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Performance of Commercial Broiler Strains Common in Jos, Nigeria

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ABSTRACT

A six weeks experiment was conducted to determine the performance of three strains of broilers fed commercial feed. The broilers strains used were Arbor Acres Farm Support, Arbor Acres Grinphield and Marshall Grinphield and fifty day-old each were purchased from their respective Distributors in Jos, Plateau State, Nigeria. They were randomly distributed into 5 replicates and each replicate had 10 birds. The design used was a completely randomized design. The commercial feed (Vital Feed produced by Grand Cereals Company Ltd, Jos) and water were provided ad libitum. Total weight gain, daily weight gain, total feed intake, daily feed intake and feed conversion ratio were not significantly (P>0.05) affected by strain. However, high mortality was recorded. Also, hematological parameters, carcass and organs' weights were not significantly (P>0.05) affected. It may be concluded that Arbor Acres Farm Support, Arbor Acres Grinphield and Marshall Grinphield expresses similar genetic potential when fed with the same feed. Therefore, these three broiler strain are recommended for farmers.

INTRODUCTION

A broiler chicken (*Gallus gallus domesticus*) is known to be of fast-growing genotype (Riber *et al*., 2018) and nowadays, broiler chicken can attain slaughter weight with decreasing age of maturity (Sleman *et al*., 2015). Zuidhof *et al*. (2014) and Wilson (2005) reported that the ability of broiler chicken to grow faster has been as result of improved breeding, nutrition and good husbandry practices. The Nigerian poultry industry approximately has 165 million birds and predominantly chickens (SNL, 2015). By market size perspective it has the second largest chicken population in Africa after South Africa (SNL, 2015). The poultry sector is extremely fragmented and most of the chickens are raised in the 'backyards' or on poultry farms with less than 1,000 birds (USDA,

2013). However, there outstanding farms with thousands of chickens; most are concentrated in the South-Western Region namely Obasanjo Farms, Chi Farms, Supreme Farms, Agrited, Amo Farms, Farm Support, Poultry Plaza, Nastech and Zartech and few in the Northern Region notably are ECWA Farms and Olams Farms (Olawumi and Fagbuaro, 2011). The common broiler strains in the Nigeria market include Marshall, Abor Acre Plus, Cobb, Ross, Hubbard, Anak, Cockerel, Neoiler/Kroiler (Amao *et al*., 2015; Olawumi and Fagbuaro, 2011). The management of birds by these big Farms is sophisticated due to their financial capability of using modern technologies, but in the case of the small scale farms the use of sophisticated gadgets may not be feasible. As a result, the performance of birds in most rural communities may not be adequate because of poor infrastructure. Farmers often improvised equipment, light, heat, cold storage, and other facilities necessary to be in production. Another challenge is poor transportation network which make it difficult to access chicks, vaccine, feeds and drugs as when due. Feed in particular pose major challenge and accounts for about 65 to 70 % of broiler production (Pathak *et al*., 2015; Srivastava *et al*., 2013). Due to high cost of feed, most village farmers either compromised feed supply or resorted to restrict feeding. Ghanem (2012) reported that broilers that are fed *ad libitum* grow faster and heavier.

Besides, the aforementioned challenges, what worried rural farmers and the less privilege in cities mostly is which breed or strain of broilers to rear believing that when high mortality is recorded, it is attributed to the source of stock, neglecting the fault in management. In a quest to ascertain the productive performance of commercial birds in rural areas, it becomes necessary to conduct this experiment. Therefore, this paper aimed at determining the performance of three broiler strains fed commercial feed.

MATERIALS AND METHODS

Site location

The experiment was conducted at the Poultry Unit, Plateau State College of Agriculture, Garkawa, Nigeria. Garkawa lies within the Guinea savanna zone about 300 m above sea level. It is located on latitude 8.8955°N and longitude 9.4537°E. Its annual average temperature was usually about 27.7°C and annual average precipitation was usually about 1178 mm ((Shiru, 2018; Sudik *et al*., 2016) (Figure 1a and b).

Figure1: Map of Nigeria, the portion with Pinkcolouris Plateau state

Fig 2: Map of Plateau state, the portion with black dot is Garkawa town

Experimental birds and management

Three broiler strains were randomly selected among the commonly sold in Jos, Plateau State, Nigeria. They were Arbor Acres Farm Support, Arbor Acres Grinphield and Marshall Grinphield and fifty (50) day-old of each were purchased and weighed in group of 10 and distributed randomly into 5 replicates. The design used was a completely randomized design. They were reared under deep litter system in an opened sided house. Wood shaving was used as litter material. Heat was supplied using charcoal. The opened side of the house was covered with tarpaulin during brooding to maintain adequate heat. The birds' behavioural disposition was used to moderate the heat. Lanterns that use dry cell batteries were used to supplied light in the nights. However, after brooding, the tarpaulin was removed to ensure free ventilation. The birds were served with water and feed (Vital feed produced by Grand Cereal Company Ltd, Jos) (starter: 0-3 weeks of age; finisher: 3-6 weeks of age) *ad libitum*. Waste litter was usually removed and replaced at 4 days interval. Infectious bursal disease vaccine was administered through drinking water on day 11 and was repeated at day 21 of

age; Newcastle disease vaccine was administered also through drinking water at day 14. On arrival, clean water with glucose was served to them as anti-stress and subsequently during vaccination. A brood spectrum antibiotic was administered in drinking water in the first 3 days and occasionally serving as prophylactics against bacterial infections. Anticoccidial drugs were administered occasionally in drinking water. Management was strictly adopted as described by Oluyemi and Roberts (2000). Mortality was recorded as occurred and calculated as shown below:

$$\% \text{ mortality} = \frac{\text{Number died}}{\text{Number housed}} \times \frac{100}{1}$$

Data collection

The initial body weights of the birds were taken at the start of the experiment and subsequently on weekly basis. The difference between the final and initial weights gave total weight gain (TWG). Daily weight gain (DWG) was calculated as shown below:

$$\text{Daily weight gain: DWG} = \frac{Total\ weight\ gain\ (g)}{42\ days}$$

A known quantity of feed was supplied each day and the leftover in the following day was weighed. The difference between the feed supplied and the leftover gave the quantity of feed consumed per week. The accumulative feed consumed for the six weeks gave total feed intake (TFI). Average daily feed intake (DFI) was calculated as shown below:

$$\text{Feed Intake (g/bird): FI} = \frac{\text{Feed consumption in a treatment}}{\text{No.of birds in a treatment}}$$

Values generated from daily weight gain and daily feed intake was used to calculate feed conversion ratio (FCR) as shown below:

$$\text{Feed conversion ratio: FCR} = \frac{Feed\ consumed\ (g)}{Weight\ gain\ (g)}$$

At the end of the experiment, two birds per replicate were randomly selected and starved for 8 hours thereafter they were weighed and sacrificed. Some bloods were collected in bijou bottle containing ethylenediamine tetra-acetic acid (EDTA) forhaematology. Packed cell volume (PCV) and haemoglobin (Hb) were determined by the method of Lamb (1981). Red blood cell (RBC) count, white blood cell (WBC) and differential counts were determined as described by Jain (1986) while Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCH), Mean Cell Haemoglobin Concentration (MCHC) were calculated as follows:

$$\text{MCV (fl)} = \frac{PVC}{RBC)} \times \frac{10}{1}$$

$$\text{MCH (pg)} = \frac{Hbc}{RBC)} \times \frac{10}{1}$$

$$\text{MCHC (g/dl)} = \frac{Hbc}{MCH)} \times \frac{100}{1}$$

After blood collection, the carcass was scalded in 60°C hot water for about 30 second to remove the feathers. Each carcass was open and the visceral organs (gizzard, heart, kidney, liver, lungs and spleen) were excised. The dressed weight was calculated as shown below:

$$\% \text{ dressed weight} = \frac{dressed\ weight\ (g)}{Live\ Body\ weight\ (g)} \times \frac{100}{1}$$

Each organ was expressed as percent of dressed weight.

Data analysis

The data collected were subjected to statistical analysis under completely randomized design employing one way analysis of variance results of the SPSS 16.0 version. Differences in means were separated using Duncan new multiple range test (DNMRT).

RESULTS

General observation: Mortality was recorded within the first week of commencing the experiment.

Table 1 shows the performance of broiler stains fed commercial feed. There was no significant difference (P>0.05) by strain in all the parameters measured. Table 2 shows the carcass and organs weight of broiler stains fed standard feed. Also, the dressed weight and entire organs' weights had no significant difference (P>0.05) by strain. Table 3 shows the haematological parameters of the three broiler strain fed commercial feed. Also, there were no significant difference (P>0.05) by strain.

DISCUSSION

The strain difference among the Arbor Acres Farm Support, Arbor Acres Grinphield and Marshall Grinphield could not have caused variations in their performance, they exhibited insignificance difference in live weight, feed consumption and efficient of feed utilization. This supported the findings of Hossain *et al*. (2014) that heavier broiler strain consumed more feed and gain similar weights.

Table 1: Growth performance and feed utilization of three broiler strains

Parameter	Arbor Acres Farm Support	Arbor Acres Grinphield	Marshall Grinphield
Live weight (g)	2202.14±6.89	2205.21±6.53	2215.56±7.92
Total weight gain(g)	2152.14±6.89	2155.21±6.53	2165.56±7.92
Daily weight gain (g)	51.25±0.16	51.33±0.15	51.55±0.19
Total feed intake (g)	3742.86±23.27	3744.12±21.71	3784.88±37.61
Daily feed intake (g)	101.33±0.55	101.34±0.52	102.33±0.90
Feed conversion ratio	2.41±0.02	2.41±0.01	2.42±0.01
% Mortality	8.00±2.00	8.00±3.00	8.00±2.00

Values are average of 50 birds.

Table 2: Carcass and organs weight (% of body weight gain) of three broiler strains

Parameter	Arbor Acres Farm Support	Arbor Acres Grinphield	Marshall Grinphield
Dressed weight (%)	80.13±1.11	80.21±1.34	81.36±1.03
Gizzard (%)	0.69±0.45	0.72±0.52	0.71±0.46
Heart (%)	0.14±0.33	0.14±0.23	0.14±0.16
Kidneys (%)	0.15±0.55	0.15±0.35	0.15±0.37
Liver (%)	0.60±0.72	0.59±1.21	0.59±0.57
Lungs (%)	0.17±1.01	0.18±1.38	0.17±1.46
Spleen (%)	0.04±0.07	0.04±0.07	0.04±0.313

Values are average of 50 birds

Table 3: Hematological parameter of three broiler strains

Parameter	Arbor Acres Farm Support	Arbor Acres Grinphield	Marshall Grinphield
PCV(%)	38.9±1.11	38.21±1.34	38.36±1.03
Hb (g/dl)	13.60±0.45	13.52±0.52	13.40±0.46
RBC ($x10^{-3}$/ml)	4.22±0.33	4.13±0.23	3.96±0.16
WBC ($x10^{-6}$/ml)	4.01±0.55	4.20±0.35	4.28±0.37
MCV (Fl)	81.34±0.72	81.78±1.21	82.81±0.57
MCH (Pg)	27.33±1.01	26.86±1.38	27.73±1.46
MCHC (%)	30.00±0.07	30.11±0.07	30.22±0.313

Values are average of 50 birds
PCV = packed cell volume, Hb = haemoglobin, RBC = red blood cell, WBC = white blood cell
MCV=mean cell volume, MCH=mean cell haemoglobin, MCHC=mean cell haemoglobin concentration

However, it disagrees with the finding of Pathak *et al*. (2015) who reported that genetic differences cause variation in broilers performance. Also, it disagrees with the report of Ghanem (2012) who observed higher live body weight, weight gain and better feed efficiency in Cobb-500 than that of Hubbard strain. By values the average live body weight of these three broiler strains is lower than 2.5 kg and average feed conversion ratio is higher than 1.38-1.72 reported for 6 weeks old broilers by McDonald *et al*. (2002). This difference may be attributed to environmental and management differences. The present study was conducted in sub-standard environment characterized with inadequate social amenities such as electricity, pipe borne water, cold rooms, poor transportation network. Interestingly, despite the remote environmental condition the average live body weight is higher than that of 1.96 kg reported by Pathak *et al*. (2015) and the FCR is better than 2.5 reported by SNL (2015). The performance demonstrated that the birds were at better condition. The crude protein and energy contents of the feed served to the birds were within the nutrient requirements of broiler chickens as recommended by (NRC, 1994).

The acceptable mortality rate in broiler chickens production is 5% (Oluyemi and Roberts, 2000; Obioha, 1992). By this recommendation, a 5% mortality means for every 50 broilers 2-3 should die, but 8% mortality was recorded in this study depicted an uncalled situation. Behavioral disposition of the birds was used to control heat which may have probably not been effective. Heat was supplied using charcoal controlling heat and smoke may also not have been effective. There was no provision for testing water quality, powder milk was added to water used for vaccination, and whether or not it was effective could not be ascertained. The efficacy of vaccine used could not be guaranteed because of epileptic power supply. Another likely factor for the high mortality could be the stress incurred by the birds at transit. The birds spent 2 days before arriving at the study site due to poor transportation network. This

implies that environment play key role in the survival of birds (Leinonen *et al*., 2013).

The insignificant difference in the haematological parameters among the birds confirms that when these birds are given the same feed, they also exhibited similar blood characteristics. These parameters compared favourably with the reference value reported by MVM (2012). This probably implies that the birds' health status was not threatened. According to MVM (2012) the examination of blood parameters help in diagnosis and monitoring of health status of animals. The high mortality recorded occurred within the first week of commencing the study, which was probably attributed to management factors rather than infection.

CONCLUSION

This study indicated that Arbor Acres Farm Support, Arbor Acres Grinphield and Marshall Grinphield would exhibits similar performance when fed with the same diet. A similar study that would involve more than three broiler strains is suggested.

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