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ASSESSMENT OF HATCHLING EGG LOSSES AND TWO CHICK SEXING METHODS IN NIGERIAN INDIGENOUS CHICKEN

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Sex identification at day old and separate management of male and female birds is important milestones in the development of commercial strains of chicken. The aim of the present study is to evaluate hatchling egg loss as well as sex determination at day old and sexual dimorphism over a period of 8 weeks in Nigerian local Chicken. A total of 360 eggs of Nigerian Indigenous Chicken (NIC) were used to investigate hatchling egg losses, Sex determination at day old and weekly linear measurements were taken on 100 randomly selected Nigerian local chicks. The results obtained showed that the NIC have high fertility (86.67%) and hatchability of 69.17%. The egg total weight loss and chicks' weights were 5.02g and 26.25g respectively. The percentage hatching loss is 29.04%.

The Japanese vent sexing of the chicks have higher (73.58%) percentage accuracy than feather sexing (62.26%). There were no significant differences between males and females in weekly body weight from 2-6 weeks of age. However, male chicks were significantly ($p<0.05$) higher in higher body weight (358.64g vs 283.21g), BL (28.28cm vs 26.09cm), BG (17.57cm vs 16.16cm) and WL (14.76 vs 13.61) at week 7. Generally, male chicks were significantly higher ($p<0.05$) in body length, body girth and wing length than female chicks from 1 to 8 weeks of age. It was concluded that male chicks could be separated from the female chicks using body weight at week 7 and above, but quicker results may be achieved by using morphometric traits like body length, body girth and wing length.

Keywords: Body weight, Feather sexing, Hatchling Losses, Nigerian Indigenous Chicken, Vent sexing

The commercial egg producers on the other hand sex chicks to separate males from females for egg production while broilers producer sex chicks to raise fast growing males separately from females (Shafey *et al.*, 2013).

Sexing of day old chicks can be achieved through two (2) methods: one of which is vent sexing (Tran, *et al.*, 2010). This is based on the observable differences in the rudimentary genitalia organ of male termed 'bumps' in the cloaca of birds (Cerit and Avanus, 2007). The method was first practice in 1925 by the Japanese and has now be found to be the most reliable method of sexing day old chicks with an accuracy of 95% (Cerit and Avanus, 2007). Not with standing, this method has its difficulty in been dependent on a trained expert sexer to be effectively practice (Alasahan and Akpinar, 2014).

Another method is feather sexing which is based on observable differences in the feather length characteristic at hatching (Kalina, *et al.*, 2012). This requires specific crosses between rapid feathering males and slow feathering females to produce slow feathering male chicks and rapid feathering female chicks at hatching. Another approach is to employ sexual dimorphism in body weight and morphometric measurements at specific age to separate male from female lines. Sexual dimorphism may originate from the expression of some sex-limited alleles which brings about certain physiological or hormonal differences in growth pattern of male and female birds (Coyne *et al.*, 2007). . On the other hand, both sexes could express the sexual dimorphic trait initially but later disappeared

in female (Coyne *et al.*, 2007). This is why in most indigenous chicken, males and females are nearly identical in morphology during their early developmental stage. However, at a particular growth stage, males and females growth are governed by hormonal and physiological control (Alexander, 2002) and this result in phenotypic and genetic variation between the two sexes.

The un-sexed Nigerian indigenous chickens are usually kept together which gives room for indiscriminate mating. Previous study by Sola-Ojo, *et al.*,(2008) showed that there is systematic difference in the growth performance and aggressiveness in feeding behaviour between male and female chicks. Alasahan and Akpinar (2014) also reported differences in marketing age and nutrition between male and female chicks. Sex identification among Nigerian indigenous chickens will enhance their commercial production. This study therefore investigate the vent and feather methods of chick sexing at day old and sexual dimorphism trait over the periods of eight (8) weeks in Nigerian indigenous chickens

MATERIALS AND METHODS

A total of 360 eggs from Nigerian indigenous chickens where collected and set in an electric incubator (500 egg capacity) within seven days of collection.. Egg weight of the settable eggs were recorded before setting them inside the incubator and subsequent weight of the incubated eggs were determined weekly for 21 days using sensitive electronic weighing scale (Scout II brand) to determine egg weight losses. Egg fertility was determined at day 5 and day 17 using candling machine. The hatched chicks were tagged and raised on chick mash (22% C.P and 2800 ME Kcal/Kg) for 8 weeks after which growers mash (15% C.P, 2500 ME Kcal/Kg) were fed till 18th week when the males can be visually separated from the females using comb development. Fertility and hatchability of total eggs and hatchability of fertile eggs were estimated as follow:

$$\text{Fertility \%} = \frac{Number\ of\ fertile\ eggs}{Total\ number\ of\ egg\ set} \times 100$$

$$\text{Hatchability\% (TES)} = \frac{Number\ of\ chicks\ hatched}{Number\ of\ egg\ set} \times 100$$

Each of the 100 day old chicks used for sex identification were investigated for the present or absence of ‘bumps’ in the cloaca by squeezing the genital organ of the chicks. Chicks with bumps were grouped as males, while those with absence of ‘bump’ were grouped as females. Weekly body weights and body linear measurements were taking for 8 weeks using the methods described by Sola-Ojo *et al.*, (2013).

Body weight (BW) was measured in gram using electronic sensitive scale and the linear body parts were measured using tape rule and vernier calliper. Body Length (BL) was measured as the distance between the nasal opening to the top of pygostyle. Body Girth (BG) was determined by winding a tape rule around the region of the breast. Shank Length (SL) was measured as the distance from the foot pad to the hock joint. Thigh Length (TL) was measured from the tip of the tarsus to the ball joint. Keel Length (KL) was measured from the cranial to the caudal terminals of the keel bone. Wing Length (WL) was measure by stretching the wing and the measurement taken from humerous-Coracoids junctions to the tip of the digit while the Drumstick Length (DL) was measured from the tip of the hock joint to the ball joint of femur.

The accuracy of vent sexing at day old and sexing with body weight and linear measurements from 1-8 weeks were tested by comparing the records obtained using these early sexing methods with the record of sexing with morphometric characters at 18 weeks of age.

Data obtained from incubation egg losses were subjected to Analysis of Variance (ANOVA) procedure suitable for a Completely Randomize Design model (SAS, 1999) and significant means at $p<0.05$ were separated using Duncan Multiple Range Test (Duncan 1955), Data on vent sexing of chicks was subjected to descriptive statistic (percentile) while data on weekly body weight and morphometric measurements were subjected to student *t*-test.

RESULTS

Table 1: Effects of settable egg characteristics on egg weight losses, fertility, hatchability and chick weight of Nigerian indigenous chickens.

Parameters	Values
Egg weight (g)	40.43 ± 4.09
Final egg weight (g)	35.39 ± 3.97
Egg total weight loss (g)	5.02 ± 0.93
Week 1 egg weight loss (g)	2.02 ± 0.56
Week 2 egg weight loss (g)	1.52 ± 0.52
Week 3 egg weight loss (g)	1.46 ± 0.34
Fertility (%)	86.67 ± 3.41
Hatchability (%)	69.17 ± 4.64
Egg shell weight (g)	2.44 ± 1.37
Weight of day old chick (g)	26.25 ± 1.33

Table 2: Accuracy of sexing Nigerian indigenous chickens using untrained Sexer sex prediction

Methods of sex prediction	Percentage accuracy at 18 weeks old
Untrained Vent sexing	73.58
Untrained Feather sexing	62.26
Sexual dimorphism at week 8	92.00
Actual sex at week 18	100

Table 1 reflected the result of the effects of settable egg characteristics on fertility, hatchability and day old chick weight of Nigerian indigenous chickens.

The total egg weight loss within 21 days is 5.02g while the shell weight is 2.44g. NIC had 86.67% fertility, 69.17% hatchability and chick weight of 26.25g.

Table 2 showed the result of Sex prediction using untrained vent sexer. The percentage of Vent sexing method was higher (73.58%) than feather sexing method (62.26%) 11.32%.

The results of sexual dimorphism in Nigerian indigenous chickens are presented in Table 3. Generally, male chicks were significantly higher ($p<0.05$) in body length, body girth and wing length than female chicks from 1 to 8 weeks of age. Similarly, the result of other body linear measurement such as drumstick length, keel length, thigh length and shank length shows that males are significantly longer, bigger and taller than the females at week five and above.

There was no significant difference ($p>0.05$) in body weight between males and female chicks between week 1 to 6, however significant differences ($p<0.05$) exist

Table 3: Mean weekly body weight and morphometric measurements in Nigerian indigenous chicken

Age (wks)	Sex	BW	BL	BG	WL	DL	KL	TL	SL
1	M	53±14	14^{a}±2	8^{a}±1	6^{a}±1	3±0	3±1	4±0	3±1
	F	49±10	13^{b}±2	8^{b}±1	6^{b}±1	3±1	3±1	4±0	2±1
2	M	88±24	17^{a}±2	10^{a}±1	8^{a}±1	4±0	5±1	5±1	3±1
	F	81±23	16^{b}±2	10^{b}±1	8^{b}±1	3±0	5±1	5±1	3±1
3	M	143±39	20^{a}±2	12±1	10^{a}±1	4±1	6±1	6±1	4±1
	F	124±29	19^{b}±2	12±1	9^{b}±1	4±1	5±1	5±1	4±1
4	M	199±44	23^{a}±2	15^{a}±1	11±1	5±0	7±1	6±1	4±0
	F	164±37	21^{b}±2	14^{b}±2	11±1	4±0	6±1	6±1	4±0
5	M	221±48	24^{a}±2	15^{a}±1	13^{a}±1	5±0	7^{a}±1	7±1	4^{a}±0
	F	186±41	23^{b}±2	14^{b}±1	12^{b}±1	5±0	7^{b}±1	6±1	4^{b}±0
6	M	300±66	26^{a}±2	17^{a}±1	14^{a}±1	5±1	8^{a}±1	7^{a}±1	5^{a}±1
	F	242±52	25^{b}±2	15^{b}±1	13^{b}±1	5±1	7^{b}±1	7^{b}±1	5^{b}±0
7	M	359^{a}±69	28^{a}±2	18^{a}±1	15^{a}±1	6±1	8^{a}±1	8^{a}±1	5^{a}±1
	F	283^{b}±61	26^{b}±2	16^{b}±1	14^{b}±1	5±1	7^{b}±1	7^{b}±1	5^{b}±1
8	M	404^{a}±76	31±2	19^{a}±1	16^{a}±1	6^{a}±1	9^{a}±1	8^{a}±1	6^{a}±1
	F	326^{b}±71	28±3	17^{b}±1	15^{b}±1	6^{b}±1	8^{b}±1	8^{b}±1	5^{b}±1

Means with different superscript on the same column are significantly different (P<0.05). wks, M, F, BW, BL, BG, WL, DL, KL, TL and SL represent weeks, male female boby weight, body length, body gait, wing length, drumstick length, keel length, thigh length and shank length respectively

between male and female chicks in body weight at week 7 and 8.

DISCUSSION

The result (Table 1) shows that egg weight decreased weekly inside the incubator and lost about 29.04% initial weight of the egg to give 64.93% chick weight and 6.04% shell weight. The weight of the egg set has direct relationship with chick weight and egg fertility (Ulmer-Franco *et al.,* 2010). Egg fertility is an indicator of viability of the egg set as it may predict hatchability (Ulmer-Franco *et al.,* 2010). The percentage egg fertility of Nigerian indigenous chickens (NIC) in this study was relatively high (86.67%) suggesting that NIC has no fertility problem. The result of percentage fertility obtained in this experiment agrees with Sunder *et al.,* (2010) that reported 84.34%- 90.75% fertility in aged broiler breeder stock while the result of egg total weight loss obtained in this study corroborate the report of Petrie *et al.,* (2001) that incubated eggs reduces in weight before hatching. However, the percentage egg losses obtained in this study were higher than the one reported by Sunder *et al.,* (2010). The differences between the two reports may be related to the differences in breeds of birds (Sola-Ojo, *et al.,* 2008) and yolk proportion (Ulmer-Franco *et al.,* 2010) between the broiler breeder and NIC.

The weight of hatched chicks suggests that NIC may have relatively smaller body weight compared with their exotic counterpart (Sonaiya, (1991) and Musharaf, *et al*. (1990).

The method of sex prediction through Japanese vent sexing shows greater potential as tool for separating males from females local chicken than feather sexing method. Separating heterogeneous population of local chicken into male and female with 73.58% accuracy at day 3 post hatching of egg may solve the problem of inequality in growth between male and female chicken and aggressiveness in feeding (Sola-Ojo *et al.,* 2013).

The lower percentage (73.58%) of prediction through Japanese vent sexing method when compared with the recommended 95% (Alaşahan and Akpinar, 2014) accuracy may be associated with lack of expertise of the researcher.

The results obtained for body weight of chicks (Table 3) may be suggestive reason while Nigerian indigenous chickens are very difficult to separate in their early ages using body weight alone. Although from week seven and above, the males could be separated from the females since they are heavier than the females. Similarly, at week seven and eight, observable differences during this experiment revealed that males have well pronounced comb than their females' counterpart. This may be one of the reasons why rural dwellers (villagers) use comb development to separate sexes at maturity. This result corroborate the report of Sola-Ojo *et al,*. (2008) that morphologically males appear bigger and taller than the females and their comb are well pronounced at 8 weeks of age.

The higher body weight reported by Sola-Ojo *et al,*. (2008) when compare with the body weight recorded in this experiment may be attributed to differences in the breeds of birds used as Fulani ecotype chicken are characterized by uniform, heavy and fast growth than other Nigerian indigenous chickens (Fayeye and Adesiyan, 2008).

CONCLUSION

It can therefore be concluded that the initial weight of egg decreases inside incubator and the total egg losses from day 1 to 21 could be about 29.04% initial weight of the egg while chick weight is about 64.93% of the initial egg weight. Vent sexing method by untrained sexer seems to be 73.58% accurate and male chicks could be separated from female chicks at week 7 using body weight, although, quicker results may be obtained by using morphometric traits like body length, body girth and wing length.

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