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Effect of Feeding Different Protein Source on Growth Performance 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 that blood meal and meat meal at 5 per cent resulted in significant improvement in body weight, feed intake and feed efficiency compared to control and other groups and no significant difference in survivability among all groups.

HIGHLIGHTS

- Conventional protein source like soyabean meal can be replaced with non-conventional feed source like blood meal and meat meal.
- Addition of protein source like blood meal and meat meal is economically feasible for feed production

Keywords: Blood meal, Fish meal, Silkworm pupae meal, Meat meal

Large margin foods are required because to the world population's ongoing growth, and the agricultural production needs be increased by between 70 and 100 per cent in the future to keep up with demand for food worldwide (Yang *et al*., 2021). In 2018, more than 820 million people were hungry, and 2 billion people worldwide experience moderate to severe food insecurity. However, according to estimates from the Food and Agriculture Organization (FAO), over one-third of the food produced globally for human consumption is lost or wasted. This poses a threat to food security as well as a huge loss of the resources used to produce, process, and transport food. Therefore, reducing food waste is a feasible technique for bridging the food supply and demand imbalance. Recycled by products from slaughter houses of pigs, cattle and sheep including leftover bone, skin, fat offal and meat after removing edible parts makes the main component of meat and bone meal (MBM) (Hossain *et al.,* 2018). This process uses advanced processing technology and high temperature sterilization to make the organic components more absorbable and palatable to the animals. It may be used as a feed additive for pets, poultry and dairy animals. 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 rich in protein (48 – 52%), fat (8 – 12%), and ash (33 – 35%). It might make up to 30% of the dietary protein supply in poultry and pig ration. MBM can successfully substitute up to 50% of the daily fish meal in addition to being an important source of protein,

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energy, calcium, phosphorus, and other trace minerals. According to several research, adding up to 10% of MBM to broiler and turkey diets had no detrimental effects on broiler performance even when it was at the highest level.

The broilers fed with four dietary treatment groups with different fish meal inclusion levels (0, 1.5, 2.5, and 3.5%) for four treatments respectively, and observed that the daily feed intake and total feed intake had no significant ($p > 0.05$) effects when 1.5, 2.5 and 3.5% fed diets compared to the control (treatment A) (Muhammad *et al*., 2016).

Ullah *et al.* (2017) observed that effect of replacement of soybean meal with silkworm meal in the diets in white leghorn layers, effects on performance revealed feed conversion ratio did not differ significantly ($P > 0.05$) among the dietary groups.

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) 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 growth performance on 42nd day in commercial broilers were presented in Table 2-5, respectively. There was significant difference ($P \leq 0.05$) in body weight, feed intake and feed conversion ratio and no significant difference ($P > 0.05$) in survivability (%) of birds in the groups fed with different protein sources compared to the control group at the end of the experiment (42nd day).

The cumulative mean body weight of birds (g/bird) under different treatment groups T1, T2, T3, T4 and T5 were 2127.9, 2302.5, 2168.6, 2150.4 and 2304.6, respectively at the end of sixth week (42nd day). The statistical analysis revealed significant ($P \leq 0.05$) difference in body weight of birds among different treatment groups. The treatment groups T2 and T5 showed significantly ($P \leq 0.05$) higher body weight than the groups T1, T3 and T4 and also significant difference was observed between treatment groups T1 and T3. There was no significant difference ($P > 0.05$) in body weight between treatment groups T1 and T4, T2 and T5 and also among T3 and T4.

At the end of sixth week (42nd day), the cumulative average feed intake of birds (g/bird) under different treatment groups T1, T2, T3, T4 and T5 were 3902.1, 3833.1, 3871,

Table 1: Proximate composition of different protein source

Parameter	Blood meal	Fish meal	Silk worm pupae meal	Meat meal
Moisture (%)	5.2	10.0	10.41	5.52
Crude protein (%)	86.6	61.37	44.40	62.87
Crude fiber (%)	0.5	1.0	5.45	1.97
Crude fat (%)	1.0	1.0	32.1	18.05
Total ash (%)	3.2	13 .21	4.03	7.20
Metabolizable energy (Kcal/kg DM)	2900	2370	4000	3660
Calcium (%)	0.7	8.4	0.2	2.1
Phosphorous (%)	0.4	3.88	0.921	1.06

Source: Venkateshwara hatcheries Pvt. Ltd., Bengaluru.

3888.8 and 3863.8, respectively. The statistical analysis revealed significant ($P \leq 0.05$) difference in feed intake among different treatment groups. The treatment groups T1 and T4 showed significantly ($P \leq 0.05$) higher feed intake than the groups T2, T3 and T5 and also significant difference was observed among treatment groups T3 compared to T2 and T5. There was no significant difference ($P > 0.05$) in feed intake among treatment groups T2 and T5 and also among T1 and T4.

At the end of sixth week (42nd day), the cumulative average feed conversion ratio of birds under different treatment groups were 1.890 (T1), 1.711 (T2), 1.812 (T3), 1.822 (T4) and 1.707 (T5). The ANOVA revealed significant ($P \leq 0.05$) difference in feed conversion ratio among different treatment groups. The significantly better FCR values were observed in groups T2 and T5 when compared to the control group (T1), T3 and T4 and also significant difference was observed among treatment groups T3 compared to T1 and T4 and significant difference was observed among treatment groups T4 compared to T1. There was no significant ($P > 0.05$) difference in feed conversion ratio among different treatment groups T2 and T5.

The survivability or liveability (%) values were 96.66 in T1, 100 in T2, 93.33 in T3, 100 in T4 and T5. The statistical analysis revealed non-significant ($P > 0.05$) difference in survivability (%) of birds between different treatment groups.

The findings of the present results were in agreement with Seifdavati *et al*. (2008) who studied the 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 at 1-42 or 21-42 days of age. More than 25 % blood meal/fish meal substitution ratios significantly ($p < 0.05$) increased birds daily weight gain.

The findings of the present results were in agreement with Khawaja *et al*. (2007) 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 on performance characteristics in broilers and observed that broilers fed with diet containing 3 per cent blood meal has higher feed intake compared to other treatment groups.

Table 2: Effect of feeding different protein source on weekly cumulative body weight (g/bird) (Mean ± SE) in commercial broilers

Experimental group	Description of the Treatment	Weeks					
		I	II	III	IV	V	VI
T1	Control diet	144.00 ± 2.11	360.10 ± 3.56^{b}	712.60 ± 2.87^{b}	1123.4 ± 4.66^{b}	1629.3 ± 5.18^{c}	2127.9 ± 8.09^{c}
T2	5 % Blood meal	146.90 ± 1.84	370.93 ± 2.40^{ab}	765.30 ± 3.86^{a}	1224.6 ± 6.60^{a}	1788.0 ± 8.71^{a}	2302.5 ± 6.45^{a}
T3	5 % Fish meal	145.30 ± 1.95	364.37 ± 2.67^{ab}	717.00 ± 4.55^{b}	1136.1 ± 6.34^{b}	1667.1 ± 7.56^{b}	2168.6 ± 7.73^{b}
T4	5 % Silkworm pupae meal	145.37 ± 2.07	360.73 ± 3.35^{b}	717.97 ± 4.07^{b}	1133.3 ± 4.46^{b}	1652.9 ± 6.63^{bc}	2150.4 ± 9.39^{bc}
T5	5 % Meat meal	147.07 ± 2.36	372.07 ± 2.07^{a}	767.37 ± 2.83^{a}	1232.0 ± 3.54^{a}	1787.2 ± 10.29^{a}	2304.6 ± 8.80^{a}

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

Table 3: Effect of feeding different protein source on weekly cumulative feed intake (g/bird) (Mean ± SE) in commercial broilers

Experimental Group	Description of the treatment	Weeks					
		I	II	III	IV	V	VI
T1	Control diet	102.10 ± 0.25^{b}	416.10 ± 0.89^{b}	944.14 ± 0.93^{c}	1649.7 ± 0.63^{c}	2757.0 ± 2.11^{b}	3902.1 ± 3.72^{a}
T2	5 % Blood meal	109.08 ± 0.18^{a}	485.18 ± 0.36^{a}	994.71 ± 1.49^{a}	1688.8 ± 1.03^{a}	2668.4 ± 2.84^{c}	3833.1 ± 3.81^{c}
T3	5 % fish meal	101.03 ± 0.09^{b}	414.70 ± 0.40^{b}	973.23 ± 1.42^{b}	1659.4 ± 2.26^{b}	2768.0 ± 2.83^{a}	3871.2 ± 1.54^{b}
T4	5 % silkworm pupae meal	102.33 ± 0.30^{b}	414.99 ± 0.70^{b}	969.98 ± 1.05^{b}	1660.5 ± 0.513^{b}	2768.9 ± 2.07^{a}	3888.8 ± 2.76^{a}
T5	5 % Meat meal	109.95 ± 0.30^{a}	486.18 ± 0.42^{a}	997.55 ± 1.40^{a}	1690.7 ± 1.71^{a}	2667.7 ± 1.50^{c}	3863.8 ± 2.75^{c}

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

Table 4: Effect of feeding different protein source on weekly cumulative feed conversion ratio (Mean ± SE) in commercial broilers

Experimental Group	Description of the treatment	Weeks					
		I	II	III	IV	V	VI
T1	Control Diet	1.120 ± 0.001[a]	1.321 ± 0.001[a]	1.438 ± 0.001[a]	1.550 ± 0.001[a]	1.758 ± 0.002[a]	1.890 ± 0.002[a]
T2	5 % Blood meal	1.109 ± 0.001[b]	1.283 ± 0.001[b]	1.380 ± 0.001[c]	1.466 ± 0.001[c]	1.596 ± 0.003[c]	1.711 ± 0.001[d]
T3	5 % Fish Meal	1.127 ± 0.001[a]	1.322 ± 0.001[a]	1.411 ± 0.001[b]	1.504 ± 0.002[b]	1.710 ± 0.002[b]	1.812 ± 0.001[c]
T4	5 % silkworm pupae meal	1.128 ± 0.001[a]	1.319 ± 0.002[a]	1.409 ± 0.002[b]	1.505 ± 0.002[b]	1.706 ± 0.002[b]	1.822 ± 0.001[b]
T5	5 % Meat meal	1.111 ± 0.001[b]	1.286 ± 0.001[b]	1.381 ± 0.001[c]	1.466 ± 0.002[c]	1.593 ± 0.002[c]	1.707 ± 0.001[d]

[a,b,c,d]Means in the same column with no common superscript differ significantly ($P \leq 0.05$).

Table 5: Effect of feeding different protein source on survivability (%) in commercial broilers

Experimental group	Description of the treatment	Survivability percentage (%)
T1	Control Diet	96.66 ± 3.33
T2	5 % Blood meal	100 ± 0.00
T3	5 % Fish Meal	93.33 ± 3.33
T4	5 % silkworm pupae meal	100 ± 0.00
T5	5 % Meat meal	100 ± 0.00

The findings of the present results were in agreement with Navidshad *et al.* (2009) who conducted experiment on supplementation of dietary levels of a modified meat meal at 20, 35, 50, 65 and 80 g / kg diet in broilers and observed better feed efficiency in the group containing 20 g / kg diet of modified meat diet.

The higher growth rates observed for birds fed on diets containing higher concentrations of blood meal might be caused by the increased amount of lysine available for growth when true growth is considered as deposition of amino acids (of which lysine is the most critical under practical conditions of feed formulation).

The findings of the present results were in disagreement with Ekwe *et al*. (2020). The birds were randomly allotted to four treatments (T1, T2, T3 and T4) where T1 (Control) contained 0 % bovine blood meal. T2, T3 and T4 contained 5 %, 10 % and 15 % bovine blood meal, respectively, the results showed that there were no significant ($p > 0.05$) differences in weight gain.

The findings of the present results were in disagreement with Karimi (2006) who found that the effect of feeding varying fishmeal inclusion levels (0, 2.5 and 5 per cent) on performance of broilers and revealed that the feed intake was significantly ($P \leq 0.05$) higher in diet supplemented with 5 per cent fish meal.

The findings of the present results were in agreement with Bozkurt (2004) who studied to determine the effect of meat and bone meal (MBM) supplementation (added at 2.0, 3.5 and 5.0 %) to broiler chicken diets on performance, and observed that the mortality was 2.79 % and did not significantly ($p > 0.05$) affect mortality.

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 the body weight, feed intake and feed efficiency whereas survivability showed no significant difference among different treatment groups compared to control group at the end of the experiment (42nd day).

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