Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.7, No.8, 2017

Characterization of Local Chickens in Akwa Ibom State Using Hatch Weights

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Abstract
This study was conducted to determine hatch weights of male and female local chickens in Akwa Ibom State; to evaluate the effects of hatch batch on hatch weights and also characterize local chickens in Akwa Ibom state using hatch weights. A total of 84 local chickens (60 pullets and 24 cocks) used for the experiment were purchased from Uyo, Nsit Atai, Eket and Ikot Ekpene Local Government Areas. Chickens from all localities were assembled on deep litter to generate a broad-based population for random mating. Mating ratio of males and females was maintained at 1:5 to ensure fertilization of eggs. From inception, chickens were fed growers mash (15% CP). Feed was changed to layer's mash (16.5% CP) when 5% egg production was attained. At 4 months egg production, collection of egg for incubation commenced. Data were collected on hatch weights of male and females chicks. Means and ranges were computed for hatch batches and sexes. Significant means were separated using Duncan's Multiple Range Test. Mean hatch weights ranged between 22.33±0.75 and 27.03±0.82. Mean hatch weight of 25.99±0.61 for males was significantly higher ($P<0.05$) than 24.53±0.66 for females. Hatch weights of local chickens in Akwa Ibom State are low. Hatch batches had no effects on hatch weights. Variations observed in hatch weights constitute a valuable genetic resource for breeding programmes and in designing proper conservation strategies.
Key Words: Local chickens, hatch weights, characterization, conservation.

1. Introduction

The productivity of local chickens in Nigeria has been reported (Ibe, 1990 and Udoh *et al.*, 2012) to be low. The low productivity has been attributed to lack of improved local chicken breeds, the presence of predators, incidence of diseases, poor feeding, and management factors (Alemu, 1997). Hence the International Fund for Agricultural Development (IFAD) of United Nations proposed an integrated programme for the global management of genetic resources on an international level. The main objective was to assist countries by providing extensive research databases and guidelines for better characterization, conservation and utilization of animal genetic resources. Accordingly, this study sought to unearth the variations in hatch weight of local chickens in Akwa Ibom State, Nigeria. Hatch weight is most reliable in predicting body weight at first egg of local chickens (Udoh and John- Jaja, 2014). Characterization includes a clear definition of the genetic attributes of an animal's specie or breed, which has a unique genetic identity and the environment to which species or breed populations are adapted or known to be particularly or not adapted at all (Rege, 1992).

The rural poultry population in most African countries accounts for more than 60 percent of the total national poultry population (Sonaiya, 1997). However, adequate attention has not been given to evaluating these resources or setting up realistic and optimum breeding goals for their improvement. An increasing loss of genetic diversity has been observed for all agriculturally used species (Frankham, 1994 and Hammond, 1994) and poultry genetic resources are considered to be the most endangered (Romanou *et al.*, 1996). More particularly, it is estimated that 35% of mammalian breeds and 63% of avian breeds are at the risk of extinction and that two breeds are lost every week (FAO, 2000a).
Local chickens in Akwa Ibom State have not been characterized. They have been found to vary widely in hatch weight and other phenotypic characteristics (Mogesse, 2007). Their genetic resources are becoming seriously endangered owing to the high rate of genetic erosion from diseases. The extensive and random distribution of exotic breeds by government, non-governmental organizations and individuals is also believed to dilute the indigenous genetic stock. If this trend continues, the gene pool of local chickens in Akwa Ibom State would be lost in the near future before they are described and documented. Characterization, conservation and use of indigenous animal resources under low levels of inputs in the tropics are usually more productive than in the case with exotic breeds. The locally adapted animals are also more readily available to resource - poor farmers. These animals can be productive without high disease control inputs. Therefore, characterization, conservation and utilization of these indigenous genetic resources are of paramount importance.

The objectives of this study are: to determine hatch weight of male and female local chickens in Akwa Ibom State; to evaluate the effects of hatch batch on hatch weights; to characterize local chickens in Akwa Ibom State using hatch weights.

2. Materials and Methods

2.1 Study site

This research was carried out in the poultry unit, Teaching and Research farm, Department of Animal Science, University of Uyo, Nigeria. The climatic data obtained from the meteorological station of the University showed that Uyo is located between latitude $05^0$02' North and longitude $07^0$56' East with a natural day length of 12-13 hours. The monthly mean minimum temperature ranged from 21.3^0C to 24.9^0C and the mean maximum temperature ranged from 28.4^0C to 34.5^0C. Annual mean rainfall ranged between 2000 mm and 3000 mm. Relative humidity ranged from 78% to 93%.

2.2 Generation of foundation stock

A total of 120 local chickens (80 pullets and 40 cocks) were purchased from 4 different localities (Uyo, Nsit Ibom, Ikono and Esit Eket Local Government Areas) in Akwa Ibom State, Nigeria. Twenty (20) pullets and ten (10) cocks were assembled from each of the 4 localities. The localities chosen were based on their distances from Uyo, the site of the research. The local chickens assembled this way gave a representative sample of the local chickens in Akwa Ibom State. The distances of these localities in kilometers from Uyo are: Nsit Ibom 23, Ikono - 46 and Esit Eket -69.

At inception, chickens from the different localities were quarantined separately for 7 days, dewormed and fed growers mash (15% CP) to stabilize them. After the quarantine period, 15 pullets and 6 cocks were chosen from each locality based on their health conditions. Health conditions were determined by closely observing the chickens for signs of ill health, chickens showing signs of ill health such as watery nasal or ocular discharges, cough, weakness, loss of appetite, tendency to huddle away from the rest of the chickens, watery feaces and difficulty in walking were culled. Eighty-four (84) healthy chickens (60 pullets and 24 cocks) from all localities were assembled and raised on deep litter to generate a broad-based population for random mating. Mating ratio of cocks to hens was maintained at 1:5 to ensure fertilization of eggs. Feed was provided in adequate quantity to birds namely at 8:30am and 02:30pm. Feed was changed to layer mash (16.5% CP) when 5% egg production was attained. Clean drinking water was provided continuously. At 4 months egg production, collection of eggs for incubation commenced. Eggs for incubation were collected twice a day for 7 days. The frequency of collection was to ensure that eggs were not dirty or pecked by chickens. Wholesome and clean eggs were incubated artificially. There were 4 incubations with 117, 93, 84 and 92 eggs for the 1st, 2nd, 3rd and 4th incubations respectively.

On the 21st day, hatched chicks were removed from incubator and weighed immediately to obtain hatch weights. There were 4 batches at weekly intervals between batches. The chicks hatched totaled 155, with 48, 35, 33 and 39 for the 1st, 2nd, 3rd and 4th batches, respectively.

2.3 Management of experimental birds

The preparation for brooding started about two weeks before the chicks were hatched. The house was washed, disinfected and left dry to destroy any surviving disease organisms through starvation. Two days before the chicks were received, the floor was littered with wood shavings to a depth of 5cm. Source of warmth were then placed in position and switched on, feeders and drinkers were installed only a few hours before chicks arrived. Two hours before chicks arrived, feed was placed in the feed trays. On arrival, the chicks were rapidly unboxed and inspected. The distribution of the chicks in response to heat supply was observed. Other brooding procedures were as outlined by Oluyemi and Roberts (1979). The respective hatch batches were brooded separately on the floor pens. The brooding period lasted for 4 weeks. Feed was provided in adequate quantity to the chicks twice a day namely at 8:30 am and 2:30 pm. Water was provided continuously. Chicks (0-6 weeks) were fed *ad libitum* with chicks mash (18% CP). Vaccinations against Newcastle disease, Gumboro and Fowlpox were given to all birds at the appropriate ages. At about 6 weeks of age, the chicks showed some noticeable sex characteristics. Their sexes. were then matched with the identified numbers for purposes of analyses.

2.4 Data collection and statistical analysis

At hatch, all chicks were immediately weighted to obtain hatch weights. Weighing was done by placing each chick on a sensitive OHAUS 200 g capacity weighing balance. Each chick was identified by numbers using a leg band. Means and ranges were computed for hatch batches and sexes. Significant means were separated using Duncan's Multiple range test.

3. Results and Discussion

3.1 Hatch weights of local chickens in the first batch

Hatch weight of local chickens in the first batch are presented in Table 1. Male chickens' hatch weights ranging between 21.00 g and 29.60 g was similar to the range of between 23.30 g and 29.50 g obtained by Migna *et al* (1989). Male chickens' hatch weights obtained in this study were generally low, compared to the range of between 22.00 g and 36.00 g obtained by Katule (1990) for Mbeya chickens in Tanzania.

Female chickens' hatch weights of between 19.20 g and 32.00 g in this study was similar to the range of between 18.80 g and 30.80 g recorded in Mali by Wilson *et al* (1987).

3.2 Hatch Weights Of Local Chickens In The Second Batch

Values of hatch weight in the second batch (Table 2) revealed that male chickens' hatch weights ranged between 21.80 g and 34.30 g. This was similar to the range of between 20.40 g and 34.70 g cited by Katule (1990). The similarity in the results obtained in these studies confirms the reports by Adedokun and Sonaiya (2001) that birds of different ecological zones may have similar characteristics such as hatchability, fertility, and chick weight. Female chickens' hatch weights of between 12.20 g and 25.20 g was very low, compared to the ranges of between 16.22 g and 34.40 g (Safaloah, 1998), 14.00 g and 34.00 g (Katule, 1990), 18.20 g and 36.12 g (Msoffe *et al*., 2001). In the second batch, male chickens had higher mean hatch weight (34.70 g) than the females (25.20 g). This confirms earlier reports (Katule, 1990 and Wilson *et al*., 1987) that sexual dimorphism could be the reason for the male hatch weights being higher than those of the females.

3.3 Hatch weights of local chickens in the third batch

Hatch weights of male local chickens in the third batch (Table 3) ranging between 7.90 g and 31.30 g was lower than earlier records of between 23.30 g and 29.50 g (Minga *et al.,* 1989) and between 20.40 g and 34.70 g (Wilson, 1979). However, male hatch weights in this study agree with the results of Ibe (1990) and Ebangi and Ibe (1994) that Nigerian local chickens are characterized by small hatch weights, which are not desirable in competitive economic situations. Female chicken hatch weights in the third batch (ranging between 7.30 g and 33.10 g) differed from the range of between 18.40 g and 32.80 g (Gwakisa *et al*., 1994) and between 16.92 g and 36.10 g (Msoffe *et al*., 2001). These variations may be caused by differences in experimented settings and other environmental conditions.

3.4 Hatch weights of local chickens in the fourth batch

Hatch weights of male local chickens (21.70 g - 3.30 g) in the fourth batch (Table 4) was comparable to the range of between 22. 40 g and 31.70 g obtained by Nwalusanya (1998). Female chicken hatch weights ranged between 19.70 g and 29.60 g. In batch 4, male chickens had the heaviest hatch weight, although the overall batch mean was recorded by the females. Lovich and Gibbon (1992) acknowledged that sexual dimorphism is a key evolutionary feature that is related to ecology and life histories of organisms.

Males' hatch weights were significantly higher ($P<0.05$) in batches 2 and 3, but not significantly different ($P>0.05$) than females' hatch weights in batch 4. Jacob, 2013 observed that male and female chickens have the same hatch weight. Mean hatch weight for females was significantly higher ($P<0.05$) than that of males in batch I. On the whole, male local chickens had significantly higher ($P<0.05$) mean hatch weight of 25.99 ± 0.61 than the females with 24.53 ± 0.66. The results indicate that hatch weight may be an indicator of sexual dimorphism. Msoffe *et al.,* (2001) noted that sexual dimorphism could be the reason for hatch weights being higher for male chicks than for females. Similar observations were made by Katule (1990) and Wilson *et al.,* (1987), showing sexual dimorphism on weight measurements. Mean hatch weight in this study ranged from 24.68 ± 0.79 to 25.62 ± 0.85 in the four batches. Results suggest that hatch batches had no effects on hatch weights of local chickens. This is because, except for the second batch, there was no significant difference ($P>0.05$) among batches for mean hatch weight.

4. Conclusion

From the results of this study, the following conclusion can be made:

- Hatch weights of local chickens in Akwa Ibom State are low.
- The variations in hatch weights constitute a valuable genetic resource for use in breeding programmes, improvement of hatch weights and in designing proper conservation strategies.
- Higher hatch weight in males than in females is an indicator of sexual dimorphism.
- Hatch batch has no significant effect on hatch weights because hatch weight is influenced by breed of chicken, yolk size, among other factors.

5. Recommendations

From the results of this study, there should be:

- A more intensive selection among local chicken populations in Akwa Ibom State.
- Realistic and optimum breeding goals for improvement of hatch weights of local chickens.
- Urgent efforts taken to characterize and conserve them.

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Table 1: Hatch Weight (g) of Local Chickens in the First Batch

	BATCH	
S/N	**Male**	**Female**
1	23.00	29.50
2	22.30	32.00
3	28.10	27.00
4	23.80	27.90
5	27.10	27.50
6	26.40	23.30
7	23.40	26.30
8	25.20	25.60
9	25.50	24.00
10	24.30	24.60
11	23.40	24.30
12	23,40	25.40
13	26.80	30.10
14	27.20	26.70
15	26.90	25.40
16	25.30	27.80
17	22.70	23.20
18	25.10	23.20
19	23.40	25.20
20	21.30	25.20
21	26.80	25.20
22	24.20	27.40
23	22.40	24.90
24	21.00	32.50
25	22.10	20.60
26	24.20	27.90
27	29.00	27.70
28	29.60	26.70
30		25.30
31		24.20
32		24.10
33		19.20
34		27.30
35		25.10
36		23.40
37		23.00
38		28.40
39		27.60
40		24.80
41		26.10
42		28.00
43		27.30
44		24.60
45		25.70
46		26.30
47		24.10
48		25.60
49		28.20
AVERAGE	**24.74**	**25.93**

Table 2: Hatch weights (g) of local chickens in the second hatch

	BATCH	
S/N	**Male**	**Female**
1	31.40	25.20
2	26.30	24.90
3	25.00	21.40
4	24.10	20.30
5	28.00	23.00
6	26.10	20.70
7	29.50	23.80
8	27.00	21.00
9	28.90	20.60
10	21.80	18.40
11	27.00	23.50
12	28.60	26.50
13	24.70	20.20
14	34.30	12.20
15	28.70	20.90
16	28.60	25.20
17	24.20	21.10
19		22.70
20		21.20
21		15.00
22		19.10
23		20.70
24		20.90
25		20.40
26		21.50
27		20.00
28		20.10
29		20.80
30		15.10
31		21.60
32		20.10
33		22.40
34		20.60
35		20.10
36		20.00
37		22.40
38		20.10
39		20.20
40		20.40
41		20.30
42		18.00
AVERAGE	**27.26**	**26.25**

Table 3: Hatch Weights (g) of Local Chickens in the third batch

	BATCH	
S/N	**Male**	**Female**
1	28.90	28.40
2	28.10	24.00
3	26.40	25.90
4	31.10	20.90
5	7.30	24.30
6	7.90	22.20
7	28.20	24.60
8	24.40	24.20
9	21.70	28.20
10	31.30	28.30
11	25.80	22.60
12	25.90	28.20
13	28.60	26.60
14	24.60	26.40
15	22.30	9.80
16	30.00	27.20
17	31.00	25.20
18	29.10	19.40
19	24.60	24.60
20	28.30	25.40
21	22.10	23.10
22		28.80
23		27.30
24		28.60
25		26.60
26		26.00
27		27.00
28		23.80
29		22.60
30		26.60
31		25.20
32		20.30
33		27.30
34		22.80
35		22.00
36		27.10
37		27.60
38		23.10
39		24.60
AVERAGE	**25.70**	**24.79**

Table 4: Hatch weights (g) of local chickens in the fourth batch

	BATCH	
S/N	**Male**	**Female**
1	28.20	25.30
2	31.40	26.20
3	26.60	25.00
4	29.40	25.60
5	27.70	27.20
6	30.30	25.00
7	21.70	24.90
8	31.70	20.90
9	23.80	20.20
10	27.80	24.80
11	28.60	28.10
12	32.30	22.50
13	22.40	25.00
14	28.70	23.30
15	22.30	27.90
16		26.00
17		21.70
18		24.50
19		29.60
20		27.70
21		24.80
22		23.20
23		21.70
24		25.90
25		25.40
26		25.40
27		25.00
28		27.40
29		21.90
30		23.20
31		25.10
32		27.40
33		20.60
34		27.80
35		25.20
36		20.40
37		23.30
38		21.60
39		21.10
40		19.70
41		21.30
42		24.60
AVERAGE	**24.59**	**23.55**

3.5 Mean hatch weights

Mean hatch weight for male and female local chickens in the four batches are presented in Table 5.

Table 5: Mean hatch weights of local chickens

	BATCHES				
Sex	1	2	3	4	Mean for Sex
Males	24.78±0.49[b]	27.03±0.82[a]	26.97±0.71[a]	25.18±0.43[a]	25.99±0.61[a]
Females	26.28±0.49[a]	22.33±0.75[b]	24.26±0.99[b]	25.26±0.42[a]	24.53±0.66[b]
Mean for batches	25.53±0.49[a]	24.68±0.79[b]	25.62±0.85[a]	25.22±0.43[a]	

[a,b] Means along columns with different superscripts are significantly different (P<0.05) Mean for sex.

[a,b] Means along rows with different superscripts are significantly different (P<0.05) Mean for Batches.