2 and also significant ($P \leq 0.05$) difference in yield of thigh between T1 and T2. However, there was no significant ($P > 0.05$) difference in yield of thigh between the treatments T3 and T4.

Drumstick yield (%) in groups T1, T2, T3 and T4 were 16.25, 16.84, 17.06 and 16.74, respectively. ANOVA revealed significant ($P \leq 0.05$) difference in drumstick yield (%) among all the treatment groups. The group T3 recorded the highest drumstick yield and significantly ($P \leq 0.05$) different from T1. However, no significant ($P > 0.05$) difference was observed in the drumstick yield among the groups T1, T2 and T4 and also among T2, T3 and T4.

The mean per cent abdominal fat (%) at the end of the experiment were 1.33, 1.37, 0.996 and 0.933 in groups T1, T2, T3 and T4 at the end of the experiment. ANOVA revealed significant ($P \leq 0.05$) difference in per cent abdominal fat among all the treatment groups. Significantly higher abdominal fat percentage was observed in T1 and T2 compared to T3 and T4. However, no significant ($P > 0.05$) difference was observed in the abdominal fat percentage in the groups T3 and T4 and also among T1 and T2 groups.

The weight of heart (% of live weight) in different treatment groups were 0.602 (T1), 0.632 (T2), 0.609 (T3) and 0.591 (T4). The weight of the heart showed statistically no significant ($P > 0.05$) among all the groups compared to control group.

The liver weight (% of live weight) in different treatment groups were 2.39 (T1), 2.45 (T2), 2.27 (T3) and 2.22 (T4). ANOVA revealed that there was a significant difference ($P \leq 0.05$) in the liver weight among treatment groups. The group T2 recorded the highest liver weight and showed significant ($P \leq 0.05$) difference compared to T3 and T4 and also T1 significantly higher than T4. However, no

significant (P > 0.05) difference was observed in the liver weight among the groups T1 and T2 and also among T3 and T4.

Gizzard weight (% of live weight) in treatment groups were 2.68 (T1), 2.77 (T2), 2.61 (T3) and 2.53 (T4). ANOVA revealed that there was a significant difference (P ≤ 0.05) in the weight of gizzard among treatment groups. The group T2 recorded the highest gizzard weight and showed significant (P ≤ 0.05) difference from T4. However, no significant (P > 0.05) difference was observed in the gizzard weight among the groups T1, T2 and T3 and also among T1, T3 and T4.

The proventriculus weight (% of live weight) in different treatment groups were 0.632(T1), 0.670 (T2), 0.608 (T3) and 0.623 (T4) and there was no significant difference (P > 0.05) in the proventriculus weight among all the groups compared to control group.

The findings of the present study is in agreement with Pascual *et al.* (2020) who evaluated the dietary supplementation of microencapsulated sodium butyrate (500 mg / kg) on carcass traits of commercial broiler and revealed that the birds had higher carcass weight, breast yield and thigh yield when compared with the control. Yang *et al.* (2022) findings is in agreement with the present study where they performed an experiment to evaluate the effect of butyrate in combination with forskolin - containing Coleus forskohlii extract and found that the combination had significantly lowered the abdominal fat deposition (P = 0.01) with no impact on carcass weight and breast yield.

The findings of present experiment are in agreement with Bedford *et al.* (2017) they found that effects of monobutyrin inclusion on the carcass characters in broilers and the effects of its combination with tributyrin recorded that there was a significantly decreased abdominal fat deposition compared to control (P ≤ 0.05) and the breast yield increased in a dose-response manner to the supplementation of monobutyrin (P ≤ 0.05) and it had no impact on overall dressing percentage (P > 0.05).

The better carcass traits and visceral organ weight recorded in the current experiment might be related to considerably increased body weight, better FCR, improved gut health and high nutritional digestibility in broilers which caused due to inclusion of sodium butyrate in the broiler diet.

In contrary to the present experimental findings Lan *et al.* (2020) is in disagreement with present experiment on the effects of dietary sodium butyrate supplementation along with control diet on commercial broilers and observed no significant differences in dressing percentage, breast yield, thigh yield and abdominal fat yield.

Gomathi *et al.* (2018) investigations on the effect of supplementation of cinnamon oil and sodium butyrate on carcass characteristics and meat quality of broiler chicken compared with the antibiotic supplementation is in disagreement with the present study. Where they recorded carcass characteristics such as ready-to-cook yield,

Table 1: Effect of sodium butyrate supplementation on carcass traits (% of live weight) (Mean ± SE) in commercial broilers

Experimental group	Diet	Dressing %	Breast %	Thigh %	Drumstick %	Abdominal fat %
T_1	Basal diet without antibiotic	68.94 ± 0.79^{b}	31.46 ± 0.41^{c}	13.27 ± 0.26^{c}	16.25 ± 0.19^{b}	1.33 ± 0.06^{a}
T_2	Basal diet + 0.02 % Bacitracin disalicylate (BMD)	68.02 ± 0.52^{b}	33.78 ± 0.23^{b}	14.18 ± 0.28^{b}	16.84 ± 0.21^{ab}	1.37 ± 0.05^{a}
T_3	Basal diet + 0.1 % sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher	73.03 ± 0.54^{a}	36.77 ± 0.39^{a}	16.87 ± 0.20^{a}	17.06 ± 0.16^{a}	0.996 ± 0.03^{b}
T_4	Basal diet + 0.02 % Bacitracin disalicylate (BMD) + 0.1 % sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher	73.00 ± 0.50^{a}	36.26 ± 0.36^{a}	17.10 ± 0.17^{a}	16.74 ± 0.11^{ab}	0.933 ± 0.03^{b}

a, b, c Means in the same column with no common superscript differ significantly (P ≤ 0.05).

Table 2: Effect of sodium butyrate supplementation on per cent relative visceral organs weight (% of live weight) (Mean ± SE) in commercial broilers

Experimental group	Diet	Heart	Liver	Gizzard	Proventriculus
T_1	Basal diet without antibiotic	0.602 ± 0.015	2.39 ± 0.057^{ab}	2.68 ± 0.070^{ab}	0.632 ± 0.022
T_2	Basal diet + 0.02% Bacitracin disalicylate (BMD)	0.632 ± 0.009	2.45 ± 0.043^{a}	2.77 ± 0.038^{a}	0.670 ± 0.015
T_3	Basal diet + 0.1% sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher	0.609 ± 0.010	2.27 ± 0.038^{bc}	2.61 ± 0.055^{ab}	0.608 ± 0.014
T_4	Basal diet + 0.02 % Bacitracin disalicylate (BMD) + 0.1 % sodium butyrate in pre-starter, 0.05 % in starter and 0.025 % in finisher	0.591 ± 0.012	2.22 ± 0.027^{c}	2.53 ± 0.023^{b}	0.623 ± 0.012

a, b ,c Means in the same column with no common superscript differ significantly (P ≤ 0.05).

eviscerated weight and abdominal fat were not influenced by supplementation of coated butyrate or antibiotic supplementation in broilers at the end of the 35th day.

CONCLUSION

The significant difference (P ≤ 0.05) in dressing percentage, breast yield, thigh yield, drumstick yield, abdominal fat percentage, liver and gizzard in the groups fed with sodium butyrate and combination of bacitracin methylene disalicylate (BMD) + sodium butyrate compared to control group and non-significant difference (P > 0.05) in weight of heart and proventriculus of birds in the groups fed with different groups of sodium butyrate and bacitracin methylene disalicylate (BMD) + sodium butyrate compared to the control group at the end of the experiment (42nd day).

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