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Effect of feeding different protein source on carcass characteristics in commercial broilers

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Abstract
An experiment was conducted to study the effect of feeding different protein source on carcass characteristics in commercial broilers. A total of 150, one day old cobb chicks were distributed into five treatment groups with three 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 blood meal at 5 per cent (T2), fish meal at 5 per cent (T3), silkworm pupae meal at 5 per cent (T4) and meat meal at 5 per cent (T5). The results revealed significant difference ($p \leq 0.05$) in carcass characteristics like dressing percentage, breast yield and thigh yield in groups fed with blood meal and meat meal at 5 per cent when compared to control and other treatment groups was observed and non-significant difference ($p > 0.05$) in drumstick yield, abdominal fat per cent, relative weight of gizzard, heart, liver and proventriculus was observed among all groups compared to control.

Keywords: Blood meal, fish meal, silkworm pupae meal and Meat meal

Introduction
In the poultry sector, feed costs are one of the biggest expenses, accounting for 65 to 70 percent of overall production costs. The protein of animal origin, is the ingredient in chicken feed formulas that has the highest unit cost (Sahraei *et al*., 2012) [6]. Protein costs account for roughly 45 per cent of the entire feed cost, making them relatively more expensive than the other elements. There are two sources of protein for feed: protein derived from plants and protein derived from animals

Nowadays, the majority of poultry breeders substitute protein concentrates for fishmeal in their flocks' diets (Swe *et al*., 2022) [8]. In the diet of broilers, fish meal is frequently employed as an animal source of protein.

Meat and bone meal has been widely used as a protein source in animal and pet meals to enhance the quality of livestock feed because it is a rich source of protein (48 – 52 per cent), fat (8 – 12 per cent), and ash (33 – 35 per cent). It might make up to 30% of the dietary protein supply in poultry and pig ration.

As a byproduct of the meat business, blood meal (BM) is fed to both ruminants and non-ruminants as a source of protein (Seifdavati *et al*., 2008) [7]. A dark chocolate-colored powder called blood meal has a distinct odour. It is one of the best sources of lysine, arginine, methionine, cystine, and leucine, although it is very deficient in isoleucine and contains less glycine compared to fish meal or bone meal (NRC, 1994) [5].

Khawaja *et al*. (2007) [4] studied the effect of different levels of blood meal (0, 3, 4, 5 and 6 per cent) in combination with fish meal up to 8 per cent in broilers and observed that dressing percentage and relative weight of liver of chickens were higher ($p < 0.05$) in groups fed with 3 percent blood meal compared to all other groups.

The effect of meat and bone meal (MBM) supplementation at 2.0, 3.5 and 5.0% to broiler chicken diets, and found that no significant ($p > 0.05$) effect on carcass yield when slaughtered at 42nd day (Bozkurt, 2004) [1].

Materials and Methods
A total of one hundred and fifty, day-old commercial broiler chicks will be procured from the Venkateshwara hatcheries Ltd., All the chicks will be weighed and wing banded individually. The chicks will be allocated to five different treatment groups each consisting of three replicates with 10 chicks each (30 chicks per treatment). Each of the treatment groups will be fed with different types of experimental diets.

The control group T1 will be fed with soyabean meal as protein in basal diet as per BIS (2007) [2] standards. The treatment groups T2, T3, T4 and T5 will be fed with 5% of blood meal, 5% of fish meal, 5% of silk worm pupae meal and 5% of meat meal respectively, T2, T3, T4, and T5 diet will be formulated to meet isocaloric and isonitrogenous by manipulating the test diet inclusion level in the basal diet. The chicks will be reared in deep litter system and will be maintained under standard managemental practices till 6 weeks of age. Standard vaccination schedule will be followed for immunizing the birds. Feed and water will be provided ad libitum throughout the experimental period.

Results and Discussion

The results of the effect of feeding different protein sources on different carcass traits and relative weight of visceral organs on 42nd day in commercial broilers were presented in Table 1 and Table 2, respectively. There was significant difference ($p \leq 0.05$) in dressing per centage, breast yield (%), thigh yield (%) and no significant difference ($p > 0.05$) in drumstick yield (%), abdominal fat per cent, relative weight of gizzard, heart, liver and proventriculus (%) of birds in the groups fed with different protein sources compared to the control group at the end of the experiment (42nd day).

At the end of 42nd day of the experiment, the mean dressing percentage in groups T1, T2, T3 and T4 and T5 were 69.48, 75.73, 69.73, 70.73 and 72.15 per cent, respectively. The group T2 and T5 recorded the highest dressing percentage and were significantly ($p \leq 0.05$) higher compared to T1, T3 and T4 groups. However, there was no significant ($p > 0.05$) difference in the dressing percentage between the treatments T1, T3 and T4 and also among the groups T2 and T5.

The yield of breast (%) in groups T1, T2, T3, T4 and T5 at 42nd day were 33.80, 36.06, 34.07, 33.95 and 35.57, respectively. Statistical analysis revealed significant ($p \leq 0.05$) difference in yield of breast between the treatments. The treatment T2 recorded the highest breast yield and were significantly ($p \leq 0.05$) different from T1, T3 and T4. However, no significant ($p > 0.05$) difference was observed in the breast yield in the groups T1, T3, T4 and T5 and also among control, T2 and T5 groups.

The yield of thigh (%) in groups T1, T2, T3, T4 and T5 at 56th day were 14.46, 15.95, 14.47, 14.44 and 15.85, respectively. Statistical analysis revealed significant ($p \leq 0.05$) difference in yield of thigh between the treatments. The treatment T2 and T5 recorded the highest thigh yield and were significantly ($p \leq 0.05$) different from T1, T3 and T4. However, there was no significant ($p > 0.05$) difference in the thigh yield between the treatments T1, T3 and T4 and also among the groups T2 and T5.

The per cent abdominal fat (%) at the end of the experiment were 1.54, 1.43, 1.59, 1.51 and 1.51in groups T1, T2, T3, T4 and T5 respectively and the drumstick yield (%) in groups T1, T2, T3, T4 and T5 were17.08,17.19, 17.11, 17.09 and 17.14 respectively. Statistical analysis revealed no significant ($P > 0.05$) difference was observed in the abdominal fat percentage between the treatments and control.

The liver weight (% live weight) in different treatment groups were 2.61 (T1), 2.61 (T2), 2.64 (T3), 2.66 (T4) and 2.64 (T5), the heart weight (% live weight) in different treatment groups were 0.650 (T1), 0.661 (T2), 0.638 (T3), 0.663 (T4) and 0.646 (T5), the proventriculus weight (g/100g body weight) in different treatment groups were 0.732 (T1), 0.716 (T2), 0.723 (T3), 0.732 (T4) and 0.724 (T5) and the gizzard weight (% live weight) in different treatment groups were 2.93 (T1), 2.91 (T2), 2.96 (T3), 2.97 (T4) and 3.01 (T5). Statistical analysis revealed no significant ($P > 0.05$) difference in visceral organ weight in all treatment groups.

The findings of the present results were in agreement with Khawaja *et al*. (2007) [4] who studied the effect of different levels of blood meal (0, 3, 4, 5 and 6 per cent) in combination with fish meal up to 8 per cent in broilers and observed that dressing per centage and relative weight of liver of chickens were higher ($p < 0.05$) in groups fed with 3 per cent compared to all other groups.

The findings of the present results were in agreement with Ijaiya and Eko, (2009) [3] who studied the effects of substituting fish meal with different levels of silkworm (*Anaphe infracta*) caterpillar meal (SCM) with five diets which had 100% FM: 0% SCM; 75% FM: 25% SCM; 50% FM: 50% SCM; 25% FM: 75% SCM and 0% FM: 100% SCM and observed the Analysis of weight of carcass and body cuts indicated no significant ($p > 0.05$) differences between the treatment.

The improvement in the dressing per centage, breast yield and thigh yield in the experimental diets might be due to different protein sources which are rich in essential amino acids and vitamins and also having high digestibility value.

The findings of the present results were in disagreement with Bozkurt (2004) [1] who studied the effect of meat and bone meal (MBM) supplementation (added at 2.0, 3.5 and 5.0%) to broiler chicken diets and observed that the dietary treatments had no significant ($p > 0.05$) effect on carcass yield when slaughtered at 42nd day.

The present study is in contrary with Seifdavati *et al*. (2008) [7] who designed as a 2×5 factorial arrangement with main effects of feeding blood meal as a replacement of 0, 25, 50, 75 or 100% of dietary fish meal and the duration of this substitution was 1-42 or 21-42 days of age. The results revealed that Spleen and proventriculus per cent didn't cause any adverse effects on carcass important traits.

Table1: Effect of feeding different protein source on carcass traits (% live weight) (Mean ± SE) in commercial broilers.

Experimental group	Description of the treatment	Dressing (%)	Breast (%)	Thigh (%)	Drumstick (%)	Abdominal fat (%)
T1	Control Diet	69.48 ± 0.679^{b}	33.80 ± 0.467^{b}	14.46 ± 0.263^{b}	17.08 ± 0.149	1.54 ± 0.106
T2	5% Blood meal	75.73 ± 1.55^{a}	36.06 ± 0.560^{a}	15.95 ± 0.363^{a}	17.19 ± 0.161	1.43 ± 0.075
T3	5% Fish meal	69.73 ± 0.828^{b}	34.07 ± 0.404^{b}	14.47 ± 0.228^{b}	17.11 ± 0.357	1.59 ± 0.129
T4	5% Silkworm pupae meal	70.73 ± 0.553^{b}	33.95 ± 0.218^{b}	14.44 ± 0.114^{b}	17.09 ± 0.269	1.51 ± 0.155
T5	5% Meat meal	72.15 ± 0.741^{a}	35.57 ± 0.417^{ab}	15.85 ± 0.212^{a}	17.14 ± 0.188	1.51 ± 0.10

^{a,b} Means in the same column with no common superscript differ significantly ($p \leq 0.05$)

Table 2: Effect of feeding different protein source on visceral organ weight (Mean ± SE) in commercial broilers

Experimental group	Description of the treatment	Visceral organ weight (g/100g body weight)			
		Heart	Liver	Proventriculus	Gizzard
T1	Control Diet	0.650 ± 0.009	2.61 ± 0.016	0.732 ± 0.014	2.93 ± 0.018
T2	5% Blood meal	0.661 ± 0.013	2.61 ± 0.029	0.716 ± 0.012	2.91 ± 0.051
T3	5% Fish Meal	0.638 ± 0.029	2.64 ± 0.053	0.723 ± 0.014	2.96 ± 0.057
T4	5% silkworm pupae meal	0.663 ± 0.017	2.66 ± 0.018	0.732 ± 0.008	2.97 ± 0.018
T5	5% Meat meal	0.646 ± 0.017	2.64 ± 0.027	0.724 ± 0.007	3.01 ± 0.028

Conclusion

Based on the above results it was concluded that inclusion of different protein source that is blood meal at 5 per cent and meat meal at 5 per cent resulted in significant ($p \leq 0.05$) improvement in dressing per centage, breast yield, thigh yield when compared to the control, fish meal at 5 per cent and silkworm pupae meal at 5 per cent and no significant difference ($p > 0.05$) in drumstick yield, abdominal fat per cent, gizzard, heart, liver and proventriculus of birds in the groups fed with different protein source compared to the control group at the end of the experiment (42nd day).

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