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Full Length Research

Reproductive performance of different strains of indigenous domestic fowls at Takalmawa and Nasarawa villages of Sokoto State, Nigeria

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ABSTRACT: A study was undertaken to investigate the reproductive performance (incubation, hatching and brooding) of 14 flock indigenous domestic fowls comprising of 119 hens from July to October, 2008. The study was conducted in two villages; Takalmawa and Nasarawa villages in Dange Shuni and Shagari Local Government Areas of Sokoto State respectively. The hens in the selected households were monitored weekly for three months and information such as date of visit, live weight, eggs laid, laying duration, egg weight and hatchability were recorded. Results of the study revealed that mean body weights of hens varied significantly according to physiological state and incubation periods ($p<0.05$). The mean body weights were 1.37, 0.88 and 1.08 kg for laying hens, incubating hens and brooding hens, respectively. The mean value for number of eggs laid, laying duration, egg weight and hatchability were 12.21, 16.70 days, 21.56 g and 86% respectively. Percent brooding loss was 20.89% and mean age at weaning was 44.33 days. Hatchability was negatively correlated with number of eggs laid and hen weight.

Keywords: Brooding, flocks, hatching, incubation.

INTRODUCTION

In natural incubation, the number of chickens raised per mother hen will give insight into the reproductive capacity of the hen. Vast amounts of data exist on the performance of local chickens from tropical zones, but often they are not directly comparable due to the way in which information is gathered varies from study to study (FAO, 2010). Variation thus exists greatly between results obtained from a research station, where the cost of feed is not a problem, and those obtained from field systems in rural areas, where the farmer may be unwilling or unable to meet the cost of supplying feed for the birds. The result of a station test reflects the genetic capacity of the tested breed, while a field test provides a more realistic measure of performance under the prevailing production (FAO, 2010). It was reported by Sola-Ojo and Ayorinde (2011) that factors such as line and strain effect were paramount for fertility, hatchability, body weight, total egg number, hen day egg production and body weight at first egg. Reports on native strains in the tropics showed that the egg production potential and growth of these local chickens is very low under smallholder farmer's management conditions (Dessie et al., 2011)

A broad gene pool of local chickens arises from their large population in the tropics from which hybrids could be synthesized but which is currently neglected. The body weight variation in these fowls with respect to ecotype, sex, comb type and comb size was reported by Hassan and Abdullahi (2003). Dearth of information thus exists on performance trait estimates, especially those related to reproduction in the indigenous poultry diversity. Thus, this study offers estimates for some reproductive parameters in village-raised domestic hens in Sokoto State. This step was aimed at identifying possible gap in reproductive performance and the husbandry of the birds for enhanced

performance that would serve as an impetus for conservation efforts.

MATERIALS AND METHODS

119 hens of indigenous domestic fowls belonging to 14 flocks from July to October, 2008 were monitored in two villages in Dange-Shuni and Shagari Local Government Areas of Sokoto State for reproduction performance. The permission of the households for the performance monitoring of incubation, hatching and brooding of the local chickens in their flocks was sought and secured. At the commencement of the monitoring visits, inventory of the holdings of domestic fowls was made. Information was also sought on the husbandry practices prevailing in the two villages.

The results of an initial survey of backyard poultry keepers in the two villages culminated to the selection of the flocks. Each hen in each of the selected households was monitored weekly for three months. Information such as date of visit, bird identification number, live weight of hen and number of chicks per hen were obtained. Visits to the flocks took place in the morning before the birds were released. During each visit, the hens were weighed individually. Only hens which were considered sexually mature and have had record of eggs laid were considered (Siegel, 1963).

The reproduction traits considered were number of eggs laid per clutch, clutch length is the number of eggs laid on consecutive days without a pause (Blake and Ringer, 1987), weight of egg by the use of a digital weighing scale, incubation length, hatching date, chicks weight by the use of a weighing scale, chicks body measurements using tailor's measuring tape, from day of hatching to the day of separation of chicks from the hen and chick mortality through recording of any dead chick from each flock was recorded weekly.

Statistical analysis

Descriptive statistical measures such as number, means and standard deviations were determined (Gomez and Gomez, 1984). Analysis of variance (ANOVA) was used to establish any significant effect of ecotype on the reproductive parameters. All the statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS, 2000).

RESULTS AND DISCUSSION

The monitored hens

The number of monitored hens was 119 out of which 109 had brooding records with only 28 taking their chicks to separation stage (end of brooding). Overall mean live weight of the matured hens was 1.2 kg (Table 1). This weight was low compared to the matured hen weight (2.2 kg) recorded in United Republic of Tanzania (Minga et al., 1989), but higher than that reported in Mali (1.02 kg) (Wilson et al., 1987). The differences could be attributed to environment and management system. FAO (2003) reported that the optimum body weight for a mature hen should be around 1.5 kg, this entails that the birds in the two villages in the current study are underweight probably due to poor management condition as the birds are only given feed when available from kitchen waste. The major feed consumed is through scavenging ability of the birds. The hen weight varied very highly significantly according to the physiological state ($p<0.001$). The white strain (ecotype) recorded the least mean weight of 1.1 kg. From the results, it was revealed that laying hens were heavier (1.4 kg) than incubating hens (0.9 kg) and brooding hens (1.1 kg). This trend agreed with the report by Wilson et al. (1987). The trend of the result agrees with the normal physiology of the birds wherein the laying birds due to egg production will be heavier, the incubating hens on the other hand due to expenditure of energy and limited movement in protecting their incubating eggs will lose considerable weight. The brooding hens were able to move round with their chicks in search of feed and hence regain some of lost weight during incubation (Anonymous, 2018).

Incubation and hatching period

The average number of eggs laid per bird in a clutch was 12.2 eggs (Table 2). Though this number did not vary significantly according to either the ecotype or the flock, the Black/White ecotype recorded the highest mean value of 12.7 eggs, while the Black strain had a mean value of 11.9 eggs. This shows that the hens lay on average between 11 to 12 eggs irrespective of the strain. The overall mean value recorded in the present study did not agree with the value reported by Sonaiya and Swan (2004) and 14 to 20 eggs reported by Benabdeljelil et al. (2001) and Padhi et al. (2006) but within the range 12 to 18 eggs reported for village chicken production in the United Republic of Tanzania (Minga et al., 1989). In Ethiopia, the average eggs laid per clutch of local chickens were 16, 13.2 and 14.5 for different districts (Moges et al., 2010). The differences observed could be due to environment and management factors as reported by FAO (1998) that when management is improved, there will be increase in egg production.

The overall mean egg weights recorded in the study was 21.6 g with the Black/White ecotype laying the lightest eggs while the Black ecotype the heaviest eggs (20.3 and 25.6 g, respectively). The results did not agree with earlier reports (NAERLS, 2000; Padhi et al., 2006) as the authors observed higher figures. The values for egg weights recorded for indigenous hens in Bangladesh ranged from

Table 1. Live weight (kg) of hens according to strain and physiological state.

Characteristic	No.	Mean	S. D
Overall	109	1.17	0.29
Strain			
Brown	13	1.09	0.22
Black and White	17	1.30	0.26
Mottled	27	1.15	0.28
Physiological status			
Laying	82	1.37a	0.25
Incubating	107	1.08c	0.23
Brooding	93	0.88b	0.22

Table 2. Estimates of incubation and hatching parameters in village-raised indigenous domestic hens in Sokoto State.

Incubation and hatching parameters	No. of eggs laid		Clutch length (day)		Incubation period (day)		Hatchability (%)	
	Mean	S. D	Mean	S. D	Mean	S. D	Mean	S. D
Overall	12.21	2.92	16.70	5.40	21.85	1.76	86.00	0.29
White (Fari)	12.00	2.00	16.29	5.71	22.71	1.98	87.25	0.12
Black (Baka)	11.86	3.13	16.57	7.38	21.86	2.21	91.89	0.15
Red and Brown (Ja)	12.17	2.48	15.33	3.44	21.29	0.76	86.00	0.13
Black and White (Wake wake)	12.67	2.99	16.53	3.91	21.93	2.34	83.89	0.14
Red, Brown and White	12.45	2.88	16.64	5.22	21.33	0.87	76.40	0.12
Mottled	12.05	3.50	18.05	5.89	21.68	1.42	87.80	0.12

39 to 56 g which is higher than that of the present study. Adetayo and Babafunsho (2001) reported egg weights of 36.8 g for indigenous hens raised in cages while Yami (1995) reported 40 g for local hens under extensive system of management. All the reported figures were higher than that of the current study. The reason being that the birds most time scavenge and may not meet the nutritional requirement needed for optimum egg production. Also, the different in egg weight may be as a result of some environmental differences. The incubation period of the hens varied significantly with flock ($p<0.001$). The overall value is similar to that obtained by Padhi et al. (2006) (21-22 days). The Brown hens took the average shortest time of 21.3 days to incubate their eggs while the Red hens recorded the longest incubation period of 23.3 days (Table 2). The incubation periods recorded in this study fall within the normal range for the incubation of chicken eggs as reported by Oluyemi and Roberts (2000). The overall hatchability value recorded by the hens was 86%. The highest hatchability rate of 92% was recorded by the Black ecotype, while the least value of 76% was recorded by the Brown/White ecotype. However, this value was slightly lower than the 80% reported by Sonaiya and Swan (2004) and higher than 60.6% reported by Faruque et al. (2013) for native chickens. FAO (2006) reported hatchability value of 80% as normal, and that between 75 to 80% as satisfactory and that hatchability declines with more than 10 eggs. Padhi et al. (2006) reported value of between 60 and 80%, Tadelle et al. (2003) reported a value of 68.9%, while Benabdeljelil et al. (2001) reported 78%. The possible reason for high hatchability in the current study could be as a result of fewer eggs because hens having fewer eggs recorded the highest hatchability

Brooding period

Brooding lasted for 57 to 77 days with a mean value of 64.7 days (Table 3). The brooding period was longer than five weeks and 30 to 45 days reported by Padhi et al. (2006). It was found that the Brown hens weaned their chicks earlier (63.2days) than the Mottled (64.1 days) and the Black and White hens (66.5 days), but the differences were not significant. This implies that the local chickens in the study villages brood their chicks for a long time; with intervention this period could be shortened so that hens

Table 3. Brooding success, age of chicks at end of brooding and brooding loss according to strain of hen.

Strain of hen	No. of hens	Survival to end of brooding (%)		Age of chicks at end of brooding (day)		Brooding loss (%)	
		Mean	S. D	Mean	S. D	Mean	S. D
Brown	4	67.56	21.39	63.20	7.85	32.44	21.39
Black and White	5	57.86	22.43	64.10	6.28	42.14	22.42
Mottled	7	64.00	20.62	66.47	4.09	34.67	19.77

could wean their chicks earlier and resume egg laying.

Survival to separation

Brooding success ranged from 20 to 100% with a mean loss value of 61.6%. This translates to brooding loss of about 38% (Benabdeljelil et al., 2001). Mortality was shown to be in the ranges of 80 to 90% in Nigeria and Mali in the first year of life (Matthewman, 1977; Wilson et al., 1987) while almost 32% of losses in chicks were attributed to mortality in Burkina Faso (Kondombo et al., 2003). A mortality of 83% was attributed to illness while a paltry 10% was due to predation (Kondombo et al., 2003). In another study, it was discovered that over 40% of mortalities were attributed to predation, while disease accounted for 30% of deaths over a 12-month observation period in Zimbabwe (Mapiye and Sibanda, 2005). This further stress the need for better management of the chicks during brooding. The losses observed in the current research were as a result of diseases, predation, theft and accidents in that order of predominance from the questionnaire earlier administered to the respondents.

Reduction in chick number during brooding shows that the reduction is from about 10 on the day of hatching to about six on the 61st day. Oluyemi and Roberts (2000) reported that as the age of the chicks increased, the number of chicks with the hen decreased proportionately, so that if a farmer said that his chicks were seven or eight weeks old, one could predict that only one or two remained of the original batch.

Conclusion

The Black/White ecotype laid the highest number of eggs while the Black laid the heaviest egg and it also recorded the highest hatchability rate. The values obtained for the monitored parameters pointed to gaps in performance as a result of unimproved husbandry resulting from no housing, unbalanced feed resources, theft, diseases, predation and accidents which if bridged would permit the identified ecotypes to distinguish themselves, thereby bringing into fore the need for conservation of these invaluable genetic resources. It also offered baseline information for further research on improvement of reproductive performance of the local domestic fowls at the village level in the study area.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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