www.als-journal.com/ ISSN 2310-5380/ February 2021

Full Length Research Article

Advancements in Life Sciences – International Quarterly Journal of Biological Sciences

ARTICLE INFO

Date Received: 14/10/2019;
Date Revised: 15/10/2020;
Date Published: 25/02/2021;

Authors' Affiliation:
Poultry Research Institute Jaba, Mansehra - Pakistan

***Corresponding Author:**
Naqash Khalid
Email: dr.naqash092@gmail.com

How to Cite:
Khalid N, Ali MM, Ali Z, Amin Y, Ayaz M. Comparative Productive Performance of two Broiler Strains in Open Housing System. Adv. Life Sci. 8(1): 124-127.

Keywords:
Broiler; Cobb-500; Ross-308; Conventional broiler houses; Mortality

Open Access

Comparative Productive Performance of two Broiler Strains in Open Housing System

Naqash Khalid*, Malik Mohsin Ali, Zubair Ali, Yasir Amin, Muhammad Ayaz

Abstract

Background: The present study was conducted to compare the growth performance and ultimately to calculate the profitability of the two locally available commercial strains of broiler (Ross 308 and Cobb 500).

Methods: For the purpose of study, 900 number of day-old chicks (DOC) of each strain were purchased from the local market. The birds were reared in conventional broiler house with the provision of standard managemental conditions throughout the experimental period. The parameters recorded on weekly basis were feed intake, body weight gain, feed conversion ratio (FCR) and mortality.

Results: Result shown that the total body weight of Cobb-500 and Ross-308 on 1st week was 207.40±14 gram and 196.00±16 gram respectively and these result represented significant difference of weight gain ($P<0.05$) on 1st week of experiment among both the strains. From 2nd week of experiment till the last week (5th week) the results shown the total body weight of Cob-500 and Ross-308 as 2180.4±38 gram and 2103.7±36 gram respectively which was non-significantly different ($P>0.05$) among the strains. Furthermore, significant difference of feed conversion ratio (FCR) was observed ($P<0.05$) among both the strains but from day 7th till the market age weekly FCR of Cob-500 was significantly higher ($P<0.05$) than Ross-308. Comparatively high mortality (4.8±0.4%) was noticed in Ross broiler strain than Cobb broiler strain (3.7±0.4%).

Conclusion: It was concluded from the current study that the Cobb-500 is performing better in conventional open housing system at high altitude than Ros-308.

Introduction

For decades, those involved in the production chain of broiler chickens have been concerned with the potential for growth and body conformation of poultry, since these characteristics are related to the efficiency and profitability of the poultry sector. Genetic enhancements have resulted in the current broiler chicken strains, which are characterized by faster weight gain and better feed conversion [1]. Consumers demand of poultry products is on a constant increase, hence, influencing the commercial poultry husbandry to make significant changes [2] ultimately resulting in overall progress of the industry [3]. The broiler industry can be applied under an extensive variety of ecological conditions and can often be combined with other farm initiatives [4].

Poultry industry is continuously advancing by improvement of genetic potential of new broiler strains to provide the high-quality with low-cost protein requirements of the human population worldwide [5]. Intensive selection in broilers has focused during the previous 5 decades, on post hatch growth rate and feed conversion to achieve increased meat yield. Hence, all the broiler strains do not have similar physiology or development curves, or both. Embryonic developmental parameters are known to be related to the post hatch performance of broilers. Though, genetic line differences or strain with regard to embryo physiological parameters and juvenile growth have received little attention [6].

Amongst the meat producing broiler strains, Ross and Cobb are the most extensively produced worldwide. Sterling *et al*., [7] demonstrated that Cobb broilers have better growth rate with a better feed conversion ratio than the Ross strain. It is not clear if the different post hatch performances amongst the strains are also a reflection of their embryo physiological and hatching parameters [6]. The focus of breeding companies, in the last decade has been to select for higher meat production and improved FCR. Different profit-maximizing feeding programs and determining nutrient requirements for each genotype seems impossible and may result in redundancy. A simpler approach would be to first determine if differences in response exist among genotypes without determining a requirement [7].

Over the past three decades, improvement in feed conversion ratio (FCR- feed consumed per unit body weight) of broiler chickens has been quite surprising. There is still significant within- and between-strain variation in traits such as growth and feed conversion, despite the major improvements and years of intense selection. Broiler performance objectives, a male broiler of 2 kg weight should achieve an FCR of approximately 1.54. This objective is based on the performance of top quartile clients around the world. It is surely achievable with the good health, nutritional and management related contributions. There is a remarkable amount of variation in measured FCRs in the field. Within Aviagen's database of field performance, adjusted FCRs can vary by up to 50 points from one operation to another. This variation proves that in any one flock, the influence of management, nutrition and disease can far exceed the influence of genetics alone. Havenstein *et al*., [8] assessed that genetic selection was responsible for 85–90% of the enhancement in broiler growth and feed efficiency. According to his judgment, the other 10– 15% was due to nutrition. If we assume that in the best-case circumstances, the genetics companies give us a total of 30 points enhancement over the next 10 years, we could hope for an additional improvement of 4.5 points due to advances in nutrition [9].

Methods

The current study was carried out from the month of July to August 2019 at Poultry Research Institute Khyber Pakhtunkhwa Mansehra. A total of 900-day old chicks of each breed (Cobb and Ross) were purchased from the local market. Upon arrival at the Poultry Research Institute, the chicks were divided into 02 groups, A and B, Cobb-500 breed in group A and Ross-308 breed in group B. The group A and B were further divided into three replicas A-1, A-2, A3and B1, B2, B3 A-3 having 300 chicks in each replica. Stocking density of 17 birds/m^2 was given to both groups, standard management conditions (temperature, humidity, and light intensity) as mentioned in Table No.1 were provided to both the groups throughout the experimental period. The composition of the ration is mentioned in Table No. 2, *ad-libitum* feeding, and watering was ensured throughout the experimental period to both of the groups.

At day first of the experiment, body weight of all chicks was recorded in each group and the chicks were reared in replicates of the groups. Feed intake, body weight gain and feed conversion ratio were recorded at weekly intervals. The recoded data was statistically analyzed through student t-test to evaluate the significance difference between studied groups at $p<0.05$).

Indication	Age (days)						
	1	4	7	14	21	28	36
Temperature (°F)	95	90	85	80	75	70	70
Humidity (%)	55-65	55-65	55-65	60-70	60-70	60-70	70
Light intensity (lux)	30	30	10	10	10	10	10

Table 1: Environmental Condition

For lighting, incandescent light bulbs were used in the house similar for all the groups. Duration of light or photoperiod was age dependent, during first two days a continuous lightening of 24 hours was provided with light intensity of 30 lux. Further until the 4 day of the chicks, the lightening schedule was of 23 hours per day with the light intensity of 30 lux. From day 5^{th} to 28^{th} day, the lightening schedule was of 18 hours per day with the light intensity of 10 lux. From day 29^{th} to the day of slaughtering day, the lightening schedule was of 23 hours per day with the light intensity of 10 lux. The time period when the lightening period was of 18 hours per day, the 6 hours darkness period was divided into two rounds of 3 hours, after every 9 hours lightening period. Feed and water were provided *ad libitum*. Live performance parameters like Feed intake, Weight gain and FCR were recoded separately for each group on weekly basis. Feed intake was measured by weighed the given *ad-libitum* feeding in morning, and weight the

refused feed in evening. Feed intake was calculated by subtracting refused feed from the total feed offered. There was used a three-phase nutrition program with starter feed (mash) from day 1 to day 10th, grower feed used from day 11th to day 24th (crumbs) and finisher feed (crumbs) from day 25th to the day of market the broiler. The specification of the feed offered is given in the table 2. Flock was vaccinated similar for both groups as the schedule given in the table 3.

Specification	Starter	Grower	Finisher
Metabolized Energy (kcal/kg)	3026	3160	3250
Crude Protein (%)	21	20	19
Crude Fat (%)	6.30	6.60	7
Crude Fiber (%)	03	03	03
Lysine (%)	1.42	1.24	1.02
Calcium (%)	1.12	0.93	0.86
Phosphorus (%)	0.51	0.45	0.43
Sodium (%)	0.18	0.17	0.17
Chloride (%)	0.24	0.21	0.21
Vitamin A (µL/kg)	15000	12500	11250
Vitamin D3 (µL//kg)	5000	5000	5000
Vitamin E (mg/kg)	80	60	55

Table 2: Characteristics of administered feed

Age (Days)	Vaccine	Vaccine Type	Application Route
1	Newcastle Disease + Infectious Bronchitis	Live	Eye Drop
7	ND + H9	Killed	Subcutaneous
12	IBD	Live	Drinking Water
21	ND Lasota	Live	Drinking Water

Table 3: Vaccination schedule

Results

Body weight (g/bird):

Statistical analysis of obtained data regarding body weight of Cobb and Ross broiler strains indicated that there was significant difference (p<0.05) in body weight between both strains on 1st day up to the 4th week, while non-significant difference (P>0.05) was recorded on 5th week of experiment. The body weight of Cobb broiler was recorded between 47.00±4g (arrival weight) to 2180.4±38g from 1st day to 5th week and the body weight of Ross broiler was recorded between 44.00±3g (arrival weight) to 2103.7±36g from 1st day to 5th week. Slightly high body weight was observed for Cobb broiler than the Ross broiler (Table 4).

Week	Cobb	Ross	P-value
Birth Weight	47.00±4	44.00±3	<0.05
1st	207.40±14	196.00±16	<0.05
2nd	540.50±18	521.80±19	>0.05
3rd	1051.3±21	1019.2±22	>0.05
4th	1621.8±32	1569.4±35	>0.05
5th	2180.4±38	2103.7±36	>0.05

Table 4: Comparative weekly accumulative body weight (g/bird) of Cobb and Ross broiler strains

Feed intake (g/bird):

Statistical analysis of obtained data regarding feed intake of Cobb and Ross broiler strains indicated that there was significant difference (P<0.05) in feed intake between both strains throughout the experimental period (1st to 5th week). The feed intake of Cobb broiler was recorded between 182±7g (in 1st week) to 1158±29g (in 5th week) from 1st to 5th week and the feed intake of Ross broiler was recorded between 181±6g (in 1st week) to 1156±28g (in 5th week) from 1st to 5th week (Table 5).

Week	Cobb	Ross	P-value
1st	182±7	181±6	<0.05
2nd	378±12	379±11	<0.05
3rd	574±16	572±15	<0.05
4th	784±21	782±22	<0.05
5th	1158±29	1156±28	<0.05

Table 5: Comparative weekly feed intake (g/bird) of Cobb and Ross broiler strains

Feed Conversion Ratio (FCR):

Statistical analysis of obtained data regarding FCR of Cobb and Ross broiler strains indicated that there was significant difference (P<0.05) in FCR between both the strains throughout the experimental period (7th to 36th day). The FCR of Cobb broiler was calculated between 1.13 (1st week) to 2.07 (5th week) and the FCR of Ross broiler was calculated between 1.19 (1st week) to 2.16 (5thweek). The cumulative FCR of Cobb-500 was 1.41 and Ross-308 was 1.46. Slightly better FCR was recorded for Cobb broiler than the Ross broiler (Table 6).

Week	Cobb	Ross	P-value
1st	1.13±0.03	1.19±0.03	<0.05
2nd	1.13±0.02	1.16±0.02	<0.05
3rd	1.12±0.02	1.15±0.02	<0.05
4th	1.37±0.03	1.42±0.03	<0.05
5th	2.07±0.04	2.16±0.04	<0.05
Cumulative FCR	1.41±0.03	1.46±0.03	<0.05

Table 6: Comparative weekly FCR of Cobb and Ross broiler strains

Body weight gain (g/bird):

Statistical analysis of obtained data regarding weight gain of Cobb and Ross broiler strains indicated that there was significant difference (p<0.05) in weight gain between both strains on throughout entire experimental period (1st week to 5th day). The weight gain of Cobb broiler was ranges between 160.4g (in 1st week) to 558.6g (in 5th week) and the weight gain of Ross broiler was ranges between 152g (in 1st week) to 534.3g (in 5th week). Slightly more weight gain was recorded for Cobb broiler than the Ross broiler (Table 7).

Day	Cobb	Ross	P-value
7	160.4±7	152±6	<0.05
14	333.1±12	325.8±11	<0.05
21	510.5±14	497.4±13	<0.05
28	570.8±17	550.2±18	<0.05
36	558.6±21	534.3±22	<0.05

Table 7: Comparative weekly weight gain (g/bird) of Cobb and Ross broiler strains

Mortality (%):

Statistical analysis of obtained data regarding mortality percentage of Cobb and Ross broiler strains indicated that there was significant difference (p<0.05) in mortality percentage between both strains. Comparatively high mortality (4.8±0.4%) was noticed in Ross broiler strain than Cobb broiler strain (3.7±0.4%).

Discussion

In our study high body weight, more feed intake, better FCR, more weight gain and lowest mortality were observed for Cobb broiler than the Ross broiler. These results are closely related with the findings of Pascalau *et al.*, [10], who reported that the productive parameters

followed in the study indicated a superiority of Cobb 500 hybrid, which had greater body weight, higher weight gain with better feed conversion index. Marcu *et al*., [11] obtained 409.00g body weight in Ross 308 hybrid at 14 days and 411.00 g in Cobb 500 hybrid (411.00 g), at 35 days. Marcu *et al*., [11] obtained a final body weight of 2,598 g and 2,648 g in Ross 308 hybrid and Cobb 500 hybrid respectively. These data may be different because of variation in starter and grower feed. When the chickens were reared in cages as described by Hascik *et al*., [12], the average body weight was significantly reduced such as: in Ross 308 hybrid at 7 days (106.25 g), at 14 days (296.45 g) and at 35 days (1,644.70 g); in Cobb 500 hybrid at 7 days with (110.45 g), at 14 days with (301.00 g) and at 35 days with (1,629.15 g). Ciurescu and Grosu, [13], during 1-42 days, obtained better results for average daily gain in Ross 308 hybrid (58.05 g/day) and in Cobb 500 hybrid (56.55 g/day), while Marcu *et al*., [11], for the same time-period, obtained the best results in Ross 308 hybrid with 60.85 g/day and in Cobb 500 hybrid with 62.05 g/day. While Marcu *et al*., [11] obtained significant differences in Cobb 500 hybrid (1.676 kg feed/kg gain) and in Ross 308 hybrid (1.770 kg feed/kg gain). There found a significance difference ($p<0.05$) in FCR between both the strains of the broilers in the current experiment. These findings had an agreement with the results of Cheema *et al.,* [14] in which they suggest that there is an age-dependent difference in growth performance between the lines used in this study. Different results were found in a study conducted by Strakova *et al*., [15] in which at the end of the fattening period (day 40) the average weight of the Ross hybrid broiler chickens was statistically significantly ($P\leq0.05$) higher than of the Cobb hybrid (2.40±0.029 kg compared to 2.31± 0.028 kg). It was concluded from the current study that the Cobb-500 is performing better in conventional open housing system than Ros-308 in productive and mortality percentage at high altitude. In local condition, disease protection [16], FCR and housing are the top contributing factors when if comes to poultry production.

Authors' Contributions

Naqash Khalid conducted the experiment, data collection, data analysis and write-up of the research article. Malik Mohsin Ali contributed in the Management of the flock and data collection. Zubair Ali and Yasir Amin contributed in the study design and management of the research flock. Muhammad Ayaz supervised the experiment, helped in study design, guided in data collection and data analysis.

Competing Interest

All authors declare no conflicts of interest in this paper.

Acknowledgment

The authors acknowledge the financial support provided by Poultry Research Institute Jaba, Mansehra to conduct this research study.

References

1. Do Nascimento DCN, Dourado LRB, De Siqueira JC, De Lima SBP, da Silva MdCM, et al. Productive features of broiler chickens in hot weather: effects of strain and sex. Semina: Ciências Agrárias, (2018); 39(2): 731-746.
2. Vercoe J, Fitzhugh H, Von Kaufmann R. Livestock productions systems beyond 2000. Asian-Australian Journal of Animal Sciences, (2000); 13(Supl S): 411-419.
3. Mahmood MS, Sabir R. Preparation and evaluation of avian influenza (H9) and Newcastle disease (thermostable i-2 strain) bivalent vaccine for commercial poultry. Agrobiological Records, (2021) 3: 17-23.
4. Singh VP, Sharma V, Sidhu M, Kingra H. Broiler Production in Punjab—An Economic Analysis §. Agricultural Economics Research Review, (2010); 23(2): 315-324.
5. Talebi A, Asri-Rezaei S, Rozeh-Chai R, Sahraei R. Comparative studies on haematological values of broiler strains (Ross, Cobb, Arbor-acres and Arian). International journal of poultry science, (2005); 4(8): 573-579.
6. Tona K, Onagbesan O, Kamers B, Everaert N, Bruggeman V, et al. Comparison of Cobb and Ross strains in embryo physiology and chick juvenile growth. Poultry Science, (2010); 89(8): 1677-1683.
7. Sterling K, Pesti G, Bakalli R. Performance of different broiler genotypes fed diets with varying levels of dietary crude protein and lysine. Poultry Science, (2006); 85(6): 1045-1054.
8. Havenstein G, Ferket P, Qureshi M. Growth, livability, and feed conversion of 1957 versus 2001 broilers when fed representative 1957 and 2001 broiler diets. Poultry science, (2003); 82(10): 1500-1508.
9. Raheel IAR, Orabi A, El Masry A. Natural herbs CLEANACTIV®; immune-modulator, health activator and growth promoter in broiler chickens. International Journal of Veterinary Sciences, (2019); 8(4): 267-270.
10. Pascalau S, Cadar M, Raducu C, Marchis Z. Evaluation of productive performances in Ross 308 and Cobb 500 hybrids. Animal Biology & Animal Husbandry, (2017); 9(1): 22-27.
11. Marcu A, Vacaru-Opriş I, Dumitrescu G, Ciochina LP, Marcu A, et al. The influence of the genotype on economic efficiency of broiler chickens growth. Scientific Papers Animal Science and Biotechnologies, (2013); 46(2): 339-346.
12. Hascik P, Kacaniova M, Mihok M, Pochop J, Benczova E, et al. Performance of various broiler chicken hybrids fed with commercially produced feed mixtures. International Journal of Poultry Science, (2010); 9(11): 1076-1082.
13. Ciurescu G, Grosu H. Efficiency of feed utilization by different hybrids of broiler chicks. Archiva Zootechnica, (2011); 14(2): 36.
14. Cheema MA, Qureshi M, Havenstein G. A comparison of the immune profile of commercial broiler strains when raised on marginal and high protein diets. International Journal of Poultry Science, (2003); 2: 300-312.
15. Strakova E, Suchý P, Navratil P, Karel T, Herzig I. Comparison of the content of crude protein and amino acids in the whole bodies of cocks and hens of Ross 308 and Cobb 500 hybrids at the end of fattening. Ile, (2015); 10(9.2): 8-9.
16. Awaad MHH, Elmenawey MA, Afify MA, Zouelfekar SA, Mohamed FF, et al. The impact of high stocking density and saccharomyces cerevisiae boulardii on productive performance, intestinal microbiota and gut integrity of broiler chickens. International Journal of Veterinary Sciences, (2019); 8(4): 362-370.