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RESEARCH ARTICLE

Comparative Study of Feeding Different Levels of Black Cumin (*Nigella sativa*) on Growth Performance of COBB-500 Broilers

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ABSTRACT

The present work was aimed to determine the comparative effect of feeding different levels of black cumin on growth, feed consumption, and feed efficiency of COBB-500 broiler. Three hundred and twenty, days-old straight run COBB-500 chicks from a lot of the same hatch were brooded in an electrically operated battery brooder for a period of 7 days, where pre-experimental diet was offered. On the 8th day, chicks having uniform body weight were randomly allocated into four dietary treatments with four replications (20 chicks in each). The isoproteinous and isocaloric formulated standard starter (1–10 days), grower (11–20 days), and finisher (21–42 days) diets were supplemented with different levels of black cumin of T_1 – control, T_2 – 0.25% black cumin, T_3 – 0.5% black cumin, and T_4 – 0.75% black cumin, respectively. The chicks were offered *ad libitum* treatment diets and clean drinking water. The desired data were recorded weekly, which included live weight, weight gain, feed consumption, and feed efficiency of broiler birds. The obtained data were subjected to statistical analysis under completely randomized design as per the methods of MSTAT. Final live weight of the birds was found highly significant ($P < 0.01$) for all treatment groups. Highest final weight gain (2244.59 g) was found in birds fed ration supplemented with 0.5% black cumin. Daily live weight of the birds was also found highly significant ($P < 0.01$) for all treatment groups. Highest daily live weight gain (60.27 g) was found in birds fed ration supplemented with 0.5% black cumin. Supplementation of black cumin in the broiler rations did not exhibit any significant effect ($P > 0.05$) on the total feed consumption. Feed conversion ratio was found significantly different ($P < 0.01$) for all treatment groups. It is, therefore, concluded that inclusion of black cumin in the broiler rations could be economical and efficient production of broilers.

Key words: Broiler and feed efficiency, *Nigella sativa,* COBB-500 broilers

INTRODUCTION

Poultry keeping has been an important source of income to many households of Nepal. There is growing awareness of nutritive value of meat and eggs among people. Poultry products (meat and eggs) are a good source of food with high biological value. Therefore, poultry keeping is becoming an important business enterprise in both the urban and rural areas of Nepal. Chicken contributes about 14.5% of total meat production in the country and 98.5% of the total egg production (MoAD-2013/14).

The poultry population in Nepal in 1996, 1997, 1998, 2008, and 2011/12 was 14.5, 15.6, 15.8, 24.48, and 48.07 million, respectively (MoAD, 2011/12). The growth rate of poultry was observed 4.17% during the period from 1990–91 to 2000–2001. The annual growth in commercial chicken eggs and broiler productions was estimated at 10.6% and 18.3%, respectively, up to 2001. Per capita consumption of livestock products (meat, milk, and eggs) is expected to increase along with an increase in income and a desire for wholesome nutrition by the growing population. Income elasticity is low for milk compared to eggs and meat among livestock production.

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In poultry farming, feeding is one of the key factors that determine successful productions. Increase in the production cost of meat is mainly due to the increasing cost of broiler feed which constituted around 70–75%.[1-6]

In the past, the major growth promoters added to the feed of broilers were antibiotics. However, due to their residues and subsequent occurrence of antibiotic-resistant bacteria, there is great interest in developing natural alternatives to antibiotic growth promoters. Recent biological trials of certain herbal formulations in India as growth promoters have shown encouraging results and some of the reports have demonstrated improvement with respect to weight gain, feed efficiency, lowered mortality, increased immunity, and increased livability in poultry birds. Furthermore, these herbal growth promoters have shown to exert therapeutic effects against liver damage due to feed contaminants like afflation. Various herbal products are being used as growth promoters in the poultry rations like garlic black cumin. Such herbal products have not yet been reported to contain cross-resistance to pathogens and residual effect in tissues. *Nigella sativa* (black seed or black cumin) is a small aromatic black seed which contains the essential fatty acid (linoleic acid) which is important for obtaining maximum body weight.[7-9]

Therefore, this experiment was designed to study the effect of different levels of black cumin (*N. sativa*) on growth performance of COBB-500 broiler.[10]

MATERIALS AND METHODS

Experimental site and design

This study was carried out at Rameshwor Poultry Farm, Kawasoti-6, Nawalparasi, from March 1, 2014, to April 12, 2014. Day-old COBB-500 broiler chicks were group brooded using an electric battery brooder for 7 days and were fed on pre-experimental standard starter ration. A total of 320, 7-day-old chicks were allocated randomly to four different treatments with 80 chicks in each treatment. The experiment was designed in a completely randomized design with four replicates of each treatment. Each replication had 20 birds. The chicks were vaccinated with Litchi heart killed vaccine by subcutaneous injection (0.2 ml/chick) at the back of neck at the age of the 3rd day. The new castle disease (ND) vaccine was a modified live vaccine consisting of F1 strain of ND virus for the initial vaccination against ND. This vaccine was given to chicks by ocular route (one drop/chick) at the age of the 7th day. For revaccination against ND, the modified live Lasota ND virus vaccine was given in drinking water at the age of the 25th days. The infectious bursal disease (IBD) vaccine was a modified live vaccine containing intermediate form of IBD virus strain Georgia for both initial vaccinations at the age of the 14th day by eye drop method (1 drop/bird) and booster dose in drinking water at the age of the 21st day.

Experimental diet and shed management

Broilers were fed isoproteinous and isocaloric formulated broiler standard starter, grower, and finisher diets (basal ration) supplemented with three different levels of black cumin. The dietary treatments were as follows:

- T_1 (control) = basal ration
- T_2 = basal ration + 0.25% black cumin
- T_3 = basal ration + 0.5% black cumin, and
- T_4 = basal ration + 0.75% black cumin.

Black cumin was grounded and mixed in the basal ration on weight basis in the desired proportion to make different treatment diets.

The broiler birds were raised up to the 6th week of age. The experimental birds were fed (*ad libitum*) an experimental ration with different levels of black cumin. The experimental units were kept on a deep litter system in separate pens. The pens were thoroughly cleaned, whitewashed, and disinfected before putting the experimental chick into these. All the birds were provided similar management conditions such as floor space, temperature, relative humidity, ventilation, and light.

Observation and management

At the end of 6 weeks of experimental period, one bird from each replication was slaughtered. The weight of each carcass was recorded and dressing percentage was calculated on the basis of dressed meat including giblets and skin. After evisceration, the heart, liver, gizzard, and abdominal fat of the slaughtered birds were taken out and weighed for their absolute weight. The data thus obtained were used for the calculation of (a) dressing percentage (%) (dress weight of bird/live weight of bird) ×100) and (b) relative weight of (1) heart,

(2) liver, (3) gizzard, and (4) abdominal fat. After evisceration, relative weights (g) [(weight of organ/live body weight) ×100] of various internal organs such as liver, heart, gizzard, and abdominal fat of the slaughtered bird were recorded.

Data analysis

The data thus collected regarding dressing percentage and relative weights of heart, gizzard, liver, and abdominal fat were subjected to the analysis of variance technique in completely randomized design.[19] The differences in the treatment means were compared by the Duncan's multiple range test using computer program MSTAT-C basic version 1.3 (1975).

RESULTS AND DISCUSSION

Body weight gain

The weight gain trend of experimental birds is given in Table 1 and Figure 1.

Table 1 showed that mean weekly cumulative live body weight was significantly ($P < 0.05$) different among different treatments from the 3rd week to 6th week. The result showed that final live weight of the birds was found highly significant ($P < 0.01$) for all treatment groups. Highest final weight (2244.59 g) was found in birds fed ration supplemented with 0.5% black cumin followed by ration supplemented with 0.75% black cumin (2218.33 g) and ration supplemented with 0.25% black cumin (2204.03 g) and the lowest final weight (2179.54 g) was found in broiler fed ration without black cumin (control group). Similarly, average daily gain of the birds was also found highly significant ($P < 0.01$) for all treatment groups. Highest average daily gain (60.27 g) was found in birds fed ration supplemented with 0.5% black cumin which was followed by ration supplemented with 0.75% black cumin (59.52 g) and ration supplemented with 0.25% black cumin (59.11 g) and the lowest average daily gain (58.41 g) was found in broiler fed ration without black cumin (T_1).

Table 1: Weekly cumulative live weight of Cobb-500

Treatment	Weekly cumulative live weight, g						Average daily gain, g
	Initial	2nd week	3rd week	4th week	5th week	6th week	
T_1	135.03	300.14	557.08^{b}	985.14^{c}	1525.14^{b}	2179.54^{c}	58.41^{c}
T_2	135.03	299.17	553.06^{b}	1007.08^{ab}	1539.17^{b}	2204.03^{bc}	59.11^{bc}
T_3	135.03	304.17	583.6^{a}	1023.06^{a}	1549.03^{b}	2244.59^{ab}	60.27^{ab}
T_4	135.03	299.58	558.06^{b}	994.17^{bc}	1541.11^{b}	2218.33^{bc}	59.52^{bc}
F-value		08.58	40.71*	71.11**	34.83*	52.38*	52.38**
Probability		>0.05	<0.05	<0.01	<0.05	<0.01	<0.01
CV, %		1.03	1.59	1.10	1.21	1.18	1.26
SEM		0.66	2.7	4.05	5.36	8.62	0.25
LSD (*P*<0.05)			15.65	19.32	32.57	45.88	1.31

Means in a column with different superscript differ significantly by DMRT (*P*<0.05), Where, BC: Black cumin, CV: Coefficient of variation, SEM: Standard error of mean, LSD: Least significant difference, *, **significant at 0.05 and 0.01 probability levels, respectively

Table 2: Weekly feed consumption, total feed consumption, and FCR of Cobb-500 broilers

Treatment	Weekly feed consumption, g						Feed conversion ratio (FCR)
	2nd week	3rd week	4th week	5th week	6th week	Total	
T_1	60.97	509.03^{b}	848.89^{ab}	1089.03	1427.55	4255.5	2.02^{a}
T_2	60.01	523.89^{a}	826.11^{b}	1114.72	1453.19	4286.95	2.02^{a}
T_3	55.02	490.97^{c}	959.03^{a}	1092.08	1459.72	4265.83	1.97^{b}
T_4	55.97	493.06^{c}	870.97^{a}	1092.08	1421.11	4242.22	1.98^{ab}
F-value	0.706	12.75**	5.67**	0.87	2.65	2.32	9.09**
Probability	>0.05	<0.01	<0.01	>0.05	>0.05	>0.05	<0.01
CV, %	3.12	1.25	1.56	2.22	2.32	1.49	1.11
SEM	1.66	2.9	4.45	5.19	8.82	16.23	0.01
LSD (*P*<0.05)		10.95	23.05	42.46	57.9	10.2	0.34

Means in a column with different superscript differ significantly by DMRT (*P*<0.05), Where, BC: Black cumin, CV: Coefficient of variation, SEM: Standard error of mean, LSD: Least significant difference, *, **significant at 0.05 and 0.01 probability levels, respectively

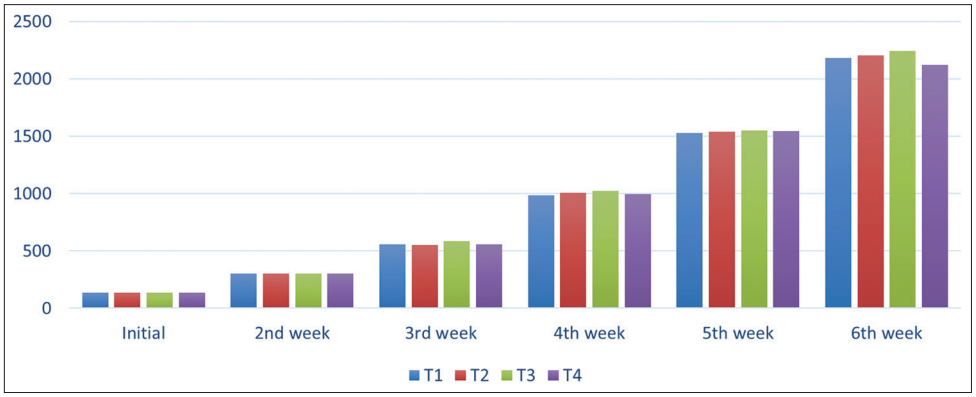

Figure 1: Cumulative body weight gain of experimental birds

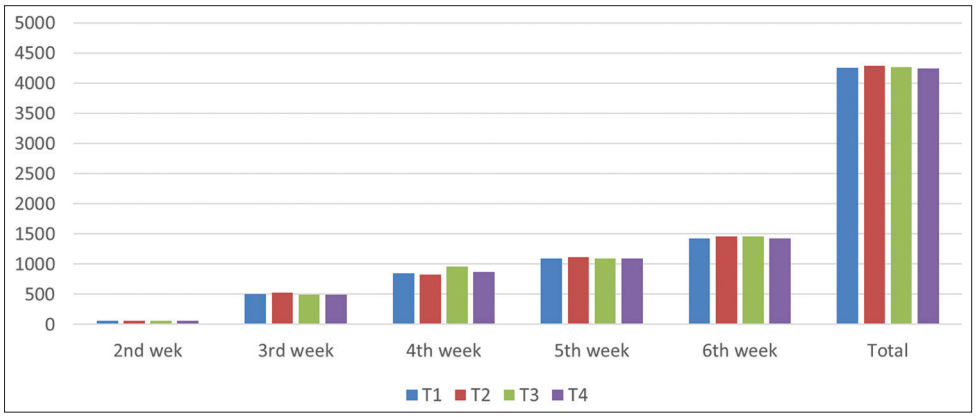

Figure 2: Cumulative feed consumption of experimental birds

Feed consumption

The feed consumption trend of experimental bird is given in Table 2 and Figure 2.

Table 2 showed that the mean weekly feed consumption was found statistically similar ($P > 0.05$) in the 2nd, 5th, and 6th weeks. However, in the 3rd and 4th weeks, it was found significantly different ($P < 0.05$). Statistically analyzed data revealed that the supplementation of black cumin in the broiler rations did not exhibit any significant effect ($P > 0.05$) on the total feed consumption of the birds of various treatment groups.

The data showed that feed conversion ratio (FCR) was found significantly different ($p<0.01$) for all treatment groups [Table 1]. Highest FCR (2.02) was found in birds fed ration supplemented with 0.25% black cumin. Similar FCR (2.02) was found in the case of control group which was followed by broilers fed ration supplemented with 0.75% black cumin (1.98) and the lowest FCR (1.97) was found in broilers fed ration supplemented with 0.5% black cumin. It concluded that the birds using ration supplemented with different levels of black cumin utilized their feed significantly ($P < 0.05$) more efficiently among the treatment groups.

These results are in close agreement with the findings of Kumar *et al.* (2010), Mahmood *et al.* (2009), Songsang *et al.* (2008), and Ahmad (2005). Mahmood *et al.* (2009) reported that the supplementation of garlic and black cumin in the broiler ration significantly ($P < 0.05$) improved the weight gain, live weight, and the FCR. Ahmad (2005) reported higher weight gain in broilers fed rations supplemented with black cumin. Siddig and Abdelati (2001) reported higher weight gain in broilers fed ration containing black cumin. The improvement in weight gain using black cumin in rations might be due to the ethyl ether extracts of *N. sativa* which inhibits the growth of intestinal bacteria such as *Staphylococcus aureus* and *Escherichia coli* as reported by Hanafy and Hatam (1991).[11-18] It contains the essential fatty acid linoleic acid which is important for obtaining maximum body weight (Al-Jassir, 1992).

CONCLUSION

From the results of this experiment, it can be suggested that broiler diet can be successfully supplemented with 0.5% black cumin as a growth promoter for better growth performance, feed

efficiency, and profitability without any adverse effect on growth performance of COBB-500 broiler production.

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