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Effect of Frequency of Ejaculation on Semen Characteristics in Two Breeds of Turkeys (*Meleagris gallopavo*) Raised in a Tropical Environment

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Abstract: A study was carried out at the Abubakar Tafawa Balewa University Farm, Bauchi (February - May, 2002) to investigate the effect of frequency of ejaculation (once, twice and thrice per week) on semen traits in exotic and local turkeys. The results showed that ejaculate volume, live spermatozoa, abnormal spermatozoa, sperm concentration and total sperm per ejaculate were significantly ($P<0.05$) higher in exotic than local turkeys, values being 0.32±0.02 vs 0.17±0.02ml, 83.83±1.33 vs 80.67±1.33%, 11.19±0.73 vs 13.61±0.73%, 4.66±70.73 vs 2.81±74.93 x 10^9 and 97.72±9.86 vs 50.81±10.45 x 10^9. It was also shown that sperm concentration was the only variable significantly affected ($P<0.05$) by frequency of ejaculation. The interaction of breeds and frequency of ejaculation also favoured ($P<0.05$) the exotic breed at lower frequency of ejaculation. Semen collection in turkeys is more favourable when harvested once per week since semen concentration declines progressively with increase in the ejaculation frequency. The exotic have superior genetic make-up than the local turkeys in terms of their reproductive potential.

Key words: Breeds, ejaculation frequency, semen, Turkey, tropics

Introduction

Rapid human population growth and low protein intake are some of the major problems facing developing countries like Nigeria. Poultry offers an avenue for rapid transformation in animal protein production. This is because they rank first in population among domesticated animal species (FAO, 1995). There is hardly any household in the rural and periurban areas that does not keep one form of poultry or the other poultry. They also have a shorter generation interval than most farm animals. Thus genetic improvement could be attained at a faster rate. Poultry population of Nigeria was estimated to be 104.3 million; turkeys (0.2 million), chicken (72.4 million), pigeon (15.2 million), ducks (11.8 million) and guinea fowl (4.7 million) (FDLPCS, 1992). However for turkey to give their maximum contribution to animal protein supply the problem of their low fertility must be overcome.

Artificial insemination (A.I)is a vital tool for rapid improvement of infertility in Turkey by allowing maximum use of the best Toms on numerous hens .A.I is one of the animal production technologies that augment production and returns from livestock and poultry at a faster rate and enhance crossbreeding programmes. The benefits of this technology are however derived only when it is available to the Farmers and is effectively utilized by them .Un fortunately this technology is at its infancy in Nigeria especially among Turkey farmers.

The assessment of the semen quality characteristics of the poultry species gives an excellent indicator of their reproductive potentials, and is a *sine quanon* to effective artificial insemination programme, but there is paucity of information on this aspect for the Nigerian indigenous species of poultry and turkey in particular. There are some limited studies on local chicken (Gbadamosi and Egbunike, 1999; Egbunike and Nkanya, 1999; Idi, 2000), guinea fowl (Onuora, 1982; Ayorinde, 1989; Butswat *et al*., 2002), but information on these attributes for the other species of indigenous poultry (ducks, turkeys and pigeons) are rare or practically non-existent .

It is therefore, imperative to understand and improve the reproductive potentials of these animals in this country in order to form a basis for rapid breeding programmes. It is also necessary that the programme should always include the local poultry since they possess some innate resistance to certain local diseases in addition to adaptability to prevailing climatic conditions.

This study was therefore designed to investigate the effect of frequency of ejaculation on semen characters in exotic and local turkeys in a tropical environment.

Materials and Methods

Location and climate: The study was conducted at the Research Farm of Abubakar Tafawa Balewa University, Bauchi, Nigeria. Bauchi is on latitude 10° 27' North, longitude 9°49' East and at an altitude of 690.2 meters above sea level (Kowal and Knabe, 1972).

The mean weather data (Table 1.) in Bauchi reveals that the rains start with a mean of about 22.2mm in April to reach a peak in July (232.1mm) and then decline to 40.6mm by October. The relative humidity tends to follow the rainfall pattern being highest (80.7%) in the

Table 1: Mean weather data of Bauchi (1999-2002)

Month	Rainfall (mm)	Relative Humidity (%)	Temperature(°C)		Sunshine (hours/day)
			Minimum	Maximum	
January	0.0	26.1	12.9	30.4	7.5
February	0.0	29.3	15.0	31.5	10.8
March	0.0	25.6	19.5	36.7	7.2
April	22.2	44.7	23.5	36.7	7.5
May	54.1	56.7	23.7	34.5	7.6
June	110.3	63.4	22.2	33.5	7.8
July	232.1	76.1	21.1	31.1	5.4
August	217.8	80.7	20.9	29.4	5.6
September	133.7	78.5	20.9	30.4	6.2
October	40.6	64.9	19.5	32.0	7.0
November	0.0	37.8	15.9	33.6	9.9
December	0.0	31.6	13.8	31.1	9.4

Source: (Meteorological Department, Federal Ministry of Aviation, 2003)

Table 2: Seminal traits in exotic and local turkeys

	Breeds		
Seminal traits	Exotic	Local	LOS
Volume (ml)	0.32±0.02	0.17±0.02	***
Progressive motility(%)	82.50±1.55	80.20±1.58	NS
Sperm concentration(x 10^9)	4.66±70.73	2.81±74.93	*
% Live spermatozoa	83.83±1.33	80.67±1.33	*
% Abnormal spermatozoa	11.19±0.73	13.61±0.73	*
Total sperm per ejaculate(x 10^9)	97.72±9.86	50.81±10.45	**

Mean ± S.E. *P<0.05; **P<0.01; ***P<0.001. NS = Not Significant. LOS = Level of Significance.

peak of the rainy season (August) and least in the peak of the dry season (25.6%) in March. Mean minimum (12.9°C) and maximum (36.7°C) are experienced in January and March respectively. The hours of sunshine indicate highest visibility in February (10.8 hours) and least in July (5.4 hours) (Meteorological Report, 2003).

Soil and Vegetation

The soils most common are ferruginous on sandy parent material and are of high fertility, but their susceptibility to erosion and drought have limited their maximum utilization for crop production (Butswat *et al.,* 2000).

The vegetation is open Savannah woodland with trees up to 6 m or more. The trees normally occur singly or in clusters, while the spaces between are occupied by non-woody species up to 3 m high. Grasses in such areas normally reach a height of 3.5m or more. These grasses are generally brown and have low nutritive value during the dry season. With the on set of the rainy season, however, there is lush pasture which has a higher nutritive value (Butswat, 1994)

Experimental Birds: The turkeys used for the study were the exotic (improved), large Holland White and local (unimproved) breeds, aged 12 months.

The local turkeys (weighing 9 kg each) were sourced from small scale farmers in Toro Local Government Area of Bauchi State, while the exotic breed (18kg each) was purchased from ZARTECH Ltd Farms, Ibadan, Oyo State.

Birds Care: Each bird was housed singly in a well ventilated netted pen. They were fed Standard Breeder Mash, containing 10%cp and given fresh water continually. Medical care was also adequately provided.

Data Collection: Three males (toms) from each breed were randomly selected and allocated to treatments in a completely randomized design (CRD). The toms were subjected to training Programme for semen collection. Semen was collected using the lumber massage method of Quinn and Burrow (1936).

Three frequencies of ejaculation (once, twice and thrice per week) were used. Seminal traits with respect to volume, concentration, motility, live and abnormal spermatozoa and total spermatozoa were evaluated as per the procedures laid down by Butswat (1994) and Hafez (1995). Data were generated over a period of four months (February - May, 2002).

Data analysis: Data generated for the study were subjected to statistical analysis using the General Linear Model (GLM) (SAS, 1987).

Table 3: Seminal traits and frequencies of ejaculation in turkeys

	Frequency of ejaculation(week)			
Seminal traits	Once	Twice	Thrice	LOS
Volume (ml)	0.22±0.24	0.24 ±0.02	0.27 ±0.02	NS
Progressive motility(%)	83.18±2.22	79.82±1.64	81.64 ±1.86	NS
Sperm concentration(x 10^9)	5.42±111.38	3.37±83.01	2.41 ±67.78	*
% Live spermatozoa	83.17±1.99	83.75±1.41	79.83 ±1.41	NS
% Abnormal spermatozoa	12.92±1.10	12.00±0.78	12.29 ±0.78	NS
Total sperm per ejaculate(x 10^9)	74.28±15.53	86.68±11.58	61.85 ±9.45	NS

Mean ± S.E. *P<0.05. NS = Not Significant. LOS = Level of Significance

Table 4: Seminal traits and frequencies of ejaculation in exotic and local turkeys

	Breed x frequency of ejaculation [Once]			
Seminal traits	Exotic	Local	LOS	LOS
Volume (ml)	0.28±0.03	0.11±0.34	*	*
Progressive motility (%)	82.11 ±3.04	84.25 ±2.23	NS	NS
Sperm concentration (x 10^9)	8.04 ±148.50	2.80 ±166.03	*	*
% Live spermatozoa	82.83 ±2.82	83.50 ±2.82	NS	NS
% Abnormal spermatozoa	11.50 ±1.56	14.33 ±1.56	NS	NS
Total sperm per ejaculate (x 10^9)	101.52 ±20.71	47.04 ±23.15	**	*
	Breed x frequency of ejaculation [Twice]			
Seminal traits	Exotic	Local	LOS	LOS
Volume (ml)	0.35 ±0.03	0.12 ±0.02	***	*
Progressive motility (%)	83.47 ±2.36	83.47 ±2.36	*	NS
Sperm concentration (x 10^9)	3.87 ±117.40	2.87 ±117.40	NS	*
% Live spermatozoa	86.08 ±1.99	81.42 ±1.99	NS	NS
% Abnormal spermatozoa	11.42 ±1.10	12.58 ±1.10	NS	NS
Total sperm per ejaculate (x 10^9)	129.43 ±16.37	43.92 ±16.37	***	*
	Breed x frequency of ejaculation [Thrice]			
Seminal traits	Exotic	Local	LOS	LOS
Volume (ml)	0.31 ±0.02	0.22 ±0.03	*	*
Progressive motility (%)	81.92±2.64	80.17±2.64	NS	NS
Sperm concentration (x 10^9)	2.07 ±95.86	2.75 ±97.86	NS	*
% Live spermatozoa	82.58 ±1.99	77.08 ±1.99	NS	NS
% Abnormal spermatozoa	10.67 ±1.10	13.92 ±1.10	*	NS
Total sperm per ejaculate (x 10^9)	62.22 ±13.37	61.47 ±13..37	NS	*

Mean ±S.E. *P<0.05; **P<0.01; ***P<0.001. NS = Not Significant. LOS = Level of Significance

Results

Table 2 depicts the results on the seminal traits in both exotic and local turkeys studied. From the table, the exotic toms were superior to the local turkeys in ejaculate volume, sperm concentration, live spermatozoa, abnormal spermatozoa and total sperm per ejaculate, values being 0.32±0.02 vs 0.17±0.02ml, 4.66±70.73 vs 2.81±74.93 x 10^9 83.83±1.33 vs 80.67±1.33%, 11.19±0.73 vs 13.61±0.73%, and 97.72 ±9.86 vs 50.81±10.45 x 10^9 (P<0.05) respectively. There were no significant difference in progressive motility in the two breeds.

Data on semen characters and frequencies of ejaculation in turkeys are shown on Table 3. The results reveal that sperm concentration is the only variable significantly affected (P<0.05) by the three frequencies of semen collection. All other variable (ejaculate volume, progressive motility, live spermatozoa, abnormal spermatozoa and total sperm per ejaculate) did not change significantly in the breeds.

Interaction results between breeds and frequencies of ejaculation show that seminal trait such as ejaculate volume, sperm concentration and total sperm per ejaculate were significantly higher (P<0.05) in the exotic breed when semen was harvested once a week. Similarly, ejaculate volume and progressive motility showed significant difference (P<0.05) when semen collection frequency was doubled in a week. With the increase in frequency of ejaculation (thrice per week) ejaculate volume and abnormal spermatozoa were significantly better (P<0.05) in the exotic than the local breeds. All other variables were not affected by

frequencies of ejaculation (Table 4).

Discussion

The superior reproductive potential exhibited by the exotic than the local turkeys showed that differences exist between genotypically different breeds as similarly reported by Butswat *et al.* (2002). The significant differences in most of the variables also suggests that the exotic turkeys are adapted to this environment and could be exploited further.

The ejaculate volume obtained in the local breed was very low and did not fall within the acceptable limit (0.25-0.35ml) reported by Burke (1984) and 0.26-0.35ml given by Bakst (1990). Conversely, the value (0.32 ml) obtained in the exotic breed is in conformity with the findings of these workers. Sperm concentration in the two breeds is much lower than the value(7.90±1.19 x 10^9) reported by Cecil and Bakst (1988). This difference is probably attributed to genotypes and management. Progressive motility and live spermatozoa obtained were higher than the findings of Sexton (1981). Spermatozoal abnormalities in the two breeds were lower than the 20% reported by Hafez (1995). High fertility could therefore be achieved with these breeds since Donaghue and Walker-Simmons (1999) reported a very high positive correlation between progressive motility and fertility.

There was a progressive decline in sperm concentration with increase in frequency of ejaculation. This is similar with the findings of Santayana (1985), but disagrees with those of Noirault and Brillard (1999) who observed a non significant difference in the concentration with increase in ejaculation frequency. Other traits investigated in this study were not affected by frequency of ejaculation. These differences could be probably due to differences in the ejaculation frequency. This was similarly observed by Watson (1990). Colas (1980) who also reported the effect of climate on seminal traits.

Conclusion: The results obtained in this study on the effect of frequency of ejaculation on semen characteristics in turkey breeds showed that the exotic turkeys are superior than the local ones. Breed differences exist with respect to frequency of ejaculation and sperm concentration declined progressively with increase in frequency of ejaculation. This means that the exotic toms have higher potential for use in natural mating and AI programmes since seminal traits could be a viable index for selection of breeding toms.

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