University of Venda

EFFECT OF STRAIN AND SKIP A DAY TECHNIQUE ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

Murunwa Makharamedzha

Student no: 15000413

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Department of Animal Science

Faculty of Science, Engineering and Agriculture

University of Venda

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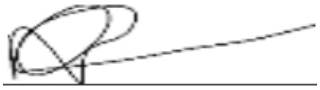
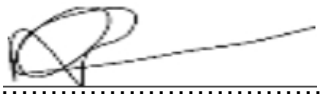
Student:		Ms M Makharamedzha
Signature:		Date: 10/05/2023
Supervisor:		Dr E. Bhebhe
Signature: ……..		Date: 10/05/2023

DECLARATION

I, Murunwa Makharamedzha of student number: 15000413, hereby declare that this dissertation for the degree of Master of Science in Agriculture (MSCANS) submitted to the Department of Animal Science, Faculty of Science, Engineering, and Agriculture, at the University of Venda has not been submitted previously for any degree at this or another university. It is original in design and in execution, and all reference material contained therein has been duly acknowledged.

Signature:……  …….. Date: 13/02/2023

DEDICATION

I dedicate this dissertation to my parents, Mr. M.E. and Mrs. L.D. Makharamedzha, as well as my sisters, Thovhedzo and Muvuledzi, for their unwavering support and love, which have brought me this far. I would also like to express my heartfelt gratitude to my dear husband, Gundo Managa, who has been my rock, the embodiment of love, and a constant source of encouragement and inspiration. Additionally, I feel honored to have had the presence of my friends, Netshipale F and Mohololа K, during my studies, and I am grateful for the exceptional care and affection they provided me with. Finally, I extend my appreciation to my study partners, Given, Zitha, Dakalo, and Khuthatso, who made the entire study period more manageable. Thank you all sincerely.

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ABSTRACT

A skip a day feeding technique could mitigate the ever-increasing cost of feeds and the undesirable excessive adipose fat. The aim of this study was to determine effect of broiler strain (Ross 308 and Arbor Acres) and different regimes of the skip-a-day technique on growth performance and carcass characteristics of broiler chickens. A 2×3 factorial study was carried out to determine the growth performance and carcass characteristics of two broiler strains. Each treatment was replicated three times with 25 birds per replicate and thus a total of 450 unsexed chickens for this study. The treatments were as follows: (i) control-Adlibitum feeding, (ii) Treatment 1-birds were fed one day, and the next day was skipped, (iii) Treatment 2-birds were fed two days and the third day was skipped. Carcass weight, abdominal fat, mortality, and average weight gain were determined and recorded. Data was analysed using analysis of variance (ANOVA) for a 2×3 factorial experiment using the General Linear Model (GLM) procedures of Minitab 18 statistical software. Feed intake per bird per week (g) was significantly different between all three treatments ($P<0.01$) and followed a consistent yet unexpected pattern across strains with feeding regime zero (control pen)>FR0- Feeding regime one>FR1- Feeding regime two>FR2. Weekly feed intake per bird per week was significantly higher for FR0 ($P<0.01$) compared to FR1 and FR2 with the latter two treatments having non-significant means ($P>0.05$) and strain significantly affected feed intake where the Ross 308 strain consumed more feed than the Arbor Acres strain ($P<0.05$). Broiler strain as well as strain by skip-a-day level interaction effects were not significant for all the carcass parameters ($P>0.05$). The overall results of this study have shown that the Ross 308 and Arbor Acres broilers did not differ significantly in the body weight, body weight gain, feed intake, and abdominal fatness ($P>0.05$). However, the Ross 308 broilers strains consumed more feed than the Arbor Acres strain, but both strains converted the feed with the similar efficiency.

Key words: broiler chicken strain, growth performance, carcass characteristics, skip-a-day technique.

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LIST OF ABBREVIATIONS

°C	Degree Celsius
%	Percentage
AWBWG	Average Weekly Body Weight Gain
AWLBW	Average Weekly Live Body Weight
FCR	Weekly Feed Conversion Ratio
FI	Weekly Feed Intake
g	Grams
IBW	Initial Body Weight
Kg	Kilogram
M	Metre
mm	Millimetre
MTRT	Mortality Rate
N	Number of observations
SEM	Standard Error Mean
Wt	Weight

CHAPTER 1

INTRODUCTION

1.1. Background

According to Benyi *et al*. (2015), white meat, which includes, poultry, and fish are healthier as compared to red meat, such as chevon, beef, or mutton due to the presence of lower myoglobin content in the chicken which makes it a leaner quality much lower in saturated fat (Mir *et al*., 2017). Not only does meat provides proteins, but also essential minerals such as ion, magnesium and vitamins including niacin, fat soluble vitamins A and E. Nonetheless, the production of poultry, production cost of feeds accounts for about 60% to 70% of total cost of production(Thirumalaisamy *et al*., 2016), in this regard, there is a dire need to decreasing costs of feed to improve economic efficiency. Broiler chicken breeders have therefore been trying to produce broilers strains which are able to reach the market weight in a short time (Khan *et al*., 2010). Although the growth period of broiler chicken strains has been shortened due to the genetic selection for fast growth, it has also led to undesirable response including excessive feed intake and consequently a high carcass fatness (Richards *et al*., 2003). The growth performance broiler chicken can be affected by factors such as the sex of the chicken, the broiler chicken strain, and farming practices including nutrition, housing, and stocking density (Benyi *et al*., 2015). Insignificant differences between the body weight gain and feed conversion ratio has been reported by Thutwa *et al*. (2012), and Hristakieva *et al*. (2014. Nonetheless, broilers' growth performance has been reported to be slow in birds that are feed-restricted compared to birds that are fed *ad-libitum* (Dozier III *et al*., 2002). There is scarcity of information about the best combination of broiler strains and skip-a-day methods to maximize profit.

1.2. Problem Statement

Modern broiler strains have the genetic potential to grow rapidly, however, such growth normally result in excessive adipose fat deposition, increased mortality rate, metabolic, and skeletal disorders when broiler chickens are fed *ad libitum* (Thanabalan and Kiarie, 2021). These effects affect market desirability and business profitability due to reduced feed efficiency associated with adipose fat deposition. Over-feeding often result in reduced carcass quality due to increased adipose fat deposition (Shabani *et al*., 2015). It thus follows that *ad libitum* feeding might disadvantage the farmer in two ways, through excess feed costs and downgrading of the carcasses.

1.3. Justification

Production systems for broiler chickens have introduced feed restrictions programs with an aim of reducing cost of production while ultimately improving feed efficiency through compensated growth mechanism (Abdel-Hafeez *et al*., 2017). However, feed restrictions techniques have a variety of effects on the performance of broiler chickens (Lippens *et al*., 2009; and Sahraei, 2012). Application of feed restriction programs in the early life cycle of broilers is another way of reducing problems due to high growth rate of modern broiler strains, and to mitigate high-feed intake induced metabolic problems including ascites, leg derangements, and sudden death syndrome (Robinson et al., 1992; Acar *et al*., 1995; Gonzales *et al*., 1998; Demir *et al*., 2004). Therefore, the study contributes positively to the body of knowledge and help broiler farmers save money and produce birds with desirable carcasses.

1.4. Research Objectives

1.4.1. Overall Objective

To determine effect of broiler strain (Ross 308 and Arbor Acres) and different regimes of the skip-a-day technique on growth performance and carcass characteristics of broiler chickens.

1.4.2 Specific Objectives

To determine the effects of different broiler strains and various regimes of skip-a-day technique on:

I. feed intake
II. feed efficiency
III. weekly body weight
IV. weekly mortality
V. weights for carcass traits (breast, abdominal fat, thighs, and gizzard).

1.5. Research Hypotheses

1.5.1. Null hypotheses

Combination of Ross 308 and Arbor Acres broiler strains with various levels of skip a day technique will not have any significant effect on:

I. weekly feed consumption
II. weekly body weight gain
III. feed efficiency
IV. weights for carcass traits (breast, abdominal fat, thighs, and gizzard).

CHAPTER 2

LITERATURE REVIEW

2.1 General Introduction

Genetic improvement, nutrition, and conducive rearing environments have led to great deal of growth performance in broilers over the past years. Although broiler chickens that are fed *ad libitum* grow fast, it result in undesirable fat deposition, high mortality rate, problems associated with metabolic disorder such as ascites, sudden death syndrome, and skeletal problems (Sahraei, 2013). Furthermore, deposition of fat causes the reduction of feed efficiency, and makes it difficult for the meat processing, and hence, meat rejection by consumers (Urdaneta-Rincon, and Leeson, 2002). Feed restriction is one of the managerial interventions to reduce fat deposition. As the cost of feed for production accounts for about 60% to 70% of the total production cost in broiler chicken, feed restriction reduces wastage of feeds through diminishing the amount of nutrients used for deposition of adipose fat and therefore minimizes the production cost (Thirumalaisamy *et al*., 2016). There exist a various methods of feed restriction in broiler chicken production to improve feed utilization efficiency and weight gain performance including among others intermittent feeding, skip-a-day feeding, physical feed restriction, lighting programs, diet dilution, use of low protein or low energy diets, and chemical methods (Sahraei, 2014).Nonetheless, several studies (Sahraei and Shariatmadari, 2007; and Benyi et al., 2009) have reported that feed restriction reduces feed intake and, weight gain and body. This study was undertaken to examine the effectiveness of different levels of feed restriction using skip-a-day technique on various performance parameters feed intake, feed efficiency, weekly body weight, weekly mortality, and weights for carcass) of Ross 308 and Arbor Acres broilers.

2.2. Effect of Strain and Skip a Day Technique on Feed Conversion

According to Plavnik and Hurwitz (1985); and Pinchasov and Jensen (1989) feed restriction on broiler chickens result in a reduced abdominal fat while improving the feed conversion efficiency compared to broilers reared under *ad libitum* feeding. Genetic strain, diet, and farming practices such as housing, watering can also serve as a factor when determining the effect of feeding regime on the growth of broiler chickens, fat deposition, and feed efficiency (Siegel, 1984). Furthermore, the genotype of a broiler chicken influences the feed conversion ratio, as such, the improvement in the feed efficiency related to the feed restriction could be due to the feed intake (Prakash *et al*., 2020).

2.3. Effect of Strain and Skip-a-day technique on Body Weight

Feed restriction has been reported to diminish the mortality rate, but also reported for improving feed conversion ratio, and allowing body weight recovery in instances where the level of feed restriction is not too severe (Plavnik and Hurwitz, 1988b; Robinson *et al*., 1992; Deaton, 1995; Lee and Leeson, 2001). Sahraei (2013) alluded that feed restriction produced inconsistent results and that the difference could be attributed to different bird management protocol including lighting, and ventilation. Mehaffey *et al*. (2006) conducted a study where they were evaluating five commonly used broiler strain in the poultry industry and found that body weight significantly differed amongst the broiler chicken strains at different ages. Nonetheless, Goliomytis *et al*. (2003), and Korker *et al*. (2004) reported a significant difference between different commercial broiler strains in the body weight at day 42 of age. Akinsola *et al*. 2021 found that birds that were subjected to restricted feeding had a lower body weight at the end of finisher phase as compared to those fed *ad libitum*.

2.4. Effect of Strain and Skip a day Technique on Carcass Traits

Studies (Plavnik and Hurwitz, 1991; and Oyedeji and Atteh, 2003) have reported efficiently high feed conversion and reduced mortality rate, reduced carcass, and reduced abdominal fat content at market age from birds which were restricted feed compared to those that were

fed *ad libitum*. Nonetheless, even though birds in feed-restricted had a lower fat content, it was reported that their feed efficiency was not significantly different to birds fed *ad libitum* (Oyedeji and Atteh, 2005). The studies by Fontana *et al*. (1993) and Saleh *et al*. (2004) reported that feed restriction had no significant effect on the broilers' carcass, and abdominal fat content.

2.5. Summary of the Literature Review

There is limited information on feed restriction during grower and finisher periods in broiler chickens raised in tropical environments, in addition, when such studies are available, conflicting findings are common. Thus, there is need to do more studies on the effects of feed restriction during the grower and finisher periods of broilers raised in open sided houses in a tropical environment.

CHAPTER 3

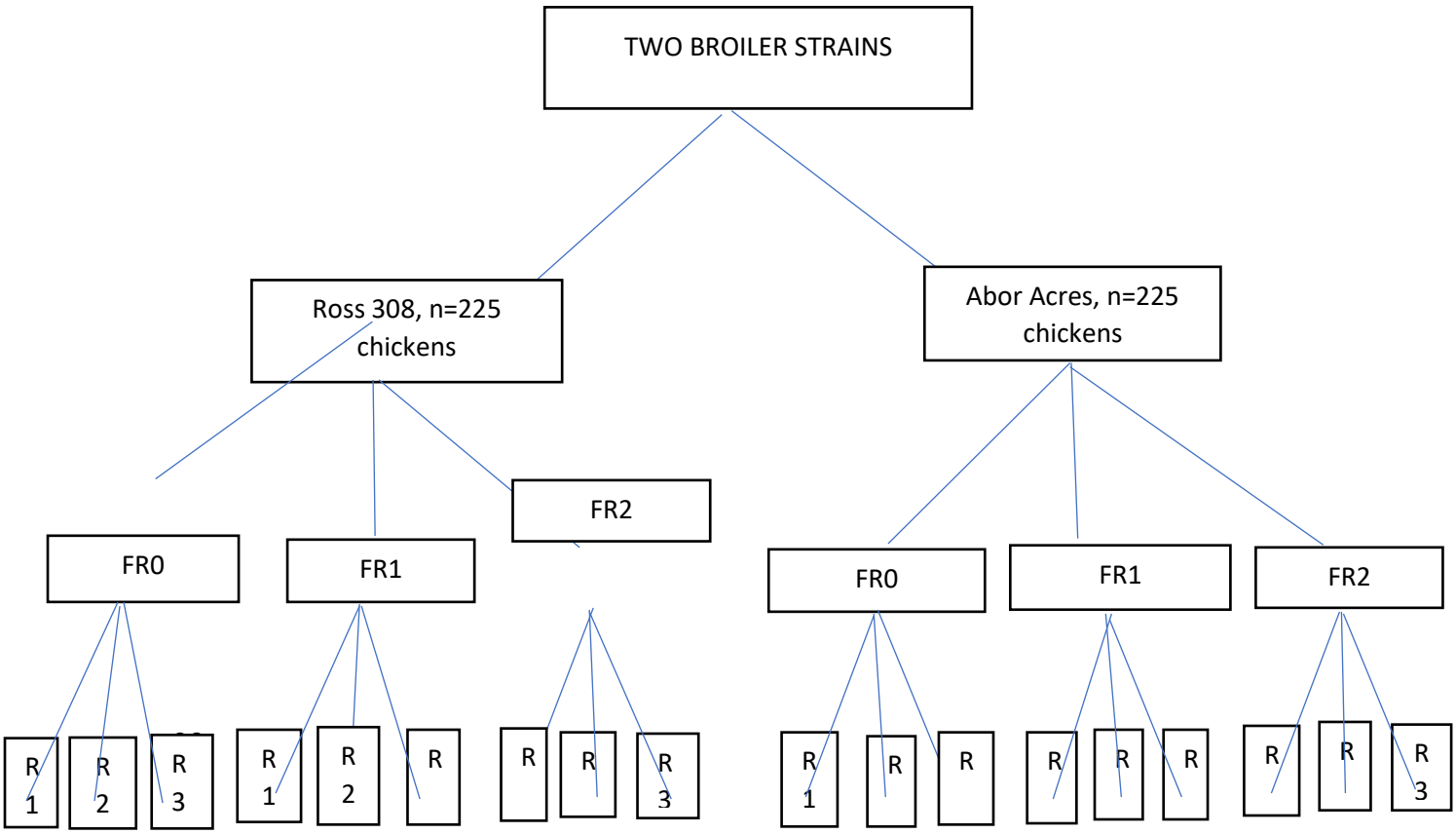
MATERIALS AND METHODS

3.1 Description of the Study Area

The present study was conducted at the University of Venda located in Thohoyandou, in the Thulamela Municipality in Vhembe District with coordinates (22°58'32''S, 30°26'45''E) in Limpopo Province of South Africa. The daily temperatures of Thohoyandou ranges from approximately 25˚C to 40˚C in summer and approximately 12˚C to 26˚C in winter. Thohoyandou experiences about 95% of total seasonal rainfall between October and March, while the average rainfall is approximately 800 mm but varies temporarily (Mzezewa and Gwata, 2012).

3.2. Experimental birds and housing management

The experiment set with a total of 450-day old broiler chicks, of which 225 chicks were of Ross 308 strain and the other 225 chicks were of Arbor Acres. The two strains were purchased from Alpha Chicks company (Alpha Chicks (Pty). LTD, Onderstepoort, Pretoria, South Africa). The experimental broiler house and equipment for rearing the broilers was cleaned and disinfected before arrival of the day-old chicks. Fresh wood shavings were provided as bedding, and during the study, wet wood shavings were replaced with dry ones to maintain bird comfort, and to prevent growth of microorganisms which could negatively affect bird health. During the first six days after their arrival, birds received water fortified with a poultry vitamin stress pack (Virbac©, Samrand Business Park, Centurion, South Africa).



FR0- Feeding regime zero (control pen)

FR1- Feeding regime one

FR2- Feeding regime two

R1- Replicate one

R2- Replicate two

R3- Replicate three

Figure 3.1: Distribution of the broiler chickens to treatments

Eighteen pens each measuring 0.75m x 1.43m were used for the experiment. On day seven, 225 birds from each strain were randomly assigned to the 9 pens previously allocated to that strain resulting in each of the 9 pens having 25 birds, thereby allowing 0.21 m^2 of the floor space per bird. Each pen was equipped with one 175-Watt infrared bulb for heating, one

tube feeder and one manual drinker, allowing each bird 12.4 cm feeder space and 9.4 cm drinker space.

3.3. Experimental design, treatments, and procedures

The experiment was a 2x3 factorial design with two broiler strains (Ross 308 and Arbor Acres) and three feeding regimes; *ad libitum* throughout (FR0), feeding 1 day and withdraw the following day (FR1) and feeding 2 days and withdraw the following day(FR2). Birds were feed *ad libitum* during the starter phase and skip a day technique was introduced in the grower and finisher feeding period. Manual drinkers were used to supply the birds with unrestricted access to clean drinking water throughout the study.

3.4. Feeding

Throughout the study, birds received starter, grower and finisher diets from Meadows feeds, a commercial livestock feed manufacturer (Meadow feeds, Randfontein, South Africa). From arrival (day one) up to day twenty-one, the birds were fed on a starter ration of broiler crumbs. From day twenty-two to day thirty-five, the birds were fed on a standard grower ration and from day thirty-six to day forty-two, the birds received a standard finisher diet.

Table 3.1: Chemical composition of the feeds

Composition	Starter	Grower	Finisher
Crude protein (g/kg)	200	180	160
ME (MJ/kg)	12.76	13	13.20
ME to CP rations (MJ g^{-1})	0.06	0.07	0.08
Fat (g/kg)	25	25	25
Fiber (g/kg)	50	60	70
Moisture (g/kg)	120	120	120
Calcium (g/kg)	12	12	12
Phosphorus (g/kg)	6	5.50	5
Lysine (g/kg)	12	10	9

CP: crude protein, ME: metabolizable energy, g/kg: gram per kilogram, MJ g^-1: megajoules per gram.

Pens were randomly assigned to the following treatments:

- FR0: *Ad libitum* feeding throughout the experimental period.
- FR1: *Ad libitum* feeding except for 24 h feed removals on day 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47 and 49 (14 days).
- FR2: *Ad libitum* feeding except for 48 h feed removals on day 24, 27, 30, 33, 38, 41, 44 and 47 (8 days).

3.5. Vaccination Programme:

Vaccination of the birds followed the programme used at the University of Venda experimental farm as presented in Table 3.2.

Table 3.2: Vaccination programme of the experimental birds

Age (days)	Disease	Vaccine	Route
7	Infectious Bronchitis	Nobilis® IB 4-91	Drinking Water
12	Gumboro/Infectious bursal disease	Nobilis® Gumboro D78	Drinking Water
18	Gumboro/Infectious bursal disease	Nobilis® Gumboro D78	Drinking Water
23	Newcastle	ND Lasota	Drinking Water
30	Newcastle	ND Lasota	Drinking Water

3.6. Data collection and calculations

3.6.1. Weekly live body weight and average weekly weight gain

A random sample of five birds each replicate were individually weighed once a week using a Sasco Africa WP-PW30 digital scale (Sasco, Benoni, South Africa) and the weight was

recorded. The average weekly live weight of the five birds from each replicate was determined and the treatment mean was then computed as the mean live weight for the three replications for each treatment. Average weekly weight gain for each replicate was calculated as the difference between the average live weights for two consecutive weeks.

3.6.2. Weekly feed intake

Feed intake per week was determined using the following formula:

FI= weekly feed offered - weekly feed leftovers

3.6.3. Weekly feed conversion ratio (FCR)

Feed conversion ratio per week was determined using the following formula:

$$FCR = \frac{\text{Average weekly feed consumption per treatment}}{\text{Average weekly weight gain for the treatment}}$$

3.6.4. Daily mortality (%) and Health status

Mortality was recorded daily and the total number of dead birds per replicate for a given week was expressed as a percentage of the total number of birds in that treatment at the beginning of each week.

3.6.5. Carcass evaluation

The chickens were fasted for 12 but with access to clean drinking water. Following the 12-hour, fast five chickens from each replica and slaughtered using the protocol described by Netshipale *et al*. (2012).The slaughtered birds were de-feathered and shanks and viscera removed. The carcasses were then hanged and chilled in a carcass hanger for overnight. For evisceration and cutting, each carcass was placed on its back, the drumstick and thighs were removed and about 45^{o} slanted cut was made under the keel to the backbone. Abdominal fat (fat surrounding the gizzard, rectum, cloaca, and adjacent abdominal muscles) was removed and weighed following the procedures of Brake *et al*. (1993). Finally,

carcass weight and dress out weight, weights of the gastrointestinal tract viscera were determined and recorded.

3.7. Statistical analysis

An analysis of variance (ANOVA) for a 2×3 factorial experiment was carried out using the General Linear Model (GLM) procedures of Minitab 18 programme (Minitab 2017) and the statistical model was used. Means of different treatments were compared using Tukey's post hoc test. Significance was set at $P<0.05$.

$Yijk = \mu + Si + Fj + (SF)ij + \varepsilon ijk$

Where:

Yijk= is the kth response variable having the ith strain and jth feeding regime (k= mean feed intake for each phase (grams/bird/per week), mean weight gain for each phase (grams/bird/per week), feed conversion ratio for each phase, mortality rate for each phase)

S_i = the effect of the i^{th} strain/genotype (i=1,2)

F_j = the effect of j^{th} feeding regime (j= 1,2,3 where 1= Ad libitum feeding, 2= feeding one day and skip the following day, 3= feeding two days and skip the following day)

$(SF)_{ij}$ = the interaction between the i^{th} strain and j^{th} feeding regime

ε_{ijk}= random error assumed to be normally and independently distributed with mean 0 and variance equal to δ^2.

3.8 Ethical Consideration

The ethical clearance for the use of broiler strain in skip-a-day techniques were obtained from the University of Venda ethics Committee. Birds always had access to clean drinking water and feed restriction only occurred under specific treatments where controlled feeding was applied. The feed contained adequate nutrients to meet the daily requirement for good health and vitality and in enough quantity to enable an increase in body weight gain and production which was in accordance with the breed specifications.

When controlled feeding practices were applied to maintain satisfactory production efficiencies and control of body weight in heavy breeds, sufficient feed space as prescribed by the breeder were allowed for all birds to feed simultaneously. Care was taken that feed is distributed to all parts of the feeder system within a period of 3 minutes. In order to maintain good health and productivity during rearing, “skip-a-day” feeding of broiler breeder birds is an accepted industry practice (Ncube, 2018).

CHAPTER 4

RESULTS

4.1. Growth and feed parameters during grower phase

Effect of strain and skip-a-day technique on growth parameters (body weight at day 35 and body weight gain) and feed parameters (feed intake, and feed conversion ratio) of broiler chickens between day 22 and day 35 are presented in table 4.1. At day 22, broiler strain as well as strain by feeding regime interaction effects were not significant for all the growth and feed parameters ($P>0.05$). Feed intake per bird per week (g) was significantly different between all three treatments ($P<0.01$) and followed a consistent yet unexpected pattern across strains with FR0>FR2>FR1. Weekly body weight gain (g/wk) was significantly higher for FR0 ($P<0.01$) compared to FR1 and FR2 with the latter two treatments having comparable means ($P>0.05$). Body weight at day 35 was not significantly influenced by broiler strain ($P>0.05$) but was significantly affected by treatment ($P <0.01$) and mirrored the trend reported for weekly body weight gain. Birds on the FR0 treatment weighed significantly more than those on the FR1 and FR2 treatments, with the latter two treatments having similar body weights ($P>0.05$).

Table 4.1. Effect of strain and levels of skip-a-day technique on growth and feed parameters of broiler chickens during grower phase (22-35 days of age)

Growth parameters		IBW d22 (g/b)	BW d35 (g/b)	BWG (g/b/w)	FI (g/b/w)	FCR
Strain means						
Ross 308		952.7[a]	1896.9[a]	472.1[a]	966.6[a]	2.2[a]
Arbor Acres		968.2[a]	1937.1[a]	484.4[a]	968.6[a]	2.1[a]
SEM		13.90	25.90	11.70	6.44	0.07
Skip-a-day levels means						
FR0		936.7[a]	2322.0[a]	692.7[a]	1123.9[a]	1.6[b]
FR1		980.0[a]	1691.3[b]	355.7[b]	790.6[c]	2.3[a]
FR2		964.7[a]	1737.7[b]	386.5[b]	988.3[b]	2.6[a]
SEM		19.70	36.60	16.50	9.11	0.10
Strain	Skip-a-day levels					
Ross 308	FR0	928.7[a]	2262.7[a]	667.0[a]	1142.7[a]	1.7b[c]
	FR1	941.3[a]	1694.7[b]	376.7[b]	792.9[c]	2.2[abc]
	FR2	988.0[a]	1733.3[b]	372.7[b]	964.3[b]	2.6[a]
Arbor Acres	FR0	944.7[a]	2381.3[a]	718.3[a]	1105.2[a]	1.5[c]
	FR1	1018.7[a]	1688.0[b]	334.7[b]	788.3[c]	2.4[ab]
	FR2	941.3[a]	1742.0[b]	400.3[b]	1012.4[b]	2.6[a]
SEM		19.70	36.60	16.50	9.11	0.10
Significance						
Strain		ns	ns	ns	ns	ns
Skip-a-day levels		ns	**	**	**	**
Strain*Skip-a-day		ns	ns	ns	ns	ns

[ab] Column Means with different superscript differ significantly; **: (P <0.01); (NS) not significant: (P >0.05), Levels of skip-a-day: FR0: skip-a-day level zero; FR1: skip-a-day level one; FR2: skip-a-day level 2; IBW d22 (grams/bird): initial body weight at day 22, BW d35 (grams/bird) body weight at day 35, BWG (grams/bird/week) body weight gain in grams per week, FI (grams/bird/week): feed intake in grams per bird per week, FCR: feed conversion ratio.

4.2. Growth and feed parameters during finisher phase

Effect of *strain* and skip-a-day level on growth parameters (body weight at day 42 and body weight gain) and feed parameters (feed intake, and feed conversion ratio) of broiler chickens between day 36 and day 42 are presented in table 4.2. There was no significant interaction between strains and skip-a-day levels ($P>0.05$) for all the growth and feed parameters. Weekly feed intake per bird per week was significantly higher for FR0 ($P<0.01$) compared to FR1 and FR2 with the latter two treatments having comparable means ($P>0.05$) and strain significantly affected feed intake where the Ross 308 strain consumed more feed than the Arbor Acres strain. Strain did not significantly affect ($P>0.05$) initial body weight, body weight at day 35, body weight gain and feed conversion ratio. Skip-a-day levels did not significantly affect ($P>0.05$) body weight gain and feed conversion ratio.

Table 4.2. Effect of strain and levels of skip-a-day technique on growth parameters of broiler chickens during the finishing phase (36-42 days of age)

Growth parameters		IBW d36 (g/b)	BW d42 (g/b)	BWG (g/b/w)	FI(g/b/w)	FCR
Strain means						
Ross 308		1896.9^{a}	2368.4^{a}	471.6^{a}	987.9^{a}	2.3^{a}
Arbor Acres		1937.1^{a}	2333.8^{a}	396.7^{a}	875.1^{b}	2.3^{a}
SEM		25.90	39.40	32.10	11.70	0.16
Skip a day means						
FR0		2322.0^{a}	2749.3^{a}	427.3^{a}	1306.4^{a}	3.2^{a}
FR1		1691.3^{b}	2078.7^{b}	387.3^{a}	769.9^{b}	2.1^{b}
FR2		1737.7^{b}	2225.3^{b}	487.7^{a}	718.3^{b}	1.5^{b}
SEM		36.60	55.80	45.40	16.60	0.22
Strain	Skip-a-day levels					
Ross 308	FR0	2262.7^{a}	2696.7^{a}	434.0^{a}	1303.4^{a}	3.4^{a}
	FR1	1694.7^{b}	2181.3^{b}	486.7^{a}	834.2^{b}	1.9^{ab}
	FR2	1733.3^{b}	2227.3^{b}	494.0^{a}	826.4^{b}	1.7^{ab}
Arbor acres	FR0	2381.3^{a}	2802.0^{a}	420.7^{a}	1309.3^{a}	3.1^{ab}
	FR1	1688.0^{b}	1976.0^{b}	288.0^{a}	705.6^{bc}	2.5^{ab}
	FR2	1742.0^{b}	2223.3^{b}	481.3^{a}	610.3^{c}	1.3^{b}
SEM		36.60	55.80	45.40	16.60	0.22
Significance						
Strain		ns	ns	ns	**	ns
Skip-a-day levels		**	**	ns	**	ns
Strain*Skip-a-day		ns	ns	ns	ns	ns

^{ab} Column Means with different superscript differ significantly **:(P <0.01); (NS) not significant: (P >0.05 at (P <0.05). Levels of skip-a-day: FR0: skip-a-day level zero; FR1: skip-a-day level one; FR2: skip-a-day level 2; IBW (grams/bird): initial body weight, ABWG (grams/bird/week): average body weight gain, (FI) feed intake, (FCR) feed conversion ratio.

4.3. Carcass parameters

The effect of *strain* and skip-a-day levels on carcass parameters of broiler chickens are presented in Table 4.3. Broiler strain as well as strain by skip-a-day level interaction effects were not significant for all the carcass parameters (P>0.05). Dressed weight, drum and thigh weight, breast weight, wings weight and abdominal fat was significantly higher for FR0 (P<0.01) compared to FR1 and FR2 with the latter two treatments having comparable means (P>0.05). Heart, liver, and gizzard were not significantly influenced by skip-a-day levels (P>0.05).

Table 4.3. The effect of Strain and levels of skip-a-day technique on carcass parameters of broiler chickens

Carcass Parameters (Weight in grams)		Dressed carcass	Drum+ thigh	Breast muscle	Wing	Abdominal Fat	Heart	Liver	Gizzard
Strain means									
Ross 308		2140.1^{a}	461.1^{a}	636.6^{a}	181.8^{a}	30.2^{a}	10.6^{a}	60.1^{a}	65.6^{a}
Arbor Acres		2060.3^{a}	440.5^{a}	622.4^{a}	178.3^{a}	28.5^{a}	10.8^{a}	59.3^{a}	64.1^{a}
SEM		39.40	8.52	15.20	4.37	1.34	0.19	1.04	1.07
Skip-a-day levels means									
FR0		2436.9^{a}	534.9^{a}	756.8^{a}	214.5^{a}	37.4^{a}	11.4^{a}	62.4^{a}	65.7^{a}
FR1		1840.9^{b}	389.3^{b}	520.1^{b}	164.5^{b}	24.0^{b}	10.3^{a}	56.6^{a}	63.4^{a}
FR2		2022.7^{b}	428.2^{b}	611.5^{b}	161.1^{b}	26.6^{b}	10.5^{a}	59.9^{a}	65.5^{a}
SEM		55.70	12.10	21.50	6.18	1.89	0.26	1.48	1.52
Strain	Skip-a-day levels								
Ross 308	FR0	2418.3^{ab}	532.3^{a}	743.2^{ab}	215.6^{a}	36.6^{a}	10.9^{a}	62.5^{a}	64.4^{a}
	FR1	1943.9^{c}	420.7^{b}	567.6^{bc}	163.7^{bc}	27.4^{ab}	10.6^{a}	55.9^{a}	63.4^{a}
	FR2	2058.0^{abc}	430.3^{b}	598.9^{abc}	166.1^{abc}	26.7^{ab}	10.3^{a}	61.8^{a}	68.9^{a}
Arbor	FR0	2455.7^{a}	537.5^{a}	770.4^{a}	213.5^{ab}	38.1^{a}	11.9^{a}	62.4^{a}	66.9^{a}
Acres	FR1	1737.9^{c}	358.0^{b}	472.7^{c}	165.3^{abc}	20.7^{b}	10.0^{a}	57.3^{a}	63.3^{a}
	FR2	1987.3^{bc}	426.0^{b}	624.0^{abc}	156.0^{c}	26.7^{ab}	10.7^{a}	58.0^{a}	62.0^{a}
SEM		55.70	12.10	21.50	6.18	1.89	0.26	1.48	1.52
Significance									
Strain		ns	ns	ns	ns	ns	ns	ns	ns
Skip-a-day levels		**	**	**	**	**	ns	ns	ns
Strain*Skip-a-day		ns	ns	ns	ns	ns	ns	ns	ns

^{abc} Column means with different superscripts differ significantly; **: (P <0.01); (NS) not significant: (P >0.05); Treatment: Levels of skip-a-day; FR0: skip-a-day level zero; FR1: skip-a-day level one; FR2: Skip-a-day level 2; g: gram; wt: weight; SEM: Standard Error Mean.

CHAPTER 5

DISCUSSION

5.1. Effect of strain and skip-a-day technique on growth performance in grower phase

5.1.1. Effects of Strain and Skip-a-day technique on feed parameters

Previous studies by Benyi *et al*. (2011) and Ligaraba *et al*. (2016) found no significant interaction between broiler strain and skip-a-day feeding regime for initial body weight, feed intake, and feed efficiency. Similarly, the current study (Table 4.1) did not find a significant interaction between broiler strains and skip-a-day level during the grower phase for all growth and feed parameters, including body weight at day 22 and day 35, body weight gain, feed intake, and feed conversion ratio. Broiler chicken strain did not have a significant effect ($P>0.05$) on the growth parameters, indicating similar performance between Ross 308 and Arbor Acres in terms of initial body weight, body weight at day 22 and day 35, body weight gain, feed intake, and feed conversion ratio. These findings are consistent with a later study by Benyi *et al*. (2015), although an earlier study by the same author (Benyi *et al*., 2011) showed that broiler strain did have a significant effect on initial body weight, body weight, body weight gain, and feed intake.

The consistently higher means in body weight at day 35, body weight gain, feed intake, and feed conversion ratio for the FR0 group have also been reported by Benyi *et al*. (2011). The relatively lower performance observed for the FR1 and FR2 groups in the current study suggests that the skip-a-day feeding regimes used negatively affected broiler growth parameters, which is supported by the findings of Sikder *et al*. (2012) who reported negative effects of feed restriction on the growth performance of broiler chickens. Interestingly, despite being on higher feed restriction, birds in the FR1 group consumed significantly more feed than the FR2 group which was on the lower feed restriction regime. The reason for this is unclear, but both groups showed similar feed conversion ratios after the restriction period.

5.1.2. Effects of Broiler strain and Skip-a-day levels on growth parameters

There was no significant interaction between broiler strain and skip-a-day feeding regime (P>0.05) for initial body weight at day 36, body weight at day 42, body weight gain, feed intake, and feed conversion ratio during the finisher phase, and Ross 308 birds consumed more feed than Arbor Acres (Table 4.2), which is consistent with the findings of Benyi *et al*. (2011) and Benyi et al. (2009). The results of the present study also showed no significant differences in IBW d36, BW d42, FI, and FCR between the FR1 and FR2 groups, in agreement with previous studies (Mahamood *et al*., 2007; Dozier *et al*., 2002; Proudfoot *et al*., 1982) which found no significant differences between the two levels of feeding regime. However, the control group (FR0=ad libitum feeding) had a higher initial body weight compared to the other groups, which may explain why they consumed more food and ultimately resulted in a higher body weight at day 42. Nevertheless, it is still unclear why the body weight gain remained constant.

5.2. Effects of broiler strain and skip-a-day levels on carcass parameters

In this study, there was no significant interaction between broiler strain and skip a day feeding regime for all broiler carcass parameters, including dressed, drum + thigh, breast muscle, wing, abdominal fat, heart, liver, and gizzard (Table 4.3). Similar results were reported by Ligaraba *et al*. (2016). Broiler strain did not have a significant effect on any of the carcass parameters, which is consistent with previous findings by Ligaraba *et al*. (2016) except for drum weight. However, skip a day regime had a significant effect (p<0.01) on carcass parameters such as dressed, drum thigh, breast muscle, wing, and abdominal fat. The FR0 group consistently had higher weights for these parameters, possibly because they were given food ad libitum and hence receiving sufficient nutrition for body maintenance and development. However, it should be noted that the FR0 group also had higher abdominal fat, which is a concern. There were no significant differences between the two levels of skip a day regime (FR1 and FR2) in all broiler carcass parameters. Additionally, there were no significant differences in heart, liver, and gizzard weights between the control and the

experimental groups. This finding agrees with previous studies by Susbilla *et al*. (1994) and Jones (1995), who reported no significant differences in the relative weights of liver at slaughter due to different feeding regimes. Mahamood *et al*. (2007) found no significant difference in gizzard weight among treatments, while Plavink and Hurwitz (1983) and Katanbaf *et al*. (1989) reported a significant increase in gizzard weights following feed restriction. The present study's observation of relative heart weights remaining unaffected despite feed restriction agrees with the findings of Mahamood *et al*. (2007).

CHAPTER 6

CONCLUSION

In summary, this study found that there were no significant differences between Ross 308 and Arbor Acres broiler strains in terms of body weight, body weight gain, feed intake, and abdominal fatness. However, the Ross 308 strain consumed more feed than the Arbor Acres strain, while both strains had similar feed conversion efficiencies. The birds in the ad libitum feeding group (FR0=control group) consumed significantly more feed than those on restricted feeding (FR1 and FR2), but all groups had similar feed utilization efficiency. The reason for the higher feed consumption in the FR1 group compared to the FR2 group is still unclear. The study did not find any significant effects of broiler strain or skip-a-day levels on the weights of various broiler carcass parameters, including the dressed carcass, drum + Thigh, Breast muscle, wing, abdominal fat, heart, liver, and gizzard. However, skip-a-day feeding levels had a significant effect on the weights of dressed carcass, drum + thigh, breast muscle, wings, and abdominal fat, with the control group having higher weights than FR1 and FR2, while FR1 and FR2 had comparable carcass and carcass components weights.

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Cell number: 079-721-0620/078-196-4459
Email address: hlavisomhlanga@yahoo.com

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