PERFORMANCE OF FOUR COMMERCIAL BREEDS OF BROILER CHICKENS UNDER THE SAME ENVIRONMENTAL CONDITION

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ABSTRACT

The study evaluates the environmental tolerance among some breeds of broiler chickens.Four hundred (400) broilerchickens were used for the trial. The four breeds of the commercial broiler chickens in Nigeria (Ross, Hubbard, Marshal and Anak) were used with hundred (100) birds in each of the breeds separated into sexes, for sex response to the environment. Optimum environmental condition for broiler production was maintained during the brooding and growing periods. Birds were fed the same diet *adlibitum* and were allowed to run on deep litter system with adequate litter management. Theinitial weight,feed intake and weekly weight changesof the birds were recorded. At the end of the trial, haematological parameters as well as carcass and organs parameters were evaluated. The performance of the different breeds of commercial broilers in Nigerian market revealed similar production capacity with observed numerical variation in the values of the parameters such as final weight gain. feed intake and feed conversion ratio. Mortality was noticed in some breeds than the other, with Ross (34.62 %) breed having the highest mortality rate for the period of observation. Marshall (1.10) had the best FCR among others;Anak breed (42.00±3.44) had the highest lymphoid cells.It could therefore be concluded that environment influences the mortality among the breeds as well as their final weight.

Keywords: Broiler chickens, environment, tolerance, weight.

INTRODUCTION

Poultry is an important farm animal species in almost all countries. They are good source of animal protein, and can be reared with limited feed and housing resources. Chickens are 'waste converters': they 'convert' a scavenged feed resource base into animal protein. They are therefore by far the most important species for generating income for rural families.

People rear chickens all around the world under widely varying circumstances. Their main objective is generally the same: maximum production for minimum costs and with minimum risks. Both low and high temperatures act in a negative way. Low environmental temperature increases feed intake and decreases body weight gain and feed efficiency, thus negatively influencing the performance of broiler chickens. Broiler chickens adapted more easily to lower than to higher temperature. The optimal temperature range for efficient production for broiler chickens over 4 weeks of age is 18 - 21°C (Aengwanich and Simaraks 2004). The increase in energy requirement as a result of exposure to low environmental temperatureimplies necessary changes in the cardiovascular system to accommodate the energy needs.Thus, increases in haematocrit, haemoglobin concentration, blood volume, liver and heartmuscle weight have been observed in broiler chickens and turkeys exposed to low environmentaltemperature (Yahav*et al.*, 1996; Yahav 2002). Yahav*et al.* (1997) reported linear relationshipbetween haematocrit and heart weight under constant temperature. The observed relationshipindicates an adaptation of heart mass to the changes in work load associated with the changes inblood flow resistance. Etim*et al* (2013) submission was that changes are often caused by several factors; some of which are genetic and others, non-genetic. Age, sex, breed and management systems are among the factors that influence blood-based parameters of farm animals. In cooler environment, more energy was dissipatedas heat and thus fat accumulation was decreased. As a result, feed efficiency is typically the primary tool by which a flock is evaluated. This research is therefore designed to evaluate the response of the commercial broiler chickens in Nigerian market to tropical environment, through their performance within the experimental periods.

MATERIALS AND METHOD

Location of the experiment

The experiment was carried out in the Poultry Unit of the Teaching and Research Farm of the Federal University of Technology, Akure, Nigeria. Akure is situated on 350.52m above the sea level at latitude 70^0 14'N and at latitude 50^0 14'E. The vegetation is rainforest with characteristic hot and humid climate. The mean annual rainfall of about 1500mm with a bimodal system of rain is usually experienced.

Experimental birds and diet

Four hundred broiler chickens used for the experiment were purchased from reputable farms in Nigeria which were known to have those breeds. Four breeds of the broiler chickens were used which include Anak, Marshall, Ross and Hubbard. Each breed, serving as treatment group has one hundred birds which were separated into males and females; the sexes were replicated and subjected to the same feeding treatment. Birds were fed with formulated diets of 23% calculated crude protein, Energy of 2922.83 and crude fibre of 3.79% *ad libitum* across breeds at this stage of the trial.

Experimental birds management

All preparatory precautions were taken before the arrival of the chicks. Brooding was done at the optimum temperature for chicks' survival. Brooding and growing stages were done in the same pen to prevent bias through environmental changes in any of the breeds. Water and feed were provided to the animals *ad libitum*. Hygiene practices such as cleaning and maintenance of dry litter were given priority.

Carcass measurements

At the end of 28 birds from each breed and sex were tagged and taken at random from each treatment for carcass evaluation. The birds were starved overnight with ample supply of drinking water. Each bird was weighed separately the following morning and slaughtered by severing the jugular and carotid veins after which they were bled. A period of five minutes was allowed to elapse between bleeding and thirty minutes scalding at about 80°C. Plucking of feathers was carried out manually and carefully to avoid tearing of the skin. The weight of each bird was taken after bleeding and plucking. The plucked carcass were dissected and eviscerated by removing the internal organs, the head and the shank. The head, shank and the internal organs (i.e. proventriculus, gizzard, kidney, liver, heart and lung) were separately weighed on a sortorious top loading chemical balance and likewise the eviscerated carcass. The eviscerated carcass were then carefully cut into parts (i.e. thighs, drumsticks, breast, neck and back) and weighed separately. The respective weights of different parts of the chicken were recorded and expressed as a percentage of body live weight.

Blood collection and haematological studies

The blood samples in the bottle containing EDTA were used for haematological studies as described by Lamb (1981).

Statistical analysis

The data were analysed using the mixed model least-squares and maximum likelihood computer program (SAS, 2008)

RESULTS AND DISCUSSION

Mortality of the animals varied slightly with the breeds. Ross breed had the significant highest recorded percentage mortality at the first week of brooding; also at second week, Ross breed had the highest number of mortality followed by Hubbard. Anak and Hubbard recorded highest significant mortality at the third week of brooding. This is in consonance with the report of Awobajo*et al.*, (2007) who reported breed differences in mortality of the selected breeds of chickens. At fifth week of the experiment, Hubbard had the significant highest mortality rate among the breeds and Marshall and Ross were highest at sixth week of the experiment. This is a reflection of variation in breeds' tolerance to environmental hazard and stress. Performance records of the four different breeds in Table 2 showed that there were significant similarities in the final weight and the feed intake among the different breeds. Feed conversion ratio among the breeds are significantly the same. Olawumi and Fagbuaro (2011) reported breed differences, with some superior to others in various performances, with respect to growth and carcass performances. Response of animal to environment is usually expressed in its health status; this is shown in Table 3. The haematological parameters of the observed breeds revealed no significant ($P > 0.05$) variations among breeds except in the lymphocytes, where Anak breed (42.00±3.44) had the highest significant ($P < 0.05$) recorded lymphoid cells. The lowest significant value

recorded for lymphocytes was among Ross (33.50±2.57).Ajayi*et al.*, (2014) reported breed differences in haematological parameters of indigenous and exotic breeds of chicken in humid Nigeria. This variability may predispose them to changes in response to infection and increase mortality rate among some breeds.The mean of the carcass characteristics of the breeds of broilers at the starter phase revealedthat MarshallBreed had higher mean values for head (25.15±1.09g), shank (32.60±2.68g), drumstick (64.75±6.37g) breast (120.93±14.52g) and de-feathered weight (618.27±47.92). Recorded highest mean for thigh (69.43±3.74g) and wing (56.37±2.43g) were observed among Ross breed; while Hubbard had the highest observed weight for back muscle (85.87±14.17) and eviscerated weight (487.22±26.41). Ruzuki*et* al., (2011) and Olawumi and Fagbuaro (2011) reported significant differences in body weight and carcass parameters of broiler breeds. Organs parameters as presented in Table 6 revealed that there were significant ($P<0.05$) differences in weight of liver among the breeds. All other parameters exhibit weight rather than significant differences among the observed breeds. Highest mean for gizzard kidney, proventriculi were observed among Marshall with values of 21.80±1.06g, 6.58±0.51g and 5.60±0.72g respectively. Spleen (0.90±0.15g) and pancreas (2.67±0.24g) were highest among Hubbard.

CONCLUSION

Performance of broiler chicken is broadly genetical and environmental; in spite similar diet there were variation in the general performance of the four breeds of broilers started chickens. Performance in term of weight is better in Ross than other breeds which also have the best conversion ratio compare with other three breeds. Hubbard rate the second in performance but highest in feed intake. Marshall can be termed early maturing because at the starter phase its performance was excellently better than all other breeds but get poorer at the finishing stage. There is prospect for brood and sale farmer when Marshall birds is used for production at age four weeks than any other breeds because it will look attractive at this age to the buyer than any of the other breeds.

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Table 1 Percentage Mortality among the broiler breeds in response to the environment

Breed	Mortality				
	Week 1	Week 2	Week 3	Week 4	Total
Anak	20.00^{b}	16.67^{b}	40.00^{a}	20.00^{b}	23.08^{c}
Marshall	20.00^{b}	16.67^{b}	0.00^{c}	20.00^{b}	15.38^{d}
Ross	40.00^{a}	33.33^{b}	20.00^{b}	40.00^{a}	34.62^{a}
Hubbard	20.00^{b}	33.33^{b}	40.00^{a}	20.00^{b}	26.92^{b}
+SEM	2.61	2.51	5.00	2.61	2.09

Means with different superscripts in the same column are significantly different (P<0.05)

Table 2 Performance characteristics of the breed in response to the environment

Parameters	Anak	Marshall	Hubbard	Ross
Initial weight	26.42	26.96	26.73	30.00
Final weight	620.00	690.00	660.00	660.00
Total weight gain	593.58	663.04	633.27	630.00
Daily weight gain	21.20	23.68	22.62	22.50
Total feed intake	651.53	710.00	753.00	680.36
Daily feed intake	23.27	25.36	26.89	24.30
F.C.R	1.10	1.07	1.19	1.08

Means with different superscripts in the same column are significantly different (P<0.05)

Table 3 Haematological characteristics of four breeds of broiler chickens at 28 daysin response to the environment

Breed	PCV(%)	HBC (g/100ml)	WBC (mm×10^3)	RBC×10^{6}mm^3	NEU(%)	LYM (%)	EOS (%)
Anak	29.50±1.88	9.82±0.63	5816.70±1128.30	3.44±0.28	57.00±3.04	42.00±3.44^a	0.33±0.33
Marshall	32.33±2.42	10.83±0.79	7200.00±762.89	3.84±0.36	60.00±2.24	38.50±2.43^{ab}	0.33±0.33
Ross	29.83±1.30	9.98±0.43	7550.00±858.97	3.51±0.21	64.50±2.95	33.50±2.57^b	0.67±0.67
Hubbard	27.67±1.09	9.27±0.37	6875.00±614.51	3.16±0.15	59.00±2.53	39.17±2.30^{ab}	0.33±0.88

Means with different superscripts in the same column are significantly different (P<0.05)

PCV- packed cell volume; HBC – haemoglobin count; WBC- white blood cell; RBC – red blood cell; NEU neutrophils; LYM lymphocytes; EOS –eosinophils

Table 4 Least-squares means for carcass performance of four breeds of broiler chickens in response to the environment

Breeds	Head (g)	Neck (g)	Shanks (g)	Dsticks (g)	Tigh (g)	Wings (g)	Backs (g)	Breast (g)	Dfeawt (g)	Evscwt (G)
Anak	22.78±1.51	36.50±3.65	31.57±2.96	57.97±6.17	64.97±5.53	52.60±2.51	67.80±5.80	107.98±6.98	557.05±38.72	451.73±33.90
Marshall	25.15±1.19	36.12±2.40	32.60±2.68	64.75±6.37	66.85±6.87	54.78±3.57	76.65±6.30	120.93±14.52	618.27±47.92	416.63±92.47
Ross	23.43±0.86	34.75±2.21	31.78±1.46	59.55±3.90	69.43±3.74	56.37±2.43	69.28±3.38	116.63±9.06	599.28±25.82	475.50±23.33
Hubbard	24.30±1.25	34.50±2.04	31.62±1.18	64.53±4.21	67.97±5.19	54.18±2.41	85.87±14.17	109.80±8.00	613.23±31.15	487.22±26.41

Means with different superscripts in the same column are significantly different (P<0.05)