

Study of Growth Performance and Carcass Quality of Different Broiler Breeds

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ABSTRACT

Background and Objective: The poultry farming sector in Nepal faces challenges, particularly in breed selection, which can profoundly affect productivity and profitability. To address the problem research was conducted at Lamjung Campus located at Sundarbazar 07, Lamjung District during the winter season to study the growth performance and carcass quality of three commonly raised broiler breeds: Cobb-500, Lohmann Indian River (LIR) and Ross-308. **Materials and Methods:** The research was conducted in a completely randomized design with three treatments replicated five times. The chicks were raised under identical management conditions with *ad libitum* water and feed under a deep litter system. The research evaluated feed intake, live body weight gain and feed conversion ratio. After 42 days of rearing three birds from each compartment were slaughtered to study the carcass characteristics including dressing percentage, breast meat yield, leg piece meat, wing meat and giblet yield. The benefit-cost (B:C) ratio was analyzed after 42 days of rearing. **Results:** Results demonstrated that Cobb-500 had the highest feed intake (4222.5 g), body weight (2788.2 g) and the most efficient FCR (1.51), along with the highest B:C ratio (1.80). Ross-308 followed with substantial feed intake (4158.8 g), body weight (2636 g) and intermediate FCR (1.57), resulting in a B:C ratio of 1.73. The LIR strain showed the lowest feed intake (3749.8 g), body weight (2310.2 g) and the least efficient FCR (1.62), resulting in a B:C ratio of 1.65. Meat yield analysis revealed that Cobb-500 had the highest dressing percentage (71.65%) and breast meat yield (43.02%), making it suitable for markets prioritizing breast meat. Ross-308 excelled in leg pieces (29.53%) and wing percentages (11.65%). The LIR despite its lower dressing percentage (68.58%), showed moderate performance across other metrics. The study underscores that Cobb-500 is the most advantageous for producers aiming for higher body weight, better feed efficiency and greater profitability while Ross-308 offers a viable alternative, especially for markets with specific demands for leg and wing meat. The LIR strain, despite lower feed costs, is less favorable due to low FCR. **Conclusion:** Findings of this research may be valuable for poultry farmers and stakeholders in Nepal, offering valuable guidance on breed selection to enhance the efficiency and economic contributions of the poultry industry in the country.

KEYWORDS

Benefit-cost ratio, broiler, carcass, dressing, feed conversion ratio

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INTRODUCTION

Poultry farming is a developing industry in Nepal and the poultry contributes about 4% to National GDP. Recently, Nepal ranks 92nd in the world for egg production and 112th for poultry meat production¹. Currently, the total number of broiler chicken in Nepal is estimated at 65 million with 2.5 million of broiler production per week². Broilers typically have white feathers and yellowish skin. In about 5 to 7 weeks, the majority of modern commercial broilers reach a slaughter weight of about 2 kg³. Broiler carcasses are primarily evaluated based on the yield of edible parts, expressed as a percentage of slaughter yields and the quality of carcass edible parts⁴. With thousands of chicken breeds to choose from, it can be difficult to select the best one for our needs⁵. The primary goal of broiler rearing is to produce quality broiler carcasses that are acceptable to consumers. In comparison to other meat-producing animals, the modern broiler chicken grows quickly, is efficient and can quickly meet the need for protein in times of scarcity. According to Khalid *et al.*⁶, Cobb and Ross breeds are widely reared out of which Cobb breeds have better growth rate and feed efficiency than the Ross breeds. A flock's ability to convert feed input into live body weight is measured by the feed conversion ratio. It offers a measure of management effectiveness as well as profit at any given feed cost⁴. Breeders have to constantly evaluate and choose newer broiler breeds in order to evolve high-quality broiler breeds with enhanced physiological and production features. However, a variety of broiler breeds attributes, including production potentials, disease incidence resistance, marketing age, customer demand, meat quality, portability and adaptability, could adversely affect the preferences of farmers and profit margins while raising broiler breeds⁷. Due to various environmental conditions and other events, the efficiency of these breeds may vary significantly, which may have an important bearing on the production potentials and viability of broiler breeds. The study is carried out to determine the best breed of broiler by studying the variations in feed intake, weight gain and carcass quality and quantity of three broiler breeds under same management so that farmers can have maximum benefit.

MATERIALS AND METHODS

The research was carried out from December, 2022 to February, 2023 at Lamjung Campus, Sundarbazar 07, Lamjung District.

A total of 150 days old chicks of three breeds (Cobb-500, Lohman Indian River and Ross-308), each 50 in number were purchased from Phewa hatchery. Each breed of chicks was allotted randomly in 15 experimental regimes each of area 10 square feet. The experiment was carried out on deep litter system with bedding material husks of rice. Timely addition of litter was done to prevent wetness. Standard management practice was done till the day of slaughter. Drinking water and feed was fed *ad libetum*. Starter ration (B0) was fed for first 12 days. Grower ration (B1) was fed up to 26th day followed and finisher ration (B2) from 26th day till the day of slaughter.

Daily feed intake was noted by subtracting refused feed from the total feed offered. Average body weight was recorded at the time of ration change and feed conversion ratio was calculated at the same time. At 42th day, three birds from each regime were slaughtered to find out dressing percentage and other carcass characteristics such as breast, giblets, wings and leg piece.

Recorded data was statistically analysed through R-Studio to evaluate the significance difference between the breeds at $p < 0.05$.

RESULTS AND DISCUSSION

Table 1 shows the comparative analysis of the growth performance, feed conversion ratio (FCR) and benefit-cost (B:C) ratio of three broiler breeds over a 42 day rearing period.

Table 1: Growth performance and B:C ratio of different broiler breeds

Treatment	Feed intake (g)	Body weight (g)	Feed conversion ratio	B:C ratio (42 days)
Cobb-500	4222.5±5.2 ^a	2788.2±58.18 ^a	1.51±0.03 ^b	1.80±0.036 ^a
LIR	3749.8±16.4 ^b	2310.2±11.4 ^c	1.62±0.02 ^a	1.65±0.013 ^b
Ross-308	4158.8±66.24 ^a	2636±25.3 ^b	1.57±0.02 ^{ab}	1.73±0.026 ^{ab}
Probability	***	***	*	**
LSD	121.77	144.75	0.078	0.0837
CV	2.18	3.23	3.62	3.51

*Significant at $p < 0.05$, **Significant at $p < 0.01$ and ***Significant at $p < 0.001$

Cobb-500 and Ross-308 breed had significantly higher ($p < 0.001$) feed intake compared to the LIR at 42 days of rearing. The differences in body weight between breeds were significant ($p < 0.001$) at 42 days of rearing. The Cobb-500 breed had the highest body weight, with an average of 2788.2 g, Ross-308 breed had an intermediate body weight, with an average of 2636 g and the LIR breed had the lowest body weight, with an average of 2310.2 g. Efficiency in feed utilization, as measured by FCR, varied notably among the breeds. There is the significant difference ($p < 0.05$) in FCR. The LIR is significantly less efficient than Cobb-500 and Ross-308 falls in between. The Cobb-500 had the best feed conversion efficiency with an FCR of 1.51. The Ross-308 had an intermediate FCR of 1.57, while the LIR showed the least efficiency with an FCR of 1.62.

The Cobb-500 consistently outperformed the other breeds across all metrics, with the highest feed intake and body weight, coupled with the most efficient feed conversion. The Ross-308 also performed well, showing high feed intake and body weight, though slightly less efficient in feed conversion compared to Cobb-500. The LIR, while having the lowest feed intake and body weight, had the poorest feed conversion efficiency. The study demonstrates that the choice of broiler strain significantly impacts growth performance and feed efficiency.

The Cobb-500 had the highest B:C ratio (1.80), indicating superior economic efficiency. This breed not only has high performance in feed intake, body weight and FCR but also translated these performance metrics into greater profitability. The Cobb-500 breed not only excels in biological performance metrics such as feed intake, body weight and FCR but also shows superior economic performance, making it the most cost-effective choice for broiler production. The Ross-308, while not as economically efficient as Cobb-500, still offers a better economic outcome compared to the LIR. The LIR, despite lower feed costs, does not convert feed to body mass efficiently, resulting in the lowest B:C ratio.

The Cobb-500 broilers had significantly higher live body weight, higher feed intake, lower FCR and higher B:C ratio than LIR and Ross-308 broilers. These results regarding feed intake, live weight at different day's intervals and FCR were related to the findings of Khalid *et al.*⁶. The researcher confirmed the superiority of Cobb breeds over Ross breeds in all above-mentioned parameters. Complementary to current study result, Badar *et al.*⁸ obtained significantly higher weight gain and lower FCR in Ross-308 breeds corresponding to Cobb-500 strains ($p < 0.05$). Research conducted by Al-Dawood and Al-Atiyat⁴ found no significant differences in mean live body weight of Lohmann and Ross breeds, in the first two experimental weeks. However, in the 3rd, 4th and 5th weeks of the experiment, Ross had significantly higher mean live body weight than Lohmann. The researcher concluded the results were due to the natural interactions. Current results of higher B:C ratio in Cobb-500 is also supported by Mohammed *et al.*⁹, who reported LIR breeds with significantly higher FCR. It can be the superior genetics of Cobb-500 that results its higher live body weight, better FCR and higher B:C ratio.

The dressing percentage, which represents the proportion of the live animal that remains as carcass after processing, was highest in Cobb-500 and Ross-308, with no significant difference between them. Both strains outperformed the LIR strain, which had a significantly lower dressing percentage ($p < 0.001$). In line with current findings by Fernandes *et al.*¹⁰ reported that the Cobb-500 broiler breed consistently exhibited

Table 2: Comparison of meat yield (%) of different broiler breeds

Treatment	Dressing (%)	Breast (%)	Leg piece meat (%)	Wing (%)
Cobb-500	71.65±0.28 ^a	43.02±0.09 ^a	26.97±0.66 ^b	10.30±0.06 ^b
Ross-308	71.03±0.14 ^a	41.69±0.16 ^b	29.53±0.27 ^a	11.65±0.31 ^a
Lohmann Indian River	68.58±0.15 ^b	41.77±0.08 ^b	27.52±0.25 ^b	10.86±0.15 ^b
Probability	***	***	***	**
LSD	0.63	0.36	0.67	0.62
CV	0.65	0.62	1.74	4.17

Significant at $p < 0.01$ and *Significant at $p < 0.001$

higher dressing percentages compared to other strains except Ross-308. The Cobb-500 had the highest breast meat percentage, significantly surpassing both Ross-308 and LIR ($p < 0.001$). During the production cycle, breast meat continuously increases as a percentage of body weight. Similar pattern have been noted by Acar *et al.*¹¹.

The Ross-308 showed the highest leg piece meat percentage, significantly higher than both Cobb-500 and LIR ($p < 0.001$). The Cobb-500 and LIR had similar percentages of leg meat. Similar result was observed by Mohammed *et al.*⁹. The wing percentage was highest in Ross-308, significantly higher than both Cobb-500 and LIR ($p < 0.01$). The Cobb-500 and LIR had similar wing percentages. Possible reasons for this could be the higher number of muscle fibers and faster rate of muscle protein synthesis in wing muscles. Also it is possible that Ross-308 have a different hormonal profile among the breeds. Yaqoob *et al.*¹² found that broilers fed a diet supplemented with an enzyme mixture had higher wing weight and better growth performance than broilers fed a control diet. The Cobb-500 strain excels in breast meat yield, making it highly desirable for markets prioritizing breast meat. However, it has a lower leg piece and wing percentage compared to Ross-308. Ross-308, on the other hand, offers a higher proportion of leg meat and wings, which may be advantageous for markets with a preference for these parts. The LIR strain, while performing moderately across most traits, has a notably lower dressing percentage, which could impact overall carcass yield (Table 2).

CONCLUSION

The choice of broiler strain significantly impacts biological performance, carcass yield and economic efficiency. The Cobb-500 seems out as the most efficient and profitable, followed by Ross-308. The LIR strain, with its lower performance metrics, is less attractive from both biological and economic stand point. The Cobb-500 strain is optimal for producers targeting high breast meat yield, whereas Ross-308 is preferable for higher yields of leg and wing meat. The LIR strain, with its lower dressing percentage, may be less favorable in terms of overall carcass yield. Producers aiming for higher profitability and better feed efficiency should consider Cobb-500. The Ross-308 is also a viable option, particularly for those targeting slightly different market needs. The LIR strain, despite lower feed costs, does not convert feed to body mass efficiently, impacting its overall economic returns. Producers should consider market demand for specific meat parts when selecting broiler strains. The Cobb-500 is suitable for markets with high demand for breast meat, while Ross-308 is better for leg and wing meat.

SIGNIFICANCE STATEMENT

Information regarding the best breed must be acknowledged because broilers are thought to be the greatest choice for meat production due to their quicker growth, shorter generation interval, better feed conversion rate and superior carcass. The Cobb-500 seems out as the most efficient and profitable, followed by Ross-308. Also, Cobb-500 is suitable for markets with high demand for breast meat, while Ross-308 is better for leg and wing meat.

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