ISSN: 0974-5823 Vol. 7 No. 4 April, 2022

International Journal of Mechanical Engineering

EFFECT OF CHANGE IN AMBIENT TEMPERATURE AND RELATIVE HUMIDITY ON THE PERFORMANCE OF INDIGENOUS CHICKS (*Gallus gallus*) REARED IN NIGER DELTA, NIGERIA

KPEREGBEYI J. I[1] AND MEYE, J. A[2]

[1]Department of Animal Production, Faculty of Agriculture, Delta State University of Science and Technology (DSUST), Ozoro.

[2]Department of Fisheries Technology, Faculty of Agriculture, Delta State University of Science and Technology (DSUST), Ozoro

Abstract:

Most people believe that indigenous chicken (IC) production is not profitable and hence there is no need to invest in it. These beliefs are based on the knowledge that IC grow slowly and take longer time to reach maturity. However, IC have played and are still playing their role in meeting the animal protein needs of over 70 % of the populations who dwell in the rural areas of Nigeria. The study was conducted at the (DSUST), Ozoro, to determine the effect of change in ambient temperature (AT) and relative humidity (RH) on the performance of IC. A total of one hundred and fifty (150) day - old IC made up of three genotypes was used in the study. The experimental design used was Complete Randomized Design (CRD). Daily AT, RH and mortality were recorded. Determination of feed and body weight (BWT) changes were calculated. Water and feed were given *ad-libitum*. Data collected were subjected to analysis of variance (ANOVA). The results revealed the following prevailing atmospheric conditions - the mean daily AT and RH value of 34.28 ^{0}C and 96 % respectively were obtained throughout the period of the study. The results also indicated that significant differences ($P<0.05$) existed among the strains in all parameters studied. Mortality was highest (7.05 %) in normal feathered (NF) birds, (6.13 %) for frizzle feathered (FF) birds and 5.50 % least for naked neck (Nn). Therefore, it was concluded that the performance of IC under these environmental factors was low.

Keywords: Relative humidity, ambient temperature, indigenous chicken, feed intake, body weight, performance.

Introduction

Most people believe that IC production is not profitable and hence there is no need to invest in it. These beliefs are based on the knowledge that IC grow slowly and take longer time to reach maturity and that their productions are usually low. However, IC have played and are still playing their role in meeting the animal protein needs of over 70 % of the populations who dwell in the rural areas of Nigeria. They are also used as source of income (Akanji *et al.*, 2003 and Abeke *et al*, 2009). Much can be achieved in IC production if adequate care is taken to handle the climate change that affect the production process as well as adoption of some level of easy- to- practice technology. One of such easy-to-practice technology is the control of ambient conditions. Indeed improved ambient conditions hold the key to the success of IC production. This is because over 50 % of losses incurred are due to mortality especially during the early stages of chicks' life (FAO, 2004; Fairchild, 2004). These losses usually occurred due to high AT and RH, cold, disease, poor feeding, predators (from cats' and hawks), theft, trampling and drowning etc.

Effective AT and RH control ensure that the chicks are well protected from harsh weather, they are well fed and adequate healthcare provided in such a way that their survival is enhanced. The result will be the production of healthy starting pullets and cockerels with a promising future.

Unfortunately, due to global climate changes, the IC and other farm animals' producers decried that high AT and RH experienced by their flock had caused high mortality rate and lower their productivity. The objective of this study therefore is to determine the effect of changes in AT and RH on the performance of IC as reared in Niger Delta and proffer solutions.

Materials and methods

The study was conducted at the Poultry research center (PRC) situated in the school farm, DSUST, Ozoro. It falls within the rain forest vegetation zone of mid-western Nigeria on Latitude 5^0 32^I N and Longitude 6^0 15^I E of the Greenwich meridian The area is characterized by a humid climatic condition with annual rainfall value ranging between 2500 and 3000 mm. The mean temperature and RH values are 34^0C and 96 %, respectively (DSUST Meteorological Station Ozoro, 2021).

One hundred and fifty (150) day – old IC consisting of fifty (50) each of NF, FF and Nn were used for this study. The chicks were purchased from Abeokuta hatchery in Ogun State, Nigeria.

The birds received the necessary medical attention throughout the experimental period. Routine hygiene was practiced by provision of clean water, dry feed; regular cleaning of the house, careful physical examination of the chicks was carried out every day so as to quickly detect abnormal behaviour, signs of symptoms of any disease conditions. Sick chicks were isolated and dead chicks removed and buried and visitors to the poultry house were highly restricted.

The chicks were fed commercial chicks mash. Feed and water were given *ad libitum.* The crude protein (CP) content was 20% and the energy (ME) content value was 2640 kcal/kg. The experimental period was eight (6) weeks (April 1st – May 14th 2019). At the commencement of the experiment, the chicks were weighed to obtain their initial weights. CRD was used as experimental design. Daily AT and RH values were recorded with digital thermometer and hygrometer respectively. Mortality was also recorded. These were done thrice daily (8.00 am, 12.00 noon and 5.00 pm). BWT and linear body measurements (LBM) taken weekly for each of the sample birds include: comb length (CL), neck length (NL), wing length (WL), keel length (KL), breast girth (BG), thigh length (THL), shank length (SL), toe length (ToL) and BWT. BWT values were taken using a platform scale while LBM were taken according to the methods described by Solomon 2009 using fibre tape calibrated in centimeters (cm). Descriptions of how LBM were taken are as follows.

1. **CL**: Total length of part of the head the comb covered.
2. **NL:** This is the length of the axial skeleton from the first to the last *cervical vertebrae.*
3. **WL:** The length between the scapula and the tip (second *digits phalanges*) of the wing.
4. **KL:** Taken as the length of the sternum or breast plate.
5. **BG:** This was taken as the circumference of the breast around the deepest region of the breast. A tape rule was used in taking the measurement. THL measured as the distance between the hock joint and pelvic joint.
6. **SL:** Measured as the distance between the mid region of the *Genus* and that of the *Regiotarsalis.*
7. **ToL:** The length between the hind region of *RegioTarsalis* and the outside of the *Digital Tedis* (Mid digit) (Molenaar, *et al.,* 2008)

Determination of feed and weight gain parameters were calculated. Daily mean AT and RH were also determined. BWT and LBM data collected in this study were subjected to ANOVA (Steel and Torrie, 1980) and significantly different means were separated by using the procedure of SAS (2005).The model for the ANOVA was represented as:

Model: Yijk = μ+ai+eijk

Yijk = body weight measurements.

μ. = overall mean

ai = effect of the ith genotype (i = 1,2,3 and 4).

Eijk = random error

Results

The BWT, feed intake (FI) and feed cost analysis of IC are presented in Table 1. There were significant ($p < 0.05$) differences among the genotypes in all the parameters studied. Mortality was highest (7.05 %) in NF birds, followed by FF birds (6.13 %). The final BWT among the IC were 158.13 g, 152.50 g and 203.95 g for NF, FF and Nn respectively.

Mean weekly linear body parameters measured are as presented in Table 2. CL values ranged from 0.62 to 2.42 cm with a mean of 1.52 cm for NF, and 0.59 to 1.38 cm with a mean of 0.99 cm for FF birds while Nn ranged from 0.50 to 1.38 cm. NL values ranged from 0.67 to 2.40 cm with a mean of 1.54 cm for FF and 3.91 to 7.79 cm with a mean of 5.85 cm for Nn birds respectively. WL values ranged from 3.15 to 9.81 cm with a mean of 6.48 cm for NF, followed by FF (3.01 to 10.37 cm) with a mean of 6.69 cm and 4.00 to 10.35 cm with a mean of 7.18 cm for Nn respectively. KL values ranged from 1.38 to 2.94 cm with a mean of 2.16 cm for NF, 1.30 to 2.86 cm with a mean of 2.08 cm for FF and Nn had a ranged from 2.00 to 7.24 cm with a mean of 3.12 cm. BG values ranged from 0.70 to 2.68 cm with a mean of 1.69 cm for NF, followed by FF which ranged from 0.60 to 2.61 cm with a mean of 1.61 cm and 2.57 to 5.68 cm with a mean of 4.12 cm for Nn. The mean THL values ranged from 2.34 to 9.81 cm with a mean of 6.07 cm for NF while the values ranged from 2.31 to 8.20 cm with a mean of 5.25 cm for Nn.

Results in Table 2 showed that the Nn birds had better mean values in all the traits measured compared to their counterparts at six (6) weeks of age. The prevailing weather conditions are presented in Figure 1. AT ranged from 29 ^{0}C to 34 ^{0}C while RH ranged from 75 to 96 %. The growth performance of the IC during the experimental period is shown in Figure 2 and 3.

The regression equations and coefficient of determination (R^2) of AT on some growth parameter and mortality in IC are presented in Table 3. The R^2 values indicate that the analysis of variance accounted for 0.2, 1, 1.3, 2.2, 3.5 and 1.4 per cent of the variance in CL, NL, WL, KL, THL and mortality respectively.

A significant ($P<0.05$) negative correlation was obtained between BWT and BKL for grower birds (-0.68 and -0.46) except for starter birds in (NF, FF and Nn) and between BWT and WL (-0.31) for grower in FF birds. Morphometric traits measured in starter birds were significantly ($P<0.05$) correlated with BWT (0.07-0.81) for NF (0.04-0.92) for FF and (0.05-0.97) for Nn (Table 4). Correlation estimates between BWT and morphometric traits in grower birds were generally higher (0.39-0.98) than estimates obtained for starter birds (Table 4). Correlation between morphometric traits and BWT in male birds were generally higher (0.95) than in female (0.82) NF, FF and Nn genotypes chickens

Discussion

The weight gain (WG) obtained in this study revealed that the daily weight gain (DWG) of IC values of 3.10 g and 4.13 g for NF and Nn are in conformity with those of Adeleke *et al*., (2011) who reported DWG of 4.17 g per bird for starter pullets, which is higher than 3.10 g per bird per day for egg-laying chickens reported by Oluyemi and Roberts (2003).. Average daily feed intake (DFI) of IC in the present study (136.08 g to 143.07 g) per bird per day were lower than those observed by Adebambo *et al*. (2008) for starter pullets (239.61 to 241.58 g) per bird per day and 285.03 g per day per bird for six (6) weeks by Chatterjee *et al*. 2007a; Peters *et al*., 2008a. This difference could possibly be due to high AT and RH and region. The results of feed conversion ratio (FCR) revealed that Nn birds utilized their diets more efficiently than NF and FF. Adebambo *et al*. (2008) also reported similar observation on feed efficiency (FE) indicating that indigenous birds on the same diet consumed more feed than the exotic birds hence a higher feed cost (FC) per kg gain. This finding is consistent with the report of Chatterjee *et al*. (2007a) that IC consumed more than the exotic. NF and FF birds were the poorest in terms of economy of the production by gaining 130.04 g and 128.23 g of BWT consuming 6008.94 g and 5884.20 g of feed to attain 158.13 g and 152.50 g of live BWT at 6 weeks of age. The Nn birds were the best consuming 5715.36 g of feed to attain live BWT values of 203.95 g. The higher FI by NF could not be converted to BWT and can therefore not fit into high degree of specialization which permits optimum FI and utilization for productive purpose. The weight gain of Nn was higher than NF and FF. Nn had the highest weight gain of 173.64 g per bird. This finding agreed with the report of Udeh (2010). The DWG in this study are in line with values in literature (Ndofor, 2003; Oluyemi and Roberts, 2003; Udeh, 2010). FC per unit WG with Nn birds were lower compared to NF and FF. However, the results showed that ICs kept under intensive management system (IMS) are subjected to high RH above 70 %. This provides environmental conditions suitable for microbial growth in the litter. Ammonia concentrations as low as 25 ppm for the first 25 days can have a negative effect on BWT at both 4 and 7 weeks of age (Mile *et al.*, 2004). Habit of panting was frequently observed among the IC because the level of RH influences the ability of the bird to cool itself and influences ammonia production.

However, the heavier BWT recorded for the Nn chicks could be attributed to its superiority in terms of KL and BG which suggest its potential for meatiness (Fayeye*et al*., 2006). Also the Nn chicks may have had more muscles and meat in the thigh region although they were not as long as those of the FF and NF chicks during the period of this study. Again, from the results presented in Table 1, it is clear that the superiority of the Nn chicks over NF and FF chicks were both on BWT and other body parameters which account for meatiness. This reveals that KL and BG are more associated with development of meat and muscles since KL and BG are indicators of meatiness in poultry species (Adebambo *et al* 1996; Ikeobi and Godwin 1999; Fayeye *et al*, 2006). The early growth of the comb of Nn could be a sign of earlier sexual maturity when compared to the NF and FF chicks with longer thigh as they mature whereas the Nn chick grew slower at the thigh and increased in KL and BG consistently throughout the period under study. The development determines to a great level the BWT of the animal. Though the NF and FF chicks had longer thigh (Drum sticks), it did not contribute to higher live WG. This is probably due to the fact that the chicks did not build flesh around the thigh.

AT and RH on IC were above their comfort zone from day – old to 42 days of age. The findings revealed that as AT and RH increased, it affects FI level and this result to slow growth and development of the birds. Despite this, Nn birds were able to tolerate high body temperature and RH to maintain their comfort zone throughout the period of the study. The results revealed that Nn birds ultimately utilized and gained energy from the feed consumed, and this enhanced rapid growth and development of the Nn birds over their counterparts. (Czarick *et al* (2001) and Fairchild *et al.*, (2004) both reported that when birds are kept in environmental temperature above or below their comfort zone, more energy must be expended to maintain body temperature. It was observed that the month of November supposed to be harmattan period but it rained throughout the period of study. This increased the RH that affected the performance of the birds in terms of climate changes.

The differences in BWT and LBM between Nn birds and their counterparts may be attributed to environmental factors. NF and FF birds exhibited low live weight and LBM due to high environmental temperature and RH. The chicks expended more energy to maintain body temperature, this extra energy will be ultimately be supplied by the feed consumed. The energy supplied by the feed will be used to maintain body temperature instead of growth and development. R^2 values indicate that the ANOVA accounted for 0.2, 1, 1.3, 2.2, 3.5 and 1.4 per cent of the variance in CL, NL, WL, KL, THL and mortality respectively. These figures thus suggest that AT that is more than 30^0C influence growth parameters and mortality, thus corroborating the report of other workers who observed impairment in growth at AT of 30ºC and above.

BL and CL had higher correlation when compared to the other morphometric measurements (MM) in the three genotypes for grower birds. The differences between NF, FF and Nn for starter and grower genotypes chicken in MM were not similar to the results of MM in birds of different genotypes (Islam and Dutta, 2010; Ogah, 2013).

Conclusion

The IC genotypes used for this study showed potentials for growth and development if the effects of climate changes can be handled properly. The impact of high AT and high RH in IC buildings in ambient conditions encountered during dry season is very critical. According to results it was noted that lack of environmental condition control with high stocking density added to high AT and very high RH. These conditions denote a situation of chronic heat stress which has strong impact on growth and physiology of birds' performance which gives by consequences, low scale weight and high mortality rate. The effect of high AT and low humidity has an impact at the level of digestive morphometry (Areila *et al.*, 2018).

Acknowledgement

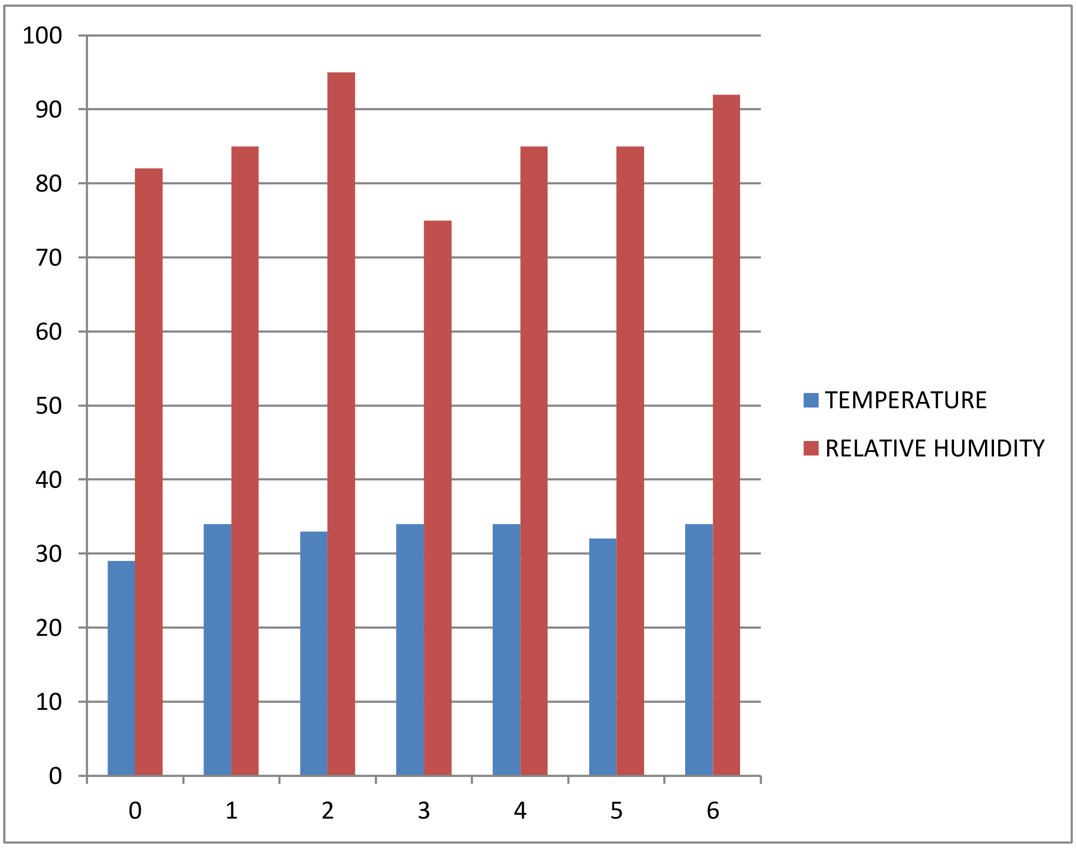
The authors are thankful to the Vice-chancellor, Prof. J.S. Oboreh and Director of Poultry Research Centre (PRC) of the DSUST, Ozoro, for providing space needed for this investigation. Also our regards goes to the management of Tetfund for granting us research grant to carry out this research successfully.

Table 1: Feed intake, body weight and cost per kg body weight gain of indigenous chickens' genotypes.

Parameters	NF	FF	Nn
Initial weight (g/bird)	28.09 ± 1.48^{b}	24.27 ± 1.35^{c}	30.31 ± 3.74^{a}
Final weight (g/bird)	158.13 ± 29.26^{b}	152.50 ±16.30^{c}	203.95 ± 56.60^{a}
Weight gained (@ 6 weeks)	130.04 ± 2.00^{b}	128.23 ± 3.42^{b}	173.64 ± 2.41^{a}
Daily weight gain (g/bird)	3.10 ± 0.04^{b}	3.05 ± 0.03^{b}	4.13 ± 0.02^{a}
Daily feed intake (g/bird)	143.07 ± 0.12	140.10 ± 0.15	136.08 ± 0.10
Total feed intake	6008.94 ± 4.17	5884.20 ± 4.32	5715.92 ± 5.60
Feed conversion ratio (FCR)	46.21 ± 0.24	45.89 ± 0.27	32.92 ± 0.08
Feed cost per kg (₦)	3.09 ± 0.02	3.02 ± 0.02	2.93 ± 0.03
Total cost of feed consumed (₦)	442.09 ± 1.80	423.10 ± 1.74	398.71 ± 1.86
Feed cost per kg gain (₦)	142.61± 3.15	138.72 ± 3.08	96.54 ± 3.00
Feed efficiency	0.01 ± 0.00	0.92 ± 0.00	1.28 ± 0.00
Mortality (%)	7.05 ± 0.09^{a}	6.13 ± 0.09^{a}	5.50 ± 0.08^{a}

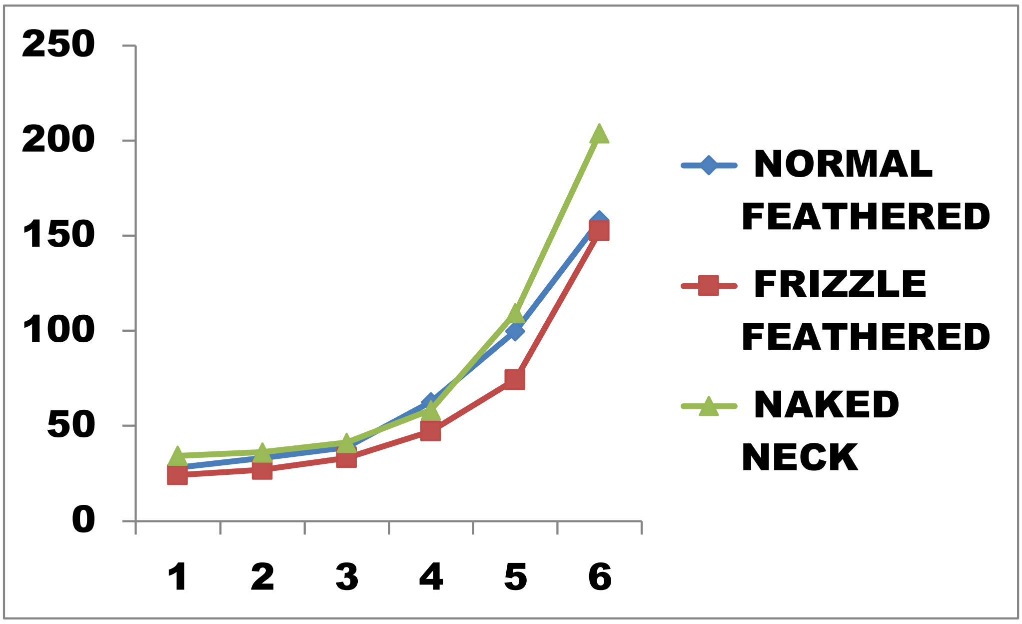
Means in the same row with different superscript differ significantly (P<0.05).

Source: Field work 2021



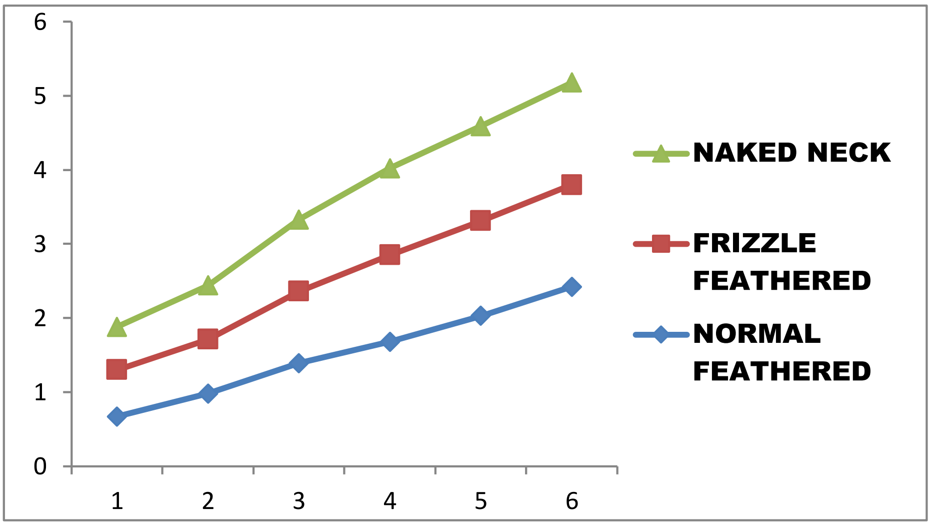
Source: Field work 2021 **Weeks of age**

Figure 1: Frequency distribution bar – chart of weekly AT and RH at the PRC of DSUST, Ozoro.



Source: Field work 2021

Figure 2: Growth pattern of body weight of indigenous chicks



Source: Field work 2021

Figure 3: Growth pattern of comb length of indigenous chicks

Table 2: Weekly mean LBM of indigenous chicks

		Weeks						
Genotype	**Variable**	**0**	**1**	**2**	**3**	**4**	**5**	**6**
NF	CL	0.62 ± 0,09^{a}	0.67 ± 0.01^{a}	0.98 ± 0.03^{a}	1.39 ± 0.13^{a}	1.68 ± 0.02^{a}	2.03 ± 0.04^{a}	2.42 ± 0.10^{a}
FF		0.59 ± 0.08^{b}	0.63 ± 0.09^{b}	0.73 ± 0.01^{b}	0.97 ± 0.01^{b}	1.17 ± 0.01^{b}	1.28 ± 0.08^{b}	1.38 ± 0.09^{b}
Nn		0.50 ± 0.09^{c}	0.58 ± 001^{c}	0.73 ± 0.09^{c}	0.97 ± 0.08 ^{b}	1.17 ± 0.01^{b}	1.28 ± 0.08^{b}	1.38 ± 0.09^{b}
NF	NL	0.60 ± 0.02^{c}	0.65 ± 0.05^{c}	0.94 ± 0.05^{c}	1.30 ± 0.02^{c}	1.75 ± 0.07^{b}	2.09 ± 0.02^{b}	2.47 ± 0.09^{b}
FF		0.67 ± 0.06^{b}	0.71 ± 0.01^{b}	1.10 ± 0.09^{b}	1.45 ± 0.06^{b}	1.76 ± 0.06^{b}	2.09 ± 0.01^{b}	2.40 ± 0.05^{b}
Nn		3.91 ± 0.08^{a}	3.97 ± 0.05^{a}	4.71 ± 0.06^{a}	6.18 ± 0.03^{a}	7.01 ± 0.06^{a}	7.56 ± 0.05^{a}	7.79 ± 0.08^{a}
NF	WL	3.15 ± 0.08^{b}	3.19 ± 0.01^{b}	4.32 ± 0.03^{b}	6.14 ± 0.07^{b}	8.22 ± 0.06^{b}	9.24 ± 0.02^{b}	9.81 ± 0.05^{a}
FF		3.10 ± 0.09^{b}	3.15 ± 0.03^{b}	4.28 ± 0.08^{b}	6.19 ± 0.03^{b}	8.29 ± 0.02^{b}	9.35 ± 0.03^{b}	10.37 ± 0.06^{a}
Nn		4.00 ± 0.02^{a}	4.04 ± 0.04^{a}	6.25 ± 0.04^{a}	8.27 ± 0.06^{a}	9.37 ± 0.09^{a}	10.23 ± 0.04^{a}	10.35 ± 0.01^{a}
NF	KL	1.38 ± 0.08^{b}	1.40 ± 0.02^{b}	1.57 ± 0.02^{b}	1.85 ± 0.02^{b}	2.24 ± 0.01^{b}	2.64 ± 0.06^{b}	2.94 ± 0.08^{b}
FF		1.30 ± 0.06^{c}	1.41 ± 0.07^{b}	1.58 ± 0.01^{b}	1.87 ± 0.09^{b}	2.16 ± 0.07^{b}	2.53 ± 0.05^{b}	2.86 ± 0.06^{b}
Nn		2.00 ± 0.08^{a}	2.06 ± 0.03^{a}	4.93 ± 0.06^{a}	4.93 ± 0.06^{a}	6.29 ± 0.08^{a}	6.90 ± 0.06^{a}	7.24 ± 0.02^{a}
NF	BG	0.70 ± 0.07^{b}	1.12 ± 0.01^{b}	1.25 ± 0.01^{b}	1.55 ± 0.01^{b}	1.94 ± 0.01^{b}	2.34 ± 0.03^{b}	2.68 ± 0.08^{b}
FF		0.60 ± 0.02^{c}	0.65 ± 0.07^{c}	1.17 ± 0.05^{b}	1.50 ± 0.03^{b}	1.87 ± 0.05^{b}	2.26 ± 0.06^{b}	2.61 ± 0.07^{b}
Nn		2.57 ± 0.06^{a}	2.60 ± 0.03^{a}	3.48 ± 0.01^{a}	4.61 ± 0.01^{a}	5.05 ± 0.04^{a}	5.46 ±0.02^{a}	5.68 ± 0.09^{a}
NF	THL	2.34 ± 0.01^{b}	2.36 ± 0.01^{b}	2.53 ± 0.08^{b}	4.52 ± 0.09^{b}	4.82 ± 0.05^{b}	7.42 ± 0.03^{b}	8.60 ± 0.02^{a}
FF		2.31 ± 0.04^{b}	2.40 ± 0.03^{b}	2.57 ± 0.02^{b}	4.34 ± 0.06^{c}	6.24 ± 0.03^{a}	9.52 ± 0.02^{a}	9.81 ± 0.08^{a}
Nn		3.30 ± 0.08^{a}	3.39 ± 0.01^{a}	4.05 ± 0.03^{a}	4.78 ± 0.06^{a}	5.78 ± 0.06^{a}	10.23 ± 0.04^{a}	10.35 ± 0.09^{a}
NF	SL	2.20 ± 0.01^{b}	2.25 ± 0.01^{b}	2.42 ± 0.05^{b}	2.73 ± 0.08^{b}	3.03 ± 0.05^{b}	3.46 ± 0.03^{b}	3.80 ± 0.09^{b}
FF		2.20 ± 0.08^{b}	2.28 ± 0.01^{b}	2.49 ± 0.03^{b}	2.78 ± 0.07^{b}	3.10 ± 0.02^{b}	3.48 ± 0.02^{b}	3.86 ± 0.03^{b}
Nn		2.58 ± 0.03^{a}	2.62 ± 0.04^{a}	3.13 ± 0.02^{a}	3.76 ± 0.05^{a}	4.15 ± 0.05^{a}	4.60 ± 0.09^{a}	4.90 ± 0.05^{a}
NF	TL	1.30 ± 0.03^{b}	1.37 ± 0.03^{b}	1.64 ± 0.06^{c}	1.98 ± 0.01^{c}	2.40 ± 0.08^{a}	2.79 ± 0.08^{b}	3.09 ± 0.03^{b}
FF		1.30 ± 0.05^{b}	1.36 ± 0.02^{b}	1.72 ± 0.07^{b}	2.05 ± 0.09^{b}	2.35 ± 0.02^{a}	2.72 ± 0.09^{b}	3.05 ± 0.05^{b}
Nn		1.70 ± 0.08^{a}	1.79 ± 0.01^{a}	2.57 ± 0.01^{a}	2.60 ± 0.06^{a}	2.90 ± 0.07^{a}	3.14 ± 0.03^{a}	4.90 ± 0.03^{a}

Means in the same column with different superscript differ significantly (P<0.05).

Source: Field work 2021

Table 3: Regression coefficients of AT on some growth parameters and mortality in IC

Variables	**Parameter estimate B**	**SE**	**Regression equation**	**R^2 (%)**
CL (cm)	-.06	.18	Y= 5.11- (.06) x	.23
	5.11	4.25		
NL (cm)	.14	.19	Y= .36 + (.14) x	1.05
	.36	3.42		
WL (cm)	1.14 – 0.4	1.63 - .04	Y= .05 + (1.14 – 0.4) x	1.30
	.05	.01		
KL (cm)	-.02	.02	Y= .50 – (.02) x	2.20
	.50	.43		
THL (cm)	-.08	.08	Y= 34.62 – (.08) x	3.51
	34.62	2.26		
Mortality (%)	-3.54	3.00	Y= 140.01 – (3.54) x	1.42
	140.01	86.70		

Values on top are the regression coefficient while those values below are for the constant

Source: Field work 2021

Table 4: Effect of AT and RH on the BWT and morphometric measurements

	STARTER			GROWER			SEX	
Trait	**NF**	**FF**	**Nn**	**NF**	**FF**	**Nn**	**M**	**F**
CL	0.79*	0.92*	0.97*	0.86*	0.88*	0.98*	0.95*	0.82*
BKL	0.58*	0.51*	0.71*	-0.68*	-0.05	-0.46*	-0.78*	0.61*
HL	0.67*	0.86*	0.69*	0.68*	0.28*	0.72*	0.76*	0.65*
NL	0.64*	0.67*	0.72*	0.72*	0.76*	0.95*	0.89*	0.77*
WL	0.07	0.04*	0.05*	0.32*	0.31*	0.55*	0.93*	0.86*
SL	0.70*	0.65*	0.76*	0.45*	0.71*	-0.26	0.52*	0.22*
TL	0.74*	0.72*	0.79*	-0.06	0.35*	0.63*	0.91*	0.83*
TOL	0.66*	0.69*	0.74*	0.69*	0.72*	0.81*	0.51*	0.24*
BRL	0.76*	0.03	0.79*	0.69*	0.58*	0.84*	0.74*	0.49*
BRW	0.81*	0.75*	0.85*	0.40*	0.37*	0.39*	-0.01	0.18

*Significant ** Highly Significant ((P<0.05)

REFERENCES

1. Abeke, F.O. 2009. Improved techniques of home stead egg hatching and artificial brooding of local chickens. *Proceedings of 34th Annual Conference NSAP Uyo, Nigeria* March 15th – 18th, 2009 Pp. 315 – 317.
2. Adebambo, O.A., Ikeobi, C.O.N., Ozoje, M.O, Adenowo, J.A and Osinowo, O.A 1996.Variation in qualitative traits and their effects on the performance of local ducks and Turkeys. *Nigerian Journal of Genetics* 11::20 -23.
3. Adebambo, O.A, Ikeobi, C.O.N., Ozoje, M. Oduguwa,O.O.,Adebambo,Olufunmilato O.A. 2008.Genetic variations in feed efficiency among pure and crossbred meat type chickens. *Nigerian Poultry Science Journal* 5(2):61-69.
4. Adeleke,M.A.,Peters,S.O.,Ozoje,M.O.,Ikeobi,C.O.N.Bamgbose, A.M. and Olufunmilayo, A. Adebambo 2011. Genetic parameter estimates for body weight and linear body measurements in pure and crossbred progenies fo Nigerian indigenous chickens. *Livestock Reasearch for Rural Development* 23(1): 1-8
5. Akanji, A.M., Ologhobo, A.D. Emola, I.A; Adedeji T.A; and Adedeji O.S., 2003. The effects of processing on haemagglutinm and other anti-nutritional factors in jackbeans (can awaliaensiforms) (L) (DC) *Proc. 2877*L *Ann. Conf. NSAP, Ibadan, Nigeria Pp. 189-193.*
6. Areila, J.C.K. Tinoco, D.F.F, Saraz, J.A.O, Rocha, K.S.O. Candide, N.G.L (2018). Z00technical and physiological performance of broilers in the final stage of growth subjected to different level of heat stress. *Magazine National Faculty of Agronomy Medallin* 71 (2): 8469-8476
7. Chatterjee, R.N.Rai,R.B., Kundu,A., Senani,S.,Sunder,J. 2007a Egg quality traits of indigenous breeds of chicken of Andaman. *Indian Veterinary Journal.*84:206 -208
8. Czarik, M., and M.P. Lacy, 2001. Heating System Thermostat/Sensor location, November. University of Goergia Comparative Extension Service.
9. Delta State University of Science and Technology Meteorological Station Report, Ozoro, 2021
10. F.A.O. (Food and Agricultural Organization) 2004. Small Scale poultry production Technology Guide F.A. Animal Production and Health Manual, Rome, F.A.O. 119 pp.
11. Fayeye, T.R; Ayorinde, K.L; Ojo, V. and Adesina, M.O. 2006. Frequeny and influence of some major genes and body weight and body size parameters of Nigeria Local Chickens. Livestock Research for Rural Development 18 (3) 2006.
12. Fairchild, B.D., 2004. Poultry Housing Tips University of Georgia Cooperative Extension Service of Environment Factors to control when brooding chicks B. 1287.
13. Ikeobi, CON; Ozoje, M.O; Adebambo, O.A. and Adenowo, J.A. 1998. Modifier genes and their effects in the Nigeria Local Chickens: Philopody and comb type. *Proc. Of 6th World Cong. Genet Appl. Livest. Prod., 24:318-321.*
14. Islam M.S. and Dutta R.K. (2010). Morphometric analysis of indigenous, exotic and crossbred chickens (Gallus domesticus) in Rajshahi. Bangladesh J. Biosciences. 18, 94-98.
15. Molenaar,R.,Reijrink,I.A.M.,Meijerhof,R and Van Den Brand,H.2008 Relationship between hatching length and weight on later productive performance in broilers. *World's Poultry Science Journal*. 64(4):599-603.

16. Mile, and Fairchild B.D. 2004. Relation humidity and Ammonia level in poultry house during chicks. Brooding B.1287.
17. Ndofor, H.M 2003. Estimation of genetics parameters of growth traits of local ecotypes reared in the derived Savannah area of Nsukka .M.Sc. Dissertation University of Nigeria. Nsukka
18. Ogah D.M. (2013). Canonical discriminant analysis of morphometric traits in Indigenous chicken genotypes. *Trakia J. Sci.* 2, 170-174. SPS

19. Oluyemi, S.O., Roberts, F.A. 2003 *Poultry production in warm wet climates* 2nd edition spectrum Books limited Ibadan, Nigeria. Pp 105-110.
20. Peters,S.O., Ilori,B.M., Ozoje,M.O., Ikeobi, C.O.N and Adebambo,A.O.2008a.Gene segregation effects on fertility and hatchability of pure and crossbred chicken genotypes in the humid tropics. *International .Journal of Poultry Science* (10):954-958 SAS, 2005. SAS Users Guide: Statistics released version 8.0 Statistics Analysis System Institute, Inc, Cary, NC, USA
21. Udeh,I 2010. Mode of inheritance and interrelationship among Age at First Egg, Body Weight at First Egg and Weight of First Egg in Local by Exotic inbred Chicken Crosses. *International Journal of Poultry Science* 9 (10):948- 953.