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Effect of Cabbage Leaf Residue Feeding On Performance and Economy of Broiler Chickens (COBB-500) in Gauradaha, Jhapa

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Abstract

The purpose of this study was to ascertain how feeding broiler chickens dried cabbage leaf residues would impact their growth performance and cost-effectiveness in 2022. Using Randomized Complete Block Design (RCBD), 180 one-day-old chicks (Cobb-500) were acquired from a commercial hatchery and split into four food regimens, each consisting of three replicates of fifteen birds. T1 represented 100% Commercial Feed (C.F.) + 0% Dried Cabbage Leaf Residues (DCR), T2 represented 95% C.F. + 5% DCR, T3 represented 93% C.F. + 7% DCR, and T4 represented 90% C.F. + 10% DCR. The experimental birds received dietary treatments for 18 days, from 22 to 39 days. Body weight gain was measured every four to five days, and feed intake was tracked every day. The analysis of variance technique (ANOVA) was used to examine the mean of the treatments, and the Least Significant Difference (LSD) was assessed at P<0.05. The greatest weight gains in 39 days, 2299.53 grams, was recorded utilizing 5% DCR, followed by 0% and 7% DCR, according to the results. Likewise, a higher feed conversion ratio of 1.56 was noted for both 0% and 5% DCR. Additionally, feed costs were reported as being lower for the 10% DCR inclusion at Rs. 8300 and Rs. 8815 for the 0% DCR.The results of the experiment showed that the group of chicks fed 7% and 10% DCR experienced a substantial drop in body weight, average daily gain, and total weight gain. The findings showed no discernible change in growth performance or weight increase between 0% and 5% DCR. Increasing the amount of cabbage leaf leftovers reduced costs. It has been determined that in order to minimize costs and provide the best growth performance, DCR may replace up to 5% of commercial broiler feeds.

Keywords: weight gain, commercial feed, feed conversion ratio, and chicks

Introduction

Poultry farming is an essential part of Nepal's agricultural system. The demand for chicken meat is enormous and still rising in Nepal. Present-day farms cannot meet this demand. Approximately 81% of all poultry meat in Nepal comes from broiler chickens (MoAC, 2011). According to Sharma et al. (2012), they are typically marketed at 1.5–2.5 kg body weight at 38–50 days of age. About 70% of the total cost of production for poultry has gone toward feed, making it a significant expense (Sugiharto et al., 2019). Farmers in Nepal occasionally suffer greater losses in farm expenses as a result of the market's volatility in the price of broiler meat and feed ingredients. Searching for alternative feed sources and agro-industrial byproducts that don't negatively impact broiler health can help reduce production costs.

The most important vegetable grown in Nepal is cabbage (Brassica oleracea var. Capitata), which occupies 30,331 hectares and yields 519,061 mt and 17.11 mt/ha (MoAC, 2019). Likewise, a lot of waste is produced during the harvesting, packing, and processing of cabbage. In Nepal's southern belt, the price of cabbage drops significantly in the late winter. Due to the decreased market demand in late winter, farmers decomposed their cabbage. Using cabbage to produce broilers could help farmers reduce the cost of producing broilers. High levels of minerals and crude protein (CP) are characteristics of cabbage leaves. Cabbage leaves have 17.0 to 17.2% CP on a dry matter (DM) basis (Heaney et al., 1996). Additionally, cabbage is a great source of nutrition for broiler chickens. Remaining cabbage leaves lower feed costs, cut waste, and increase the poultry industry's sustainability. However, using cabbage as broiler feed has limitations. That is, broiler growth performance may be hampered by anti-nutritional components such as thiocyanates and isothiocyanates that may be found in cabbage leaves (Fontainhas et al. 2002). Recent research, however, has shown that reducing the amount of these fibers in broiler diets improved gizzard growth and function and increased bile acid, HCl, and digestive enzyme secretions (Hetland et al., 2003).

Materials and Methods

Experimental site

Early in the summer of 2022, the experiment was conducted on the farm at the Gauradaha Agriculture Campus. The farm is located at 26° 33' 42" N and 87° 97' 0" E latitude and longitude, and it is 79 meters above sea level. It is situated in the easternmost district of Nepal, in the fertile Terai plains.

Birds and Experimental Diets

180 one-day-old Cobb-500 chicks were supplied by a nearby hatchery, and during their first three weeks of life, they were fed a standard commercial broiler feed. In accordance with accepted veterinarian practices, the birds were vaccinated and given medical attention. At 21 days of age, 180 evenly weighed birds were chosen, and they were randomly assigned to four feeding schedules in three replicates of 15 birds each. The treatments that comprised the group were T1 (100% commercial feed (CF + 0% DCR), T2 (95% CF + 5% DCR), T3 (93% CF + 7% DCR), and T4 (90% CF + 10% DCR).

Cabbage Leaf Residues

We bought fresh cabbages from the local market in Gauradaha, Jhapa. A knife and chopping board were used to cut it into small pieces. The remaining cabbage leaf material was chopped and dried in a forced-air oven at 50°C for 48 hours. It was then ground into a powder using a grinder and stored in a tight container until the diet was combined.

Housing and Management

Following the start of the feeding trial, 180 experimental birds were housed in a 212.8 m2 (16 m × 13.3 m) space with a stocking density of 1.18 m2 per bird on a rice husk-based deep litter poultry keeping system. Formalin was used to thoroughly clean the house, feeders, and drinkers before beginning any further work. For the first week following the chicks' arrival, the house temperature was maintained at 95 ˚ F using a brooder. After that, the temperature was lowered. The temperature is lowered by 5 ˚ F each week. The farm was disinfected using a standard concentration of the Viroclean chemical. The litter was sprayed with a hand sprayer and disinfected every three to four days. During the electric bulb testing, a full 24-hour light was used.

Feeding Schedule

Each compartment contained an identically sized feeder and drinker. Three times a day, in the morning, during the day, and in the evening, the experimental birds were fed in amounts that were always accessible to them (pre-starter, starter, grower). Vitamins, electrolytes, and antibiotics were added as needed to provide adequate amounts of safe drinking water.

Table 1: Feeding program for Broilers

	Pre- starter (B_0)	Starter (B_1)	Grower (B_2)
Days	1-9 days	7-26 days	24-39 days

Farm Layout

There are twelve compartments in total; each compartment is four meters long and four and forty-three meters wide; each plot is 17.73 meters square (4 meters by 4.43 meters).

The area of the net experiment is 212.8 m2 (16 m by 13.3 m).

Experimental Design

The Randomized Complete Block Design (RCBD) trial had three replications and four treatments. The birds under control were fed only commercial feed, while the other birds were fed the DCR listed below.

T1: Control

T2: 5% of total feed should be cabbage.

T3: 7% of total feed is cabbage.

T4: 10% of total feed should be cabbage.

Table 2 : Experimental layout of a Farm

Length of each compartment = 4m	Breadth of each compartment = 4.43m			Total Breadth of farm = 16m
	T_1R_1 (100%C.F.+0%DCR)	T_1R_2 (100%C.F.+0%DCR)	T_1R_3 (100%C.F.+0%DCR)	
	T_2R_1 (95%C.F.+5%DCR)	T_2R_2 (95%C.F.+5%DCR)	T_2R_3 (95%C.F.+5%DCR)	
	T_3R_1 (93%C.F.+7%DCR)	T_3R_2 (93%C.F.+7%DCR)	T_3R_3 (93%C.F.+7%DCR)	
	T_4R_1 (90%C.F.+10%DCR)	T_4R_2 (90%C.F.+10%DCR)	T_4R_3 (90%C.F.+10%DCR)	
	Total Breadth of farm = 13.3m			

Data collection

The group weights of the birds in each cage were noted, and the weekly feed consumption was computed. The average daily feed intake for each day was calculated by dividing the total feed intake of each compartment by the number of birds kept in that compartment. Up until the start of the trial, or 21 days, growing performance was assessed weekly. Following that, weight growth was recorded every 4–5 days, or on the 26th, 31st, 35th, and 39th days.

Average growth performance

After being housed for 22 days, twelve birds—four for each replication—were randomly selected from each treatment. Under the comb on the head, tags to the appropriate food groups were attached, and each bird was weighed independently. During the observation and data collection, the marked birds from each replication were weighed with a weighing balance, and the results were recorded in the diary. Following the initial reading on the 26th day, readings were taken at regular intervals of four to five days. Every four to five days, the weight of the designated birds from each compartment was measured. The average weight gained by the birds over a 5-day period (from the 26th to the 31st day) was determined by calculating the mean weight for each replication. By dividing the mean average weight by the number of days kept, the average daily weight growth was calculated.

Feed Conversion Ratio

Feed intake was divided by weight gain to determine the feed conversion ratio (FCR).

$$F.C.R = Consumption\ of\ feed \div Weight\ Gain$$

The measure of broiler growth performance when using various diet combinations is the feed conversion ratio, or FCR. FCR is computed by dividing the total amount of feed consumed thus far by the broiler's weight gain at the time of measurement. When compared to other feed combinations, a lower FCR value indicates a higher weight gain for the broiler with a lower feed intake.

Cost Evaluation

The sum of the costs of the commercial feed and cabbage that the birds in each treatment consumed was used to determine the total cost of the feed that the birds consumed overall. While the costs of T2, T3, and T4 include both the cost of commercial feed and the cost of cabbage, the total cost of feed in T1 only includes the cost of commercial feed. For T2, T3, and T4, the inclusion rate of cabbage was 5%, 7%, and 10% of CF, respectively.

Statistical Analysis

First, data collected for different parameters was analyzed. Data entry was done using Microsoft Excel, and data analysis was done using R Studio (4.2.2). Every treatment in the Randomized Block Design (RCBD) underwent a treatment analysis. ANOVA was used to test the hypothesis. An LSD test was performed at the 5% significance level for mean separation. The significance level of the treatment effect was ascertained using the "F" test.

Result and discussion

Average Growth performance

Table 3 shows the experimental birds' average growth performance.

Table 3 : Body weight of Cobb-500 influenced by feeding trial at Gauradaha, Jhapa, 2022.

Treatment	Average weight at 26 days	Average weight at 31 days	Average weight at 35 days	Average weight at 39 days
T_1	1215.267[a]	1614.103[a]	1944.227[a]	2303.207[a]
T_2	1211.387[b]	1612.697[a]	1946.147[a]	2299.533[a]
T_3	1207.383[c]	1608.473[b]	1943.387[b]	2282.633[b]
T_4	1205.697[c]	1603.450[c]	1933.167 [c]	2277.077[b]
LSD(0.05)	3.16	2.43	3.86	5.70
SE_m(+-)	0.46	0.35	0.56	0.49
F-probability	<0.001	< 0.001	<0.001	<0.001
CV, %	0.13	0.075	0.12	0.13
Grand Mean	1209.93	1609.68	1941.73	2290.61

Table 3 revealed that on the 26th day of the experiment, T1 had the largest body weight (1215.26g), followed by T2 and T3 (1211.38g and 1207.38g, respectively). T1 had the highest body weight (1614.103g) on the thirty-first day of the experiment, followed by T2 and T3 (1612.697g and 1608.473g, respectively). T1 had the highest body weight on day 35 of the experiment (1944.227g), followed by T2 and T3 (1946.147g and 1943.387g, respectively). Similarly, T1 had the highest weight at the end of the experiment at day 39 (2303.207), followed by T2 and T3 (2299.533g and 2282.633g, respectively). From the beginning to the end of the 18-day experiment, the inclusion of DCR had a significant impact on body weight gain. The experimental bird's overall weight growth performance was higher in T1, T2, and T3, in that order.

When dietary vegetable waste was introduced, broiler weight gain decreased. Weight gain in T1 and T2 was not significantly different, but T3 and T4 showed negative effects, according to our experiment. The findings showed that adding DCR to broiler production at a level of up to 5% is acceptable. According to (Mustafa et al., 2017), broiler growth performance was unaffected by moderate levels of DCR (i.e., 9%). Surprisingly, none of the treatment groups experienced any mortality during the trial period, indicating that the meals had no negative impact on the health of the broilers.

Feed Conversion ratio

Table 4 shows the experimental birds' average growth performance.

Table 4 : FCR of Cobb-500 influenced by feeding trial at Gauradaha, Jhapa, 2022

Treatment	FCR at 26 days	FCR at 31 days	FCR at 35 days	FCR at 39 days
T_1	1.44[a]	1.54[b]	1.66[bc]	1.56[b]
T_2	1.41[b]	1.58[a]	1.68[ab]	1.56[b]
T_3	1.43[b]	1.58[a]	1.65[c]	1.63[a]
T_4	1.45[a]	1.58[a]	1.68[a]	1.62[a]
LSD(0.05)	0.015	0.021	0.023	0.015
SE_m(+-)	0.0021	0.003	0.0034	0.0022
F-probability	<0.01	<0.01	<0.05	<0.05
CV, %	0.52	0.67	0.69	0.73
Grand Mean	1.43	1.57	1.67	1.59

On the 26th day of the experiment, T2 and T3 had the lowest FCR (1.41 and 1.43, respectively), followed by T1 and T4 (1.44 and 1.45, respectively), according to Table 4. The experiment's 31st day showed that T1 had the lowest FCR (1.54), followed by T2, T3, and T4, all of which had the same FCR (1.58). The experiment's 35th day revealed that T3 had the lowest FCR (1.65), followed by T1 and T2 (1.66 and 1.68, respectively). Similarly, T1 and T2 had the lowest FCR at the end of the experiment at day 39, which was the same (i.e., 1.56), followed by T4 and T3 with 1.62 and 1.63, respectively. From the beginning to the end of the 18-day experiment, the inclusion of DCR had no discernible impact on FCR. The dietary addition of 3-6% DCR significantly improved the broiler performance in terms of average daily growth and feed conversion ratio (Mustafa et al., 2016). The FCR of the birds in the various treatments varied significantly, as Table 4 demonstrated. T1 and T2 treatments outperformed T3 and T4 treatments at the broiler's marketable age of 39 days. A lower FCR value suggested that a higher weight gain was attained with a lower feed intake.

Cost Evaluation

A net gain of Rs. 265 between T1 and T2, Rs. 380 between T1 and T3, and Rs. 515 between T1 and T4 could be achieved by using DCR diets in T2, T3, and T4 until day 39.

Table 5 : Economic analysis of Broiler Production

Variable	T_1	T_2	T_3	T_4
Commercial feed intake	B_1: -26 kg B_2:-78 kg	B_1: -25 kg B_2:-74 kg	B_1: -24 kg B_2:-72 kg	B_1: -23 kg B_2:-70 kg
Oven dry cabbage intake	No cabbage	5 kg	7.5 kg	10.5 kg
Cost of commercial feed	B_1: - Rs. 2225 B_2: - Rs. 6590	B_1: - Rs. 2095 B_2: - Rs. 6255	B_1: - Rs. 2050 B_2: - Rs. 6085	B_1: - Rs. 1970 B_2: - Rs. 5910
Cost of cabbage	No cabbage	Rs. 200	Rs. 300	Rs.420
Total cost (commercial feed +cabbage)	Rs. 8815	Rs. 8550	Rs. 8435	Rs. 8300

Table 5 demonstrated that the cost of production decreased as more leaf meal was used. When DCR is partially included, broiler production costs are decreased, increasing the product's profitability. The cost of production increased only when a commercial diet was used. The results demonstrated that adding DCR up to a 5% level slowed the cost of producing broilers but had no effect on their FCR or growth performance. Recycling DCR into broiler diets could help lower feed costs and make it economically viable if the market price of cabbage was low (Mustafa et al., 2018). Meat from broilers fed vegetables is more tender, juicy, and flavorful (Meddes, 2003). Thus, there is a potential for increased consumer demand for these types of meat.

Conclusion

The inclusion of DCR in broiler production up to a 5% level is deemed acceptable based on the study's findings. However, broiler growth performance is negatively impacted when DCR inclusion exceeds 5%. The results indicated that broiler growth performance with DCR inclusion up to 5% was comparable to that with only commercial diet and had a lower FCR value. Farmers can overcome the failure of cabbage production and effectively use waste for broiler feeding by incorporating DCR up to a 5% level. Additionally, it lowers the cost of broiler feed and has no negative effects on broiler production. Using the DCR diet to reduce broiler feeding expenses during the growth phase may have some advantages.

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