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A preliminary study on semen collection, evaluation and insemination in Nigerian local turkeys (*Meleagris gallopavo*)

MS Yahaya[1]*, MA Umaru[1] & A Aliyu[2]

1. *Department of Theriogenology and Animal Production, Faculty of Veterinary Medicine, Usmanu Danfodiyo University Sokoto-Nigeria.*
2. *Kebbi State Ministry of Agricultural and Natural Resources, Kebbi State-Nigeria*

*Correspondence: Tel.: 2348069796802, E-mail: amsyzur@yahoo.co.uk

Abstract

This preliminary study was carried out with 6 local turkey (*Meleagris gallopavo*) by collecting semen from 2 toms and insemination into 4 hen. The semen collection was achieved by the method of abdominal massage. It was evaluated based on volume, mass motility, live-dead-ratio and sperm concentration, which were; 0.195 $\pm$ 0.010mls (Tom 1) and 0.205 $\pm$ 0.024mls (Tom 2), (+++) for both toms, 70% (for Tom 1) and 75% (for Tom 2) approximately and 6.150 ± 0.329 x10^9/ml and 6.295 ± 0.161 x10^9/ml for Tom1 and Tom 2 respectively. Hens were inseminated weekly. Eggs laid were collected, stored and later incubated for hatching. Fifty four (54) eggs were incubated, (16 eggs from Hen A and 10 from Hen B, 15 from Hen C and 13 from Hen D), and all were found to be fertile. Forty six eggs (46 eggs i. e. 85%) were hatched (13 eggs from Hen A, 8 from Hen B, 14 from Hen C and 11 from Hen D). From the result it was clear that semen collected from the turkeys (Toms) in Sokoto was of satisfactory quality and can be used fresh in artificial insemination. The result also signifies satisfactory hatchability of eggs from inseminated hens.

Keywords: Hatchery, Insemination, Semen collection, Sokoto, Turkey

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Introduction

Artificial insemination (AI), as practiced by bees and many other flying insects, has played an important role in plant reproduction for a very long time (Foote, 2002). Use of AI in animals is a human invention and is more recent. Undocumented tales exist of Arabs obtaining semen from mated mares belonging to rival groups and using the sperm to inseminate their own mares (Foote, 2002). Much of the development of AI occurred before the 1980s when electronic networks became available (Gills *et al*., 1999). The developments that made AI the most important animal biotechnology applied to date include improved methods of male management and semen collection, evaluation, preservation, and insemination. Detection of estrus and control of the estrous cycle in the females were also important.

The technique currently used for AI in poultry was developed in the 1930s and involves applying pressure to the hen's abdomen and everting the vaginal orifice through the cloaca (Burrows & Quinn 1937). This procedure is also referred to as cracking, venting or everting the hen. Semen is deposited 2–4 cm into the vaginal orifice concurrently with the release of pressure on the hen's abdomen. Insemination is accomplished with straws, syringes or plastic tubes. In large scale, commercial operations, automated semen dispensers using individual straws loaded with set of AI doses are commonly used.

Artificial Insemination (AI) in poultry is going to be more familiar (in solving the problem of breeding) to the poultry farmers, especially as it relates to turkey production, as well as poor villagers due to its practical impact from economical point of view. It is true that its practicability is still far from small holder investors due to the lack of available relevant

technologies, but with the introduction of simple equipments and procedures, the benefit can be realized. Some works have been conducted relevant to this in local chicken and guinea fowl in the tropics (Onuora, 1982; Ayorinde, 1989; Surai & Wishart, 1996; Gbadamosi & Egbunike, 1999; Bah *et al*., 2001; Butswat *et al*., 2002). However in local turkeys there is paucity of information as to whether AI by inseminating fresh semen would be practical. This neccesited this experiment as information generated will be significant for both small and large scale farmers willing to use fresh semen for AI.

Materials and Methods

Experimental animals
Six turkeys (2 toms and 4 hens) were obtained from a local market around Sokoto and fed wheat bran, table remnant and onions. The males were conditioned and trained for semen collection through abdominal massage.

Semen collection
Semen was collected using the abdominal massage method described by Burrows & Quinn (1937). The testes located at the dorsum were stroked and massaged until there was protrusion of the cloacae. The semen was then milked and collected using a rubber pipette and transferred to collection vials.

Semen analysis
Semen analysis was done at the theriogenology laboratory, Faculty of Veterinary Medicine Usmanu Danfodiyo University Sokoto. Volume, colour, concentration, mass motility, morphology and live-dead ratio were determined.

Volume: Volume was determined by the use of calibrated pipette, the semen was aspirated and the volume read.

Colour: Semen colour was always checked and consistently it was either milky or greyish in colour.

Morphology: Morphology was checked for both unstained samples and those stained with Nigrosin/Eosin stain. A drop of unstained semen was dropped on a glass slide and a smear was made and viewed. For the staining, Nigrosin-eosin stain smear was made by placing two drops of semen together with a drop of 10% Nigrosin and 2 drop 5% eosin in a vial, they were mixed thoroughly but gently. A smear was made from it mixture and viewed under high power (x100).

Mass motility: This was evaluated immediately after semen collection. A drop of semen was placed on a warmed glass slide and observed with a microscope using low power (X10, X40) without cover slip. The mass activity was graded (0 to +++) (Sastry, 2002).

Sperm count (Concentration): Sperm count was carried out with a Neubauer hemacytometer. The semen was diluted with normal saline at 1:400; the hemacytometer was then filled with the diluted semen through the capillary action of the red cell pipette. The hemacytometer was then mounted and the sperm cells counted.

Live and dead ratio: Live- dead ratio was determined using nigrosin/eosin stain (5% eosin, 10% nigrosin). A high number of the spermatozoa were found to be clear, meaning they've not absorbed the stain and were therefore live sperm cells, while a small number of them were stained pink which means they've absorbed eosin component and were therefore dead.

Insemination
Insemination was achieved following 'venting', the females were turned upside down, pressure applied on the right side of the abdomen until the vent everted, a pipette containing the fresh semen was inserted to a depth of about 1.5-2 cm into the cloacae and then 0.02mls of the semen was dispensed. This was done weekly for six weeks.

Candling
These first set of eggs collected before the onset of insemination were incubated for seven days at 37^oC, they were found to be clear (i.e. not embryonated). The insemination lasted for six weeks. At every insemination the hens received a weekly dose of 0.02 mls of raw semen each delivered into the vagina following 'venting' (oviductal eversion). Following insemination, twenty-six eggs (16 from hen A, 10 from hen B) laid were submitted to the hatchery.

Hatching
Following the hatching procedure forty eight of the fifty four eggs were hatched (16 from Hen A, 10 from Hen B, 15 form Hen C and 13 from Hen D). Hen A 85% hatched, Hen B 80% hatched, Hen C 93% and Hen D 85%.

Results

The result of semen analysis is presented in table 1 while that of the incubation and hatching is presented in table 2. The semen analysis showed mean semen volumes of 0.195 ± 0.010 and 0.205 ± 0.024 for tom 1 and tom 2 respectively (table 1). For semen concentrations mean values of 6.150 ± 0.329 x 10^9 cells/mL and 6.295 ± 0.161 x 10^9 cells/mL are shown for tom 1 and tom 2 respectively (table1). For the live-dead-ratio, the mean values of 85.2 ± 2.56 % and 87.5 ± 1.67 % have been shown on the table. Both toms have been shown to possess persistent value of +++ for mass motility throughout the period of the analysis.

The incubation and hatching

It was observed that the four hens A, B, C and D layed 16, 10, 15 and 13 eggs respectively during the entire period. After incubation 13, 8, 14 and 11 eggs were hatched from hens A, B, C and D respectively for hens A, B, C and D respectively (table 2).

Discussion

The first series of massages were not able to stimulate the tom to produce semen; this is because for semen collection, toms have to be trained usually from their tender age to get accustomed to the procedure of semen collection Gill, *et al.,* (1999).

The volume of semen collected at various times is shown on table 1.0 with the average of 0.195mls ± 0.010 and 0.205 ± 0.024 for tom 1 and tom2 respectively. The volumes were lower than those reported for exotic breeds. i.e. average of 0.35-0.40 mls (Christensen, 2005), in the local breeds however, Zahraddeen *et al.,* (2005), got an average volume of 0.17± 0.02mls in Bauchi , which were lower than those of the present study. The obvious difference is probably due to the system of management or simply genetic variation.

The live-dead ratio was found to be 85.2 %± 2.56 and 87.5% ± 1.67 for tom 1 and tom 2 resp. This is an index of fertility (Rekwot *et al.,* 2005). Although this number is higher than the findings of Zahraddeen *et al.,* (2005), it suggests further that there is genotype variation within the local breeds that can be improved. The semen concentration in the present study (6.150 ± 0329 x10^9 cells//mL and 6.295 ± 0.161 x10^9 cells/mL for tom 1 and tom 2 resp.) was also high than the finding of Zahraddeen *et al*., (2005).

Table 1: Semen analysis of the tom

	Semen Volume(mls)		Semen Conc.(cellsx10^9/mL)		Live-Dead-Ratio (%)		Mass Motility	
	Tom 1	Tom 2	Tom 1	Tom 2	Tom 1	Tom 2	Tom 1	Tom 2
Week1	0.20	0.25	6.0032	6.2015	85	83	+++	+++
Week2	0.18	0.18	4.8000	6.0028	81	87	+++	++
Week3	0.19	0.19	6.4384	5.9879	75	88	+++	+++
Week4	0.21	0.20	7.2960	6.6734	89	85	+++	+++
Week5	0.19	0.21	6.1334	6.0045	92	87	+++	+++
Week6	0.20	0.20	6.2327	6.8976	89	95	+++	++++
Means	0.195 ± 0.010	0.205 ± 0.024	6.150 ± 0.329	6.295 ± 0.161	85.2 ± 2.56	87.5 ± 1.67		

Table 2: Hatching result following incubation of egg

Hens	Total Eggs Set (pieces)	Total Eggs Hatched (pieces)	Hatchability (%)
A	16	13	81
B	10	8	80
C	15	14	93
D	13	11	85

that had average of 2.81±74.93 x 10^9 cells/mL but it was within range acceptable even for the exotic breeds (6 to about 12 billion cells/mL) reported by Donoghue & Wishart, (2000).

The result from hatchery can be seen to be very encouraging for all the hens. All the four hens had ≥ 80% hatchability. In conclusion, this preliminary work shows that artificial insemination using raw semen in local turkeys in Sokoto is not only feasible but is also practicable and lucrative with high eggs hatchability. It therefore carries significant information to those willing to invest in the field of poultry farming, especially turkey rearing and breeding by the use of artificial insemination.

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