A comparative study on the growth performance, carcass characteristics, and livability of Ross 308 and Indian River

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Abstract

This study was conducted to compare the growth performance, carcass traits, and livability of two different broiler breeds. A total of 168 broiler chickens, consisting of 84 Ross 308 and 84 Indian River breeds, were reared from day-old to 6 weeks of age under the same feeding system and management practices. The chicks were allocated to a completely randomized design (CRD) with two treatments. Each treatment (breed) consisted of seven replicates and twelve birds per replicate. Growth performances, including feed intake, body weight, weight gain, and feed conversion ratio (FCR), were measured and calculated every week. The livability rate was also calculated. On day 42, seven birds per treatment (one bird from each replicate) were randomly sacrificed according to the conventional processing method to evaluate the carcass characteristics. There were no significant ($p>0.05$) differences on growth performances through feed consumption, body weight, weight gain, and feed conversion ratio (FCR) between Ross 308 and Indian River. The carcass characteristics, including wing, breast, thigh, drumsticks, back, and relative abdominal fat pad weight, were not significantly ($p>0.05$) different between the two breeds. However, the livability of Ross 308 (98.8%) was significantly ($p<0.05$) higher than that of Indian River (86.9%). In conclusion, the growth performances and carcass characteristics of Ross 308 and Indian River showed no significant differences. Ross 308 is the preferred breed for broiler production due to its high livability.

Keywords: Ross 308; Indian River; growth performances; livability

Introduction

The global poultry industry has witnessed considerable growth and investment over the last few decades. The advantage of poultry over other livestock is primarily due to the short and relatively quick turnover on investments and high-quality protein products (Al-Dawood and Al-Atiyat, 2022). Specifically, broiler production is the quickest way to increase the availability of high-quality protein for human consumption.The body weight gain of the broiler strains has been markedly increased, and the feed utilization has been strongly improved with the advancement of new technology applied in poultry nutrition as well as in genetics (Swe et al., 2022, Gatdula et al., 2023). This progress in breeding and nutrition has resulted in broiler strains having higher performance today than ever before (Amao et al., 2015).

The most significant scientific and technological development of the poultry industry in recent years demanded the investigation of different broiler strains to improve production efficiency and disease resistance. Likewise, various characteristics of broiler breeds, such as production potentials, resistance to disease incidences, marketing age, consumer demand, meat quality, profitability, and adaptability, may completely influence farmers' preference and profit margin of rearing broiler strains. However, the productivity of these strains may vary due to several environmental factors and other incidences, which may have a significant impact on the production potential and livability of broiler strains (Hossain et al., 2011).

Moreover, genetic selection based on important economic traits such as growth rate, body size, edible meat yield, and feed conversion ratio has resulted in changes in the commercial poultry meat industry. To initiate a prosperous poultry farm, it is crucial to prioritize the quality of day-old chicks. Typically, the heavier the weight of a broiler day-old chick, the faster its weight gain will be, leading to increased profitability. The reduction in live weight gain may be attributed to decreasing feed intake, inefficient digestion, disrupted metabolism, the genetic characteristics of the birds, and temperature. Therefore, this decrease in live weight gain will affect both the market age and the production costs of chickens. Additionally, the livability of chickens is a crucial aspect, as low livability can increase production costs, and this factor is also influenced by the breeds of broiler chickens (Al-Dawood and Al-Atiyat, 2022).

Genetic improvements have focused generally on selection for growth rate, feed efficiency, and carcass characteristics. The development in poultry nutrition and genetics has led to broiler breeds achieving higher performance. Due to the genetic changes implemented in broiler chickens to improve performance characteristics, it is necessary to assess different strains. Ross 308 is a widely used commercial broiler strain developed by Aviagen, known for its rapid growth rate, high feed efficiency, strong livability, and good adaptability to a range of production systems. It also demonstrates uniform body weight and relatively low mortality under standard management conditions (Aviagen, 2018; Aviagen, 2022). Indian River broilers, developed by Hubbard, are characterized by competitive growth performance and good meat yield but tend to show slightly lower hatchability, greater sensitivity to environmental and management conditions, and comparatively higher early-life mortality (Hubbard, 2017; Sayedahmed et al., 2023). In Myanmar, several commercial broiler strains are currently available; however, comprehensive evaluations comparing the performance of different breeds, particularly Ross 308 and Indian River, under local production conditions remain limited. Therefore, the present study was focused on comparing the growth performance, carcass characteristics, and livability between Ross 308 and Indian River broiler breeds.

Materials and methods

Experimental site, animals, design, and management

The experiment was conducted from January to February 2024 at the Poultry Research Farm, Department of Animal Science, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar. The area is located between 19°50′27″ North latitude and 96°16′13″ East longitude. A total of 168 two different broiler chicken breeds (84 Ross 308 and 84 Indian River) were reared from day-old to 6 weeks of age under the same feeding system and management practices. The chicks were allocated to a completely randomized design (CRD) with two treatments. Each treatment (T1: Ross 308 and T2: Indian River) consisted of seven replicates and twelve birds per replicate. All the chickens were fed commercial starter, grower, and finisher diets at 0-2 weeks, 2-4 weeks, and 4-6 weeks, respectively. Feed and drinking water were supplied *ad libitum* throughout the experimental period. On day 7, all chicks were vaccinated against Newcastle Disease and Infectious Bronchitis (Live ND+IB) via the intraocular route, and a booster was done on day 21 in the same route of administration. On days 14 and 28, the chicks were vaccinated against Infectious Bursal Disease (IBD) by oral drop.

Data collection

Daily feed consumption was noted, and the body weight of each bird was recorded at the end of each week and repeated weekly until the last day of the experiment. The average feed consumption, weight gain, and feed conversion ratio were calculated weekly. The livability rate in each week was also calculated. At day 42, seven birds per treatment (one bird from each replicate) were randomly sacrificed by the conventional processing

method approved by the Research Ethics Review Committee (RERC), University of Veterinary Science to evaluate the carcass characteristics, such as breast, wing, thigh, drumstick, and abdominal fat pad weight.

Statistical analysis

The recorded data were statistically analysed using Student's t-test in Microsoft Excel to determine the significant differences between the breeds at $p<0.05$.

Results and Discussion

Growth performance

The cumulative feed intake, final body weight, cumulative weight gain, and cumulative feed conversion ratio (FCR) of broilers are shown in Table 1. There were no significant ($p>0.05$) differences between Ross 308 and Indian River breeds on growth performances through cumulative feed consumption, final body weight, cumulative weight gain, and cumulative FCR. This result could be due to the different broiler breeds being grown under the same environmental conditions and management. The agreement research in Nigeria reported that the final body weight, daily and cumulative weight gain of Arbor Acre, Cobb, and Ross were not significantly different from each other when compared with the growth parameters in different breeds (Kareem-Ibarahim et al., 2021). Hossain et al. (2011) also stated that different broiler breeds (Hubbard, Cobb 500, and MPK) in Bangladesh had no significant effect on body weight gain. The present results were in agreement with other studies, which described that total feed intake, body weight gain, and FCR did not show significant differences among Hubbard, Lohmann, and Ross in Jordan (AI-Dawood and AI-Ativat, 2022) and Cobb 500 and Ross in Nepal (Pandit et al., 2024), respectively. The absence of significant differences in growth parameters among broiler breeds may be attributed to their shared genetic background, as most commercial strains originate from similar breeding lines, resulting in minimal variation in performance traits (Aviagen, 2018).

The current findings differ from previous observations that highlighted the impact of breed variations on the growth performance of broiler chickens. Iqbal et al. (2012) reported that Hubbard, Arbor Acres, and Ross 308 broiler chickens gained significantly ($p<0.05$) more weight than Hybro when comparing different breeds in Pakistan. In a comparative study of breed differences on growth parameters of broiler chickens in Nigeria, the Marshall breed had a highly significantly ($p<0.01$) lower initial weight, final weight, total weight gain, and average daily gain than Arbor Acre, Cobb, and Ross breeds (Kareem-Ibarahim et al., 2021). It could be due to different strains that might arise from the genetic makeup during the embryonic stage. Moreover, the differences in feed intake, weight gain, and FCR of the broiler breeds may be explained by different factors such as strain, genotype, sex, environmental conditions, and climatic effects (Hossain et al., 2011; Husna et al., 2017).

Table 1. Cumulative feed intake, Final body weight, Cumulative weight gain, and Cumulative FCR of different broiler breeds

Parameters	Mean ± SEM		Significant level
	T1 (Ross 308)	T2 (Indian River)	
Cumulative feed intake (gm)	4695.56±187.51	4779.94±174.46	NS
Final body weight (gm)	3138.37±142.69	3197.61±133.21	NS
Cumulative weight gain (gm)	3096.20±142.92	3153.84±133.04	NS
Cumulative FCR	1.52±0.05	1.52±0.03	NS

SEM = Standard error of mean. NS = Not significant

Table 2. Carcass yield of different broiler breeds

Parameters (gm)	Mean ± SEM		Significant level
	T1 (Ross 308)	T2 (Indian River)	
Live weight	3570.86±110.44	3582.86±269.64	NS
Carcass weight	3339.43±126.86	3376.00±263.02	NS
Carcass weight without giblets	2937.43±126.08	2910.86±230.36	NS
Breast	1096.29±64.48	1015.71±92.05	NS
Wing	247.71±30.7	240.57±20.86	NS
Thigh	395.14±35.29	384.29±50.54	NS
Drumstick	352.29±49.42	341.14±34.27	NS
Back	445.71±34.48	474.29±40.22	NS
Abdominal fat	46.29±19.90	48.57±11.55	NS

SEM = Standard error of mean. NS = Not significant

Carcass characteristics

The carcass yield of two different broiler breeds is shown in Table 2. Live weight, whole carcass weight, carcass weight without giblets, and other carcass characteristics, including breast, wing, thigh, drumstick, back, and relative abdominal fat pad weight, did not show significant ($p>0.05$) differences between Ross 308 and Indian River. The mean values of whole carcass weight showed no significant differences between breeds, possibly because they accounted for the direct impacts of the final body weight of the animals. In line with the current results by Pandit et al. (2024), there was no significant difference in dressing percentage between the Cobb-500 and Ross-308 breeds. Khan et al. (2018) also documented that there were no significant differences in average carcass yield and wing yield across the genotypes of broiler, broiler breeder, and Aseel chickens. A similar study of carcass traits among Ross and Cobb by Yaranoglu et al. (2023) reported that the values of breast, thigh, and wing were not significantly different ($p>0.05$) between the genotype and gender groups. Another study on carcass yield of three different broiler breeds stated that breast meat showed no significant difference between Ross-308 and Lohmann Indian River (LIR), while wing and leg meat showed no significant difference between Cobb-500 and LIR (Pandit et al., 2024). This could be due to similar live weights, and same-sex broiler strains were utilized for examining carcass traits (Fadare et al., 2020).

The present findings are in contrast with the study of Collin et al. (2024), who reported that the breast, leg muscle, and fat pad in Cobb-500 were significantly greater than those in Athens Candian Random Bred (ACRB). According to Pandit et al. (2024), the wing and leg muscle mass in Ross 308 was significantly higher ($p<0.01$) compared to Cobb-500 and LIR, while the wing composition for Cobb-500 and LIR was similar. Possible reasons for this could be the higher number of muscle fibers and the faster rate of muscle protein synthesis in the wing muscles. Additionally, Ross-308 may possess a different hormonal profile compared to other breeds. As noted by Fadare et al. (2020), the carcass yield, including thigh and leg muscles, was similar in Marshall and Cobb strains but higher than that of Arbor acre when comparing the carcass traits among three different breeds. The differences between the results of this study and other studies might be due to the differences in the carcass fragmentation methods (Yaranoglu et al., 2023).

Livability rate

The weekly and cumulative mortality rate of two different broiler breeds is shown in Table 3. The livability percentage throughout the whole experimental period (6 weeks) of Ross 308 (98.8%) was significantly ($p<0.05$) higher than that of Indian River (86.9%). Forseth et al. (2024) documented that genotype differences in broiler strains affect mortality, growth, and response to environmental conditions. According to Kakon et al. (2024), Indian River broiler chickens often have higher mortality than Ross 308 and Cobb 500, mainly because of genetic differences that make them less robust, especially during early life stages. The embryonic mortality in Indian River reached about 13% compared to only 4% in Ross 308 and 7% in Cobb 500, indicating weaker chick viability at hatch. In addition, Indian River birds are more sensitive to farm management conditions such as temperature, ventilation, and brooding practices, so even small mistakes can increase mortality. In contrast, Ross 308 is bred for better adaptability, stronger survival, and more uniform growth, making it more tolerant under typical farm conditions and resulting in lower overall mortality.

The present research was in agreement with the findings of Al-Dawood and Al-Atiyat (2022), who reported that the livability of 98.1% in Cobb-500 was higher than that of 94.2% in Hubbard Classic and MPK broiler breeds. However, Rokonuzzaman et al. (2015) stated that strain differences had no significant effect on the livability of the broiler chickens. Husna et al. (2017) also reported that the livability rates of Hubbard (96.5%), Cobb 500 (96%), Lohmann (95.5%), and Ross (95.3%) were not significantly different from each other. The different results in the livability of one broiler strain compared to others might be due to several factors, such as strain, sex, feed, disease incidences, and environmental conditions (Hossain et al., 2011). Additionally, it could be related to a particular strain's lower ability to adapt to environmental conditions (Kalia et al., 2017), as well as its resilience and less efficient metabolic rate compared to other strains.

Table 3. Mortality of different broiler breeds

Age of bird	No. of birds (Mortality %)	
	T1 (Ross 308)	**T2 (Indian River)**
1st week	0 (0.0)	2 (2.38)
2nd week	0 (0.0)	1 (1.19)
3rd week	0 (0.0)	0 (0.0)
4th week	0 (0.0)	0 (0.0)
5th week	0 (0.0)	0 (0.0)
6th week	1 (1.19)	8 (9.52)
Cumulative	**1 (1.19)**	**11 (13.1)**

Conclusions

According to the present findings, there were no significant effects on growth performances and carcass characteristics among Ross 308 and Indian River breeds. However, the livability of Ross 308 was higher than that of Indian River. This research will support choosing the most effective broiler breeds and contribute to the profitability of broiler chicken production.

Conflict of interest

All authors have approved the submission of this manuscript and declare that there is no conflict of interest. The manuscript has not been published previously and is not under consideration for publication elsewhere.

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