EFFECTS OF LOCATION ON REPRODUCTIVE AND GROWTH PERFORMANCE OF TIV CHICKEN ECOTYPE

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Abstract
This study was conducted to assess the effect of location on the reproductive and growth performance of Tiv chicken ecotype. 55 birds (10 hens and 1 cock) were purchased from 5 localities and used as based population. The birds were housed base on their location and allowed to freely mate at a ratio of one cock to 10 hens. Fertile eggs were collected 4 weeks after onset of laying to achieve optimum fertility. The eggs collected were labelled with a marker according to their location and set for hatching in an automatic incubator. Parameters measured include: Fertility, embryonic mortality, hatchability and reproductive capacity (reproductive trait) as well as hatch weight, weekly body weight, body weight gain, growth rate and chick mortality rate for growth trait. Data collected was analysed using one way analysis of variance (ANOVA) procedure of SPSS statistical software 2011 version. The result obtained from this study showed that location had significant (P<0.05) effect on hatch weight, weekly body weight, growth rate (at week 0-1, 5-6 and 6-7) and mortality rate. However, locations had no significant (P>0.05) on reproductive parameters except fertility and infertility which were significant. From the finding of this research it was recommended that selection of Tiv local chicken should be location based especially for those parameters where location had significant effect.
Key word: Growth rate, hatchability, incubation, mortality rate, reproductive capacity.

Introduction
Chicken is one of the cheapest sources of animal protein available for human consumption but its performance is dependent on environmental and climatic conditions. The level of performance of local chicken especially Tiv ecotype chicken does not depend only on inherited capacity but, also to a great extent upon the environment they were raised (Gwaza *et al.*, 2015). Birds of different breeds/strains and of different age, sex, stage of production, and reproduction respond differently to locations. Classification of genetic resources of the Nigerian local chickens' ecotypes base on geographical location appears to be biased estimates of the genetic diversity (Pimm and Lawton, 1988) of local chicken genetic resources of Nigeria. The objective of the study was to investigate variations in the reproductive and growth performance of TiV chicken ecotypes base on location.

Materials and Methods
The experiment was carried out at the Livestock Teaching and Research Farm of the Faculty of Agriculture, Shabu-Lafia Campus, Nasarawa State University, Keffi. 11 birds (10 hens and 1 cocks) were purchased from five randomly selected localities namely: Uikpan, Daudu, Kadarko, Yelwata and Cohor all in Benue State respectively. The birds were housed according to location for four weeks for quarantining and acclimatization. Fertile eggs for hatching were collected after four weeks from onset of laying. This was aimed at obtaining higher fertility and hatchability. The birds were fed formulated diet. Feed and water was provided ad-libitum. Hatching eggs were collected twice (morning and evening) every day and were identified using marker according to localities. The eggs were accumulated for 5 days and set for pedigree hatching in an automatic electric incubator. On hatching, chicks were brooded according to their localities in separate pen. The brooding house and experimental pens were thoroughly cleaned, scrubbed and disinfected using Vinkokil and allowed to fallow for two weeks before the arrival of the chicks. Brooding was carried out for a period of 21 days (3 weeks) using stoves and electric bulbs as sources of heat and illumination. Wood shavings were used at a sufficient depth (5cm) as litter materials.

Parameters that were measured

Reproductive Traits:

Fertility: fertility was determined based on total egg set. Percentage fertility was expressed as: $\frac{\text{Number of fertile egges}}{total\ \ egg\ set} x \frac{100}{1}$

Hatchability: This was expressed on the basis of fertile eggs and total eggs set. Percent hatchability on fertile egg = $\frac{number\ of\ hatced\ chicks}{total\ fertile\ egg} \text{X} \frac{100}{1}$

Percent hatchability base on total egg set (reproductive capacity) $= \frac{number\ of\ hatced\ chicks}{total\ egg\ set} X \frac{100}{1}$

Embryonic Mortality: This is the fertilized embryo that died before hatching. Embryonic mortality was measured at two levels, early and late mortality. Early embryo mortality was determined by candling at 14th day from the onset of incubation to ascertain fertilized eggs that died at that stage. After hatching, eggs that does not develop into full chick or developed into full chick but the chick died before hatching will be term late embryo mortality.

Percent early embryonic mortality = $\frac{Number\ of\ dead\ embryo\ at\ day\ 14}{Total\ no.of\ Fertile\ eggs} x \frac{100}{1}$

Percent late embryonic mortality = $\frac{Number\ of\ dead\ embryo\ from\ day\ 14\ till\ hatched}{Total\ no\ of\ fertile\ eggs} x \frac{100}{1}$

Growth Traits

Body weight: Live body weights were measured at hatch using sensitive electronic scale and then at week 1 to 8 respectively.

Body Weight Gain: Average daily gains (ADG) were estimated using the formula: $\frac{W2-W1}{N}$ Where W2 is the present weight, W1 is the initial weight and N is the number of days taken from initial weight to the present weight.

Growth Rate: Absolute growth rate were determined from the weekly body weight changes using the formula: Growth Rate = $\frac{W2-W1}{W2}$ X100. Where W2 is the present weight, W1 is the initial weight.

Mortality Rate: The percentage mortality was estimated on weekly basis till eight week of age. This was estimated using the formula: Mortality rate = $\frac{No.of dead\ chicks\ over\ the\ week}{No.of\ chicken\ at\ the\ begining\ of\ the\ week} x \frac{100}{1}$

Experimental Design and Data Analysis

The design of the experiment was Completely Randomized Design (CRD). Data collected on all the parameters of reproductive traits and growth Performance were analyzed using the one way Analysis of Variance (ANOVA) procedure of SPSS statistical software 2011 version.

Results and Discussion

The effect of location on reproductive performance of Tiv local chicken is presented in table 1. The study revealed that location had no significant (P>0.05) effect on reproductive parameters except fertility and infertility as similarly reported by (Gwaza *et al.*, 2015). The mean value of fertility (88.00-100.00) obtained in this study is slightly higher than 77.75±6.28% reported by Gwaza *et al.* (2015) as the fertility for Tiv chicken ecotype. The value is also higher than 83.0-92.7% and range of 79.65±0.45% for normal feathered to 86.65±0.07% for Fulani ecotype reported by Islam and Nishibori, (2009) Amao (2017). The early embryonic mortality (5.17 – 14.24%) and late embryonic mortality (3.71-14.31%) are respectively lower than 14.90% reported by Gwaza *et al.* (2015). Hatchability ranges between 76.79-86.21% for the 5 locations is within the range of 52.4 -87.0%, 72- 93.1% and 85.07+8.90% reported by Islam and Nishibori, (2009), Ajayi *et al.* (2008) and Amao, (2017).

The average body weight as presented in table 2 indicated that location had significant (P<0.05) effect on hatch weight and weekly body weight of Tiv local chicken. The range of 22.54±0.56g to 24.33±0.45 at week 0 strongly agree with the value of 23±1.6g reported by Adedokun and Sonaiya (2001) but lesser

than 30.23±0.06g reported Momoh (2005) as body weight at hatch. However at week 4, the mean body weight value of 58.77±1.74g to 69.00±2.74g is far lesser than 104±14.5g and 157.16±0.45 reported by Adedokun and Sonaiya (2001) and Momoh (2005). Also at week 8, the value of 141.59±4.94 to 185.58+6.56g obtained in this study is slightly lesser than 262±4.8g and 349.88±3.01g for week 8 as reported by Adedokun and Sonaiya (2001) and Momoh (2005). These observed differences could be due to environment, season, management practice, breed and selection among others.

Table 1: Effects of location on the reproductive performance of Tiv Local Chicken Ecotype

Location	Fertility	Infertility	EEM	LEM	Hatchability	Reproductive Capacity
1	100.00±0.00^{a}	0.00±0.00^{a}	9.30±3.74	11.48±5.92	79.23±9.66	79.23±9.66
2	93.93±3.71^{ab}	6.07±2.63^{ab}	8.33±1.19	7.75±2.96	76.79±8.93	71.89±6.37
3	100.00±0.00^{a}	0.00±0.00^{a}	5.88±5.88	14.31±8.43	79.81±2.54	79.81±2.54
4	88.00±1.27^{b}	12.00±0.09^{b}	14.24±7.99	3.71±3.71	85.19±14.82	75.09±13.80
5	92.09±6.48^{ab}	7.91±4.59^{ab}	5.17±5.17	8.62±8.62	86.21±13.80	78.75±8.75
LOS	*	*	NS	NS	NS	NS

EEM = Early embryonic mortality, LEM = Late embryonic mortality, LOS = Level of significant, NS = Not significant, * = Significant at 5% level of probability ^{ab} = mean along the same column with different superscripts are significantly (P<0.05) different

Table 2: Effects of location on average weekly body weight of tiv local chicken ecotype

Location	1	2	3	4	5	LOS
Week 0	23.50±0.54^{ab}	24.33±0.45^{a}	22.95±0.65^{ab}	22.69±0.62^{ab}	22.54±0.56^{b}	*
Week 1	36.32±0.85	34.72±0.72	35.92±1.09	35.74±0.98	37.28±0.92	NS
Week 2	44.00±0.96	42.5±0.98	43.41±1.38	42.73±1.26	46.00±1.61	NS
Week 3	52.45±1.29	50.28±1.44	53.18±1.76	53.49±1.76	55.26±1.92	NS
Week 4	63.10±1.90^{ab}	58.77±1.74^{b}	64.65±2.40^{ab}	63.69±2.19^{ab}	69.00±2.74^{a}	*
Week 5	88.71±3.03^{ab}	81.75±3.61^{b}	95.74±3.80^{b}	94.72±3.77^{b}	107.51±5.34^{a}	*
Week 6	104.32±4.50^{b}	107.66±5.39^{b}	115.94±4.26^{ab}	111.24±5.03^{b}	126.26±5.61^{a}	*
Week 7	122.14±6.63^{b}	120.50±5.50^{b}	138.50±6.01^{ab}	136.66±6.57^{ab}	153.38±6.61^{a}	*
Week 8	144.21±5.97^{c}	141.59±4.94^{c}	166.48±8.30^{ab}	158.04±7.67^{bc}	185.58±6.56^{a}	*

WK = week, NS= Not significant at 5% level of probability, * =significant at 5% level of probability, LOS = Level of significant ^{abc} = mean along the same column with different superscripts are significantly (P<0.05) different

The non significant mean value of body weight gain except at hatched obtained in this study (table 3) could not be compared to any previous work as there is no information regarding the parameter. However this study indicated that location had no significant (P>0.05) effect on weekly body weight gain except between body weight gain at hatch and week 1 were location 1 and 5 demonstrated the best result. Location 5 demonstrated higher value in most weeks that were not significant. The value obtained for growth rate across all the weeks ranges between (10. 57±0.38 to 39.60±0.01). Again this result could not be compared to any previous work as there is no information regarding the parameter.

Table 3: Effects of Location on Average Daily Body Weight Gain of Tiv Local Chicken Ecotype

Location	1	2	3	4	5	LOS
Week 0-1	2.12±0.07^{a}	1.48±0.02^{b}	1.88±0.18^{ab}	1.87±0.12^{ab}	2.11±0.09^{a}	*
Week 1-2	0.81±0.25	1.12±0.01	1.07±0.08	0.10±0.23	1.25±0.51	NS
Week 2-3	1.19±0.45	1.13±0.34	1.39±0.10	1.52±0.39	1.33±0.36	NS
Week 3-4	1.51±0.45	1.22±0.23	1.57±0.50	1.46±0.11	1.97±0.63	NS
Week 4-5	3.68±0.45	3.35±0.88	4.40±0.86	4.50±0.99	5.56±1.97	NS
Week 5-6	2.23±1.29	3.30±2.18	2.88±0.12	2.35±0.70	2.61±0.01	NS
Week 6-7	2.55±1.12	2.38±0.35	3.20±1.12	3.37±0.44	3.88±0.84	NS
Week 7-8	3.16±1.07	2.90±1.78	4.05±0.91	3.31±0.97	4.54±0.99	NS

WK = week, NS = Not significant at 5% level of probability, * = significant at 5% level of probability, LOS = Level of significant. [ab] mean along the same column with different superscripts are significantly (P<0.05) different

Table 4: Effects of location on the percent growth rate of Tiv local chicken ecotype

Location	1	2	3	4	5	LOS
Week 0-1	35.15±0.89[b]	29.98±0.67[c]	36.39±1.44[b]	36.40±0.01[b]	39.60±0.01[a]	*
Week 1-2	17.49±0.90	18.47±0.21	17.08±0.82	16.11±1.31	18.33±3.26	NS
Week 2-3	15.83±3.36	15.60±2.51	18.23±0.66	19.97±3.17	16.89±2.95	NS
Week 3-4	16.51±2.27	14.36±1.12	16.88±2.58	16.06±0.69	19.95±3.52	NS
Week 4-5	28.92±0.70	28.01±2.55	32.10±1.77	32.72±2.88	34.94±4.47	NS
Week 5-6	13.97±3.76[b]	23.26±3.62[a]	17.58±0.51[ab]	14..45±1.66[b]	14.72±1.02[b]	*
Week 6-7	13.87±2.13[ab]	10.57±0.38[b]	15.81±2.07[a]	17.39±0.23[a]	17.49±0.79[a]	*
Week 7-8	16.10±4.03	15.08±5.76	16.89±0.75	14.74±2.81	17.55±2.95	NS

WK = week, NS = Not significant at 5% level of probability, * = significant at 5% level of probability, LOS = Level of significant. [ab] mean along the same column with different superscripts are significantly (P<0.05) different

The effects of location on mortality rate of Tiv local chick is presented in table 5. From the result obtained, location had significant (P< 0.05) effect on mortality rate across all the weeks except weeks 1-2 and 3-4 respectively. The mean value obtained in this study for mortality rate (0.00±0.00% to 21.82±10.09% is fairly similar to the value of 11 - 14% reported by Momoh (2005).

Table 5: Effects of Location on the Mortality Rate of Tiv Local Chicken Ecotype

Location	1	2	3	4	5	LOS
Week 0-1	6.07±0.11[ab]	12.70±0.92[ab]	21.82±10.09[b]	5.01±0.14[a]	7.15±4.13[ab]	*
Week 1-2	0.00±0.00	2.38±1.37	0.00±0.00	2.50±1.44	0.00±0.00	NS
Week 2-3	6.46±0.12[b]	0.00±0.00[a]	2.28±1.31[ab]	5.27±3.04[ab]	2.94±1.70[ab]	*
Week 3-4	0.00±0.00	2.50±1.44	2.94±1.70	0.00±0.00	0.00±0.00	NS
Week 4-5	7.04±0.21	5.76±0.29[b]	4.55±2.62[b]	8.66±1.79[c]	0.00±0.00[a]	*
Week 5-6	0.00±0.00[a]	0.00±0.00[a]	0.00±0.00[a b]	8.50±1.51[b]	2.78±1.61[a]	*
Week 6-7	0.00±0.00[a]	0.00±0.00[a]	2.50±1.44[ab]	11.77±6.79[b]	0.00±0.00[a]	*
Week 7-8	0.00±0.00[a]	0.00±0.00[a]	2.63±1.52[ab]	6.67±3.85[b]	2.94±170[ab]	*

WK = week, NS = Not significant at 5% level of probability, * = significant at 5% level of probability, LOS = Level of significant. [ab] mean along the same column with different superscripts are significantly (P<0.05) different

Conclusion and Recommendation

The study was conducted to determine the effects of location on reproductive and growth performance of Tiv local chicken. From the result obtained, location had significant (P < 0.05) effect on hatch weight, weekly body weight, growth rate (at week 0-1, 5-6 and 6-7) and mortality. However, locations had no significant (P>0.05) on reproductive parameters except fertility and infertility which were significant. From the finding of this research, it is recommended that selection of Tiv local chicken should be location based especially for those parameters where location had significant effect.

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