ADAPTABILITY AND GROWTH PERFORMANCE OF DIFFERENT STRAINS OF BROILER CHICKEN TO HIGH TEMPERATURE VARIATIONS IN NORTH CENTRAL NIGERIA

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ABSTRACT
The adaptability and growth performance of different strains of broilers were carried out to elucidate the suitability of the strains to the high-temperature region. 120-day-old chicks consisting of 30 Arbor Acre (T1), Marshal (T2), Anak (T3) and Cobb (T4) in each case were used for this study, and it lasted for six weeks. Data on the temperature, feed intake and growth performance were recorded. The highest temperature of 41.14^{o}C was recorded in the sixth week, and 38.8^{o}C was the least temperature which was observed in the second week. The study revealed that there was a significant difference in feed intake from the 1st week to the 5th week. In all treatments, there was a negative correlation to feed intake except for T4 (Cobb breed), which had a positive correlation. T4 (Cobb breed) was well adapted to temperature variations among other breeds having the highest weight gain of 1631.67 g and feed utilization with 2.70 as feed conversion ratio. Hence, from the study, it can be concluded that T4 can be reared during the dry season (January-March) with high-temperature variations of guinea savanna.

Keywords: Adaptability, Broiler chickens, Strains, Temperature

1.0 INTRODUCTION

Broilers chicken are homoeothermic animals that live comfortably only in a relatively narrow zone of thermo neutrality. Broilers are challenged with infections, feedstuff variation and climate changes, which may negatively impair the productivity of the commercial poultry industry (Shini et al., 2008). Changes in environmental temperature below or above the thermal comfort zone have a negative effect on broiler performance. It is well documented that growth, feed intake and physiological response are changed by environmental temperature. Report by Aengwanich and Simarak, (2004) reveals that the optimal temperature range for efficient production for broiler chicken over 4 weeks of age is between 18 - 21˚C.

Meanwhile, there are evidences that animals and birds are being affected by global warming in both their distribution and behavior. Changes in atmospheric condition and animal production are always antagonistic to each other and its effect on livestock and poultry production cut across the globe (Menquesha, 2011). Phenotype is the result of the interaction between specific genotype and environment. Hence, genotype interaction with the environment is used to describe the situation where different genotypes (breeds) react differently to different environmental conditions (Okere, 2014).

Backyard farmers in developing countries rear poultry irrespective of climate and seasonal variation, and do not know its influence on overall bird performance. The interaction of genetics with the environment in specific geographical locations may affect broiler growth traits (Okere, 2014). At present, climatic variation is a key threat for poultry industry, especially for marginal poultry farmers in open-house systems. Report by Alade and Ademola (2013) reveals that poultry of different breeds and ages react differently to climatic variations. These effects are evident in reduction in yield from poultry, nutritional quality of feeds i.e. mould build up under wet condition, volatilization of specific nutrients under high temperature, increase in incidence of diseases and vectors which reduces survivability of birds (Spore, 2008).

Adesoji, et al (2010) stated that the greatest effect of weather is in Sub- Saharan Africa where livestock production takes about 40% of agricultural Gross Domestic Product (GDP) which engaged about 1.3 billion people, and supporting the livelihoods of billions of the world's poor (FAO, 2007). Production of fast growing broiler chicken in molecular genetics results into modern species of broiler chicken which are easily affected by environmental stress which temperature contributes significantly to. (Deeb and Cahaner, 2002). Thus, it is important to know the extent of these effects.

Many studies have been conducted to evaluate the effect of the thermal environment on birds' growth performance (Leenstra, 1992; Yoon et al., 1995; Abu-Dieyeh, 2006), still more studies are necessary to examine the adaptability of different strains to high temperature. This research endeavour therefore focuses on adaptability and growth performance of different strains of broiler chicken to high temperature variations from January/February to March/April which marked dry season in the northern part of Nigeria (Saliu et al, 2013)

2.0 MATERIALS AND METHOD

Experimental Site

The study was conducted at the Poultry unit of Teaching and Research Farm of Animal Production Department, School of Agriculture and Agricultural Technology, Federal University of Technology, Gidankwano, Minna, Niger State, Nigeria. Minna is characterized by two seasons which are the wet (April to October) and dry season (November to April). It has altitude of 75 m above the sea level with a land area of 6784 km^2 and lies between latitude 9°37'north and longitude 6°33'east. The mean annual rainfall is 1300 mm.. Temperature rarely falls below 22°C the peak being 40°C (February and March) and 35°C (November and December) Adama et al., (2007). It is located in the guinea savannah zone of Nigeria.

Source of the experimental birds

A total number of 120 day old broiler chicks of four different breed were used for the experiment (Anak, Marshal, Abor-acre and Cobbs). The birds were purchased from commercial hatchery outside Minna (Mark's Farm Nigeria Limited).

Experimental design and management

Before the birds arrived, the house was washed thoroughly and disinfected. The litter material was spread on the floor to a depth of 4 cm (Asaniyan et al., 2007). The feeders and drinkers were set in place. Coal pot was used as source of heat. On the arrival of the chicks, multivitamins and glucose was administered in their water to serve as anti-stress and to stimulate feed consumption. The house was partitioned into 12 pens to accommodate the four treatments and each treatment was replicated thrice with ten birds each, T1 was arbor acre breeds, T2 was Marshal Breed, T3 was Anak breed and T4 was Cobb breed. The birds were kept under an intensive system of management for the period of the experiment (6 weeks) and were given the same feed ration throughout the period of the experiment. Feed and water was given ad-libitum. The feed given was gotten from a commercial source (SONA feeds). The birds were brooded for four (4) weeks. Routine managements which include washing of Drinkers, Feeders, provision of clean water and feed, weighing of left over and checking of sick birds. Vaccination against major disease (IBD, NCD) and other medications were strictly adhered to. The birds were randomly and equally allotted into four treatments in a completely randomized design (CRD) experiment. Each treatment was maintained throughout the experiment.

Parameters measured

Feed intake

The feed intake was measured daily for birds in each replicate and quantity consumed per day was obtained by subtracting the quantity left over from the quantity fed. Weekly record of average feed consumption per bird was also obtained for each replicate by dividing the total quantity of feed consumed by the number of birds in each replicate.

Body weight gain

The initial body weight of the birds was measured using a weighing balance, the weekly body weight of the birds was also measured to obtain the average body weight gain per group. Final body weight –initial Body weight

Feed conversion ratio

This was calculated using the total body weight gain and feed consumed by the birds in their different treatments.

{Total average feed intake}/{Total body weight gain} ……..……..1

Weather Data

Weekly average Temperature parameter which covers the period of experiment (6 weeks) was collected at the Minna Meteorological Station, School of Agriculture and Agricultural Technology Teaching and Research Farm, Federal University of Technology, and used for the experiment.

Statistical Analysis
All data collected at the end of the experiment was subjected to analysis of variance (ANOVA) and General Linear Model (GLM) procedure of SAS, Duncan Multiple Range Test (2000), was used to separate the mean where there are statistical significant ($p<0.05$) differences.

4.0 RESULTS AND DISCUSSION

4.1 RESULTS

Average weekly temperature
Table 1 shows the average weekly values of temperature. Temperature was lowest at week 2 with a range of 24.21-38.80^{o}C and highest at week 6 with a range of 27.14 - 41.14^{o}C.

Table 1 Average weekly temperature

	Temperature (^{o}C)	
Week	Minimum	Maximum
1	27.02	39.71
2	24.21	38.80
3	26.35	39.85
4	25.00	41.00
5	26.28	40.14
6	27.14	41.14

Source: Federal University of Technology, Minna. Metrological station

Feed intake, Weight gain and Feed conversion ratio of the treatments
Table 2 shows the mean feed intake, weight gain and feed conversion ratio. Significant difference was observed for weight gain with T4 recording the highest weight gain at 1631.6 g and the lowest body weight was recorded for T1 at 1238.9 g. The lowest significant feed conversion ratio was observed at T4 (2.7) and T1 (3.61) recording the highest. Meanwhile, no significant difference was observed on feed intake in all the treatments

Table 2. Feed intake, Weight gain and Feed conversion ratio of the treatments

Parameters	T1	T2	T3	T4	SEM	LOS
Feed intake (g)	4492.2	4436.0	4714.3	4509.8	47.89	
Weight gain (g)	1238.9^{c}	1244.7^{c}	1461.1^{b}	1631.6^{a}	50.30	*
FCR	3.61^{c}	3.58^{c}	3.23^{b}	2.7^{a}	0.11	*

T1: Arbor Acre
T2: Marshal
T3: Anak
T4: Cobb

SEM: standard mean of error
[abcd]: Means with different superscript are significantly different($p<0.05$)
LOS: Level of significance

4.2 Discussion

It is well documented that growth, feed intake and physiological response are changed by environmental temperature. The results obtained in this study, with respect to weight gain, feed intake and feed conversion ratio, are in agreement with the temperature effects reported by others (Deaton et al., 1984; McNaughton and Reece. In this study, high temperature had a negative effect on feed and weight gain of almost all breeds used except for cobb breed. This is in agreement with work by (Sams, 1997; Mashaly et al., 2004) which revealed that physiological stress can have deleterious effects on the overall performance and body growth of meat-type poultry. Also, it may be attributed to influence of the harsh temperature which hampers their physical performance which is in corroboration with the finding of Donald (1998) that a greater number of physiological activities undergoes specific changes in birds exposed to hot environment. This was further enunciated by Becker et al. (2003) who elaborated the negative impact of heat stress on the behavioral response of animals to adjust to the altered environment. However, T4 (Cobb Breed) did not response negatively to high temperature as expected. It had the highest weight gain of 1631.67g and better utilized the feed with 2.70 as its feed conversion ratio. This may be because of their genetic superiority. This corroborates with the study of Huwaida et al. (2011) which revealed that Cobb strain was not significantly affected by season unlike in Hubbard and Ross strains which are affected by season. This study reveals that Cobb strain genetic merits enable it to adapt to high temperature variation and therefore it is most suitable for rearing in the tropics.

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From this experiment, it can therefore be concluded that variation in temperature a weather parameter, affects the feed intake and growth performance of broiler. Also, T4 (Cobb breed) amidst high temperature has the highest weight gain and therefore performs best.

5.2 Recommendations

It is recommended that Cobb broiler can be reared conveniently during the dry season especially (January-March) of the guinea savanna without any stress. Also, to rear other breeds of broiler at this period, measures to control the environmental temperature should be made available. Further research should be done to compare Cobb broilers with other strains of broiler like Ross.

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