



Effects of Strain and Skip-A-Day Feed Restriction on Haematological Parameters of Broiler Chickens at Finisher Stage

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Article History

Received: November 2, 2020

Revised: November 25, 2020

Accepted: November 30, 2020

Published: December 1, 2020

Abstract

Feed restriction is a management tool designed to reduce the amount of feed consumed by birds to produce more meat without jeopardizing their health condition. The present study was therefore, undertaken to investigate the effects of strain and feed restriction on haematological parameters of broiler chickens. The strains of broilers reared are Arbor Acre, Hubbard and Marshall. The four treatments and three replicates per treatment applied are: A- full feeding (control), B-5th week feed restricted, C- 6th week feed restricted and D- 7th week feed restricted groups. After each feed restriction regime the birds were restored to full feeding until the termination of the experiment on the 56th day. At the end of the experiment on the 56th day, two birds from each replicate were randomly selected for blood collection. Analyzed results showed that there was no significant ($p>0.05$) effect of strain on all the haematological parameters at 8th week except for red blood cell. With respect to red blood cell, Hubbard birds showed superiority to other two strains which recorded similar ($p>0.05$) mean values. All feeding trials employed had positive impact on the birds' hematological parameters regardless of strain. Therefore, any of the feed restriction regime could be employed without compromising the health of the birds.

Keywords: Strain; Broiler; Haematological parameters; Arbor acre; Hubbard; Marshall.

1. Introduction

Feed restriction in broilers and pullets had been used in early studies to reduce the incidence of metabolic disorders [1, 2]. It is one of the management tools designed to limit the birds' access to feeds during a definite period of time. This might take the form of either quantitative or qualitative feed restriction regimen. The former refers to limiting the time birds have access to feeds in a day, while the latter is actual denying the bird's full access to certain nutrients by diluting the formulated feeds with inert fibres such as wheat offals [3, 4].

The success of any broiler production depends not only on the strain of the birds, but also on management, housing, quality and quantity of feeds given, health status and market forces. Khan, *et al.* [5], observed that feed constituted 60% of the total cost of production in a broiler enterprise, and whatever method to reduce this high input component should be considered for the good of the farmers and overall interest of the industry. Zubair and Leeson [6], asserted that feed restriction in broilers can help improve feed efficiency, reduce feed cost and mortality in addition to producing chicken meat at affordable price. It was further reported in literature that feed restriction reduced chances of metabolic disorders like ascities syndrome which are common with broiler production resulting in high mortality thereby making the enterprise unprofitable [2].

Skip-a-day feed removal is a technique for limiting early growth and has not been extensively studied in broiler chickens especially at the finisher stage Dozier, *et al.* [7]. Early fast growth in modern broilers is associated with increased stress on the birds and can result in metabolic diseases and skeletal disorders that lead to economic losses due to reduced animal performance, high mortality rates and carcass condemnation at slaughter houses [8]. The benefits of early feed restriction are the monetary savings obtained by improved feed conversion, reduced sudden death syndrome [9], reduced death losses, ascites [10] and reduced skeletal diseases [11]. Skip-a-day feed removal has been reported in other studies to decrease early growth and reduce the incidence fat deposition and ascites without affecting final body weight [10, 12].

Haematological studies are of physiological and ecological benefit in knowing the relationship of blood characteristics to the environment [13] and so could be useful in the selection of animals that are genetically resistant to certain diseases and environmental conditions [14, 15]. Hence, haematological parameters are good indicators of the physiological status of animals [16].

In view of the economic benefits of feed restriction to researchers and meat producers, this investigation was undertaken to examine the effects of strain of broiler chickens and skip-a-day feed restriction on haematological parameters.

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2. Materials and Methods

The study was carried out at Poultry Unit of the Teaching and Research Farm, Faculty of Agricultural Sciences, Ekiti State University, Ado-Ekiti, Nigeria. Ado-Ekiti is situated entirely within the tropics. It is located between longitudes 40° 51' and 50° 451' east of the Greenwich meridian and latitudes 70° 151' and 80° 511' north of the Equator.

2.1. Management and Experimental Birds

Two hundred and eighty eight (288) day old broiler chicks comprising of 96 chicks each of Arbor Acre, Hubbard and Marshal were purchased from reputable hatcheries. The chicks were distributed randomly at the starter phase into 12 pens per strain, that is, four treatments with three replicates per treatment and 8 chicks per replicate. The experiment was a completely randomized design arranged in a 3×4 factorial design. The four treatments are: A- full feeding, B-feed restricted (5th week, 29-35th day), C- feed restricted (6th week, 36-42nd day) and D- feed restricted group (7th week, 43-49th day). After each feed restriction regime the birds were restored to full feeding until the termination of the experiment on the 56th day. Commercial broiler starter feed containing 22% CP and 3000kcal/kg were given from 1 – 28 days while broiler finisher feed having 21% CP and 3100kcal/kg were offered from 29 to 56 days. Water was given *ad libitum*.

2.2. Data Collection

At the end of the experiment on the 56th day, two birds from each replicate were randomly selected for blood collection. About 5ml blood was collected from the wing-web vein into a well labeled bijou bottles containing a speck of Ethylenediaminetetraacetic acid (EDTA) for haematological studies according to the method described by Varley, *et al.* [17]. The following parameters were determined:

- i. The packed cell volume (PCV),
- ii. Haemoglobin concentration (Hb),
- iii. White blood cell (WBC),
- iv. Red blood cell (RBC),
- v. Mean cell volume (MCV),
- vi. Mean corpuscular haemoglobin concentration (MCHC),
- vii. White blood cell differential count: Lymphocytes, Neutrophils, Eosinophil, Monocytes, Basophils.

2.3. Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) using SAS [18]. Duncan's Multiple Range test was used to separate differences among the means at (P=0.05).

The appropriate statistical model used was:

$$Y_{ijk} = \mu + G_i + R_j + \epsilon_{ijk}$$

Where,

Y_{ijk} = observation on kth population, of ith strain and jth feed restriction

μ = common mean

G_i = fixed effect of strain (i=3)

R_j = fixed effect of feed restriction (j=4)

ϵ_{ijk} = error term

3. Results and Discussion

Table 1 shows the effect of strain on haematological parameters of broiler birds at 8th week. The result revealed that there was no significant ($p > 0.05$) effect of strain on packed cell volume, haemoglobin, white blood cell (WBC), platelets, lymphocytes, neutrophils, monocyte, and eosinophils. The three strains recorded similar mean values. However, there was significant ($p < 0.01$) effect of strain on red blood cell. Hubbard birds showed superiority to other two strains which recorded similar ($p > 0.05$) mean values of red blood cell. It is however, interesting to note that the obtained mean values were comparable and within the ranges recorded for chickens by previous authors [19, 20]. Since the obtained mean values for red blood cell were high, the birds appeared healthy and active for the fact that red blood cells are associated with absorbing oxygen from the lungs through haemoglobin.

Generally, the health status of the birds was not affected by strain of broiler and therefore, less susceptible to some poultry diseases, and there were no cases of metabolic disorder. This indicates that all the strains were feed restriction tolerant and could be selected to produce healthy and quality meat. All the haematological parameters ranged within the normal blood values [21].

Table-1. The effect of strain on broiler haematological parameters at week 8

PARAMETERS	ARBOR ACRE	HUBBARD	MARSHALL
PCV (%)	23.83±0.65	24.08±0.65	23.33±0.65
Hb (gms/100ml)	7.85±0.22	8.05±0.22	7.81±0.22
Rbc (μ)	5.15 ^b ±0.19	5.82 ^a ±0.19	4.83 ^b ±0.19
Wbc (10 ³ /cu.mm)	12762.5±515.91	13366.7±515.91	13737.5±515.91
Platelets	268500±15910.63	249500±15910.63	295583±15910.63
Lymphocytes (%)	63.75±1.73	63.92±1.73	66.58±1.73
Neut	32.17±1.83	31.58±1.83	30.00±1.83
Monocytes (%)	2.50±0.19	1.92±0.19	2.17±0.19
EOS (%)	1.5±0.33	1.83±0.33	1.33±0.33

ab means with different superscripts along rows are significantly different (p<0.01)

PCV= Packed cell volume, Hb= Haemoglobin, Rbc= Red blood cell, Wbc= White blood cell, Neut= Neutrophils, EOS= Eosinophils

Table 2 shows the effect of feed restriction on broiler haematological parameters broiler chickens. The result showed that there was no significant (p>0.05) effect of feed restriction regimes on all the haematological parameters at 8th week. That is, all the feed restriction regimen recorded similar mean values. In addition, all the mean values reported in this study on haematological parameters were within the recommended range values for the chickens documented by previous studies [22-24]. This implies that any of the feeding regimes could be employed to raise healthy broilers since the health status of the birds were not compromised.

Table-2. The effect of feed restriction on broiler haematological parameters at 8th week

	Control (<i>adlibitum</i>)	5 th Week Feed Restriction	6 th Week Feed Restriction	7 th Week Feed Restriction
PCV (%)	23.89 ±0.75	23.44 ±0.75	23.56 ±0.75	24.11 ±0.75
Hb (gms/100ml)	7.99 ±0.25	7.76 ±0.25	7.84 ±0.25	8.03 ±0.25
Rbc (μ)	5.27 ±0.21	5.18 ±0.21	5.37 ±0.21	5.24 ±0.21
Wbc (10 ³ /cu.mm)	13361.1 ±595.73	13205.6 ±595.73	12600.0 ±595.73	13988.9 ±595.73
Platelets	262444 ±18372.01	270556 ±18372.01	285444 ±18372.01	266333 ±18372.01
Lymphocytes (%)	67.00 ±2.00	62.44 ±2.00	65.22 ±2.00	64.33 ±2.00
Neut	29.33 ±2.12	34.44 ±2.12	29.67 ±2.12	31.56 ±2.12
Monocytes (%)	2.11 ±0.22	2.00 ±0.22	2.44 ±0.22	2.22 ±0.22
EOS (%)	1.22 ±0.38	1.67 ±0.38	1.44 ±0.38	1.89 ±0.38

means with no superscripts along rows are not significantly different (p>0.05)

PCV= Packed cell volume, Hb= Haemoglobin, Rbc= Red blood cell, Wbc= White blood cell, Neut= Neutrophils, EOS= Eosinophils

4. Conclusion

The study indicates that all the haematological parameters were not significantly affected by the strain of broilers except red blood cell. Hubbard strain showed superiority to the other two strains going by the result of the red blood cell counts. Also, feeding restriction trials employed had no significant effect on the bird's hematological parameters regardless of strain. Therefore, any feeding trials could be used on the birds to achieve desired result.

Acknowledgements

The authors appreciate the staff and management of Ekiti State University Teaching and Research Farm for their support during the course of this study.

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