

COMPARISON OF THE PHYSICAL CHARACTERISTICS OF SEMEN UNDER DIFFERENT COLLECTION FREQUENCIES IN THE NATIVE AND EXOTIC COCKS

Udeh, I*, S.O. Ugwu and A.I. Ojeh.

Department of Animal Science, Enugu State University of Science and Technology, Enugu

Target audience: Poultry breeders and farmers, animal scientists,
veterinarians

ABSTRACT

Twelve native cocks aged 35–40 weeks and twelve harco cocks aged 38 weeks were ejaculated at three collection frequencies of 30 minutes, 60 minutes and 120 minutes consistently on Tuesday, Thursdays and Saturdays. Ejaculates were collected in the morning (5.00-10.00 a.m.) and in the evening (3.00-9.00 p.m.) at the various frequencies and evaluated for quality for a period of 4 weeks. Results indicated significant effects ($P < 0.05$) of genotype, ejaculation frequency and ejaculation interval (weeks) on ejaculate volume, sperm motility and sperm vigour. Mean values for sperm concentration were significantly highest ($P < 0.05$) at 60 minutes collection frequency while the means for ejaculate volume, sperm motility and sperm vigour were highest in both genotypes under 120 minutes collection frequency and lowest under the 30 minutes frequency. Total sperm abnormalities as well as total live sperm were not significantly ($P < 0.05$) affected by genotype. Mean values for all the semen traits studied were significantly ($P < 0.05$) higher in the native than the exotic cocks at the various collection frequencies. The results apparently indicate that high ejaculation frequencies have negative effect on semen quality in the domestic fowl.

Key words: Collection frequency; Genotype, Semen Characteristics, native and exotic
cocks.

DESCRIPTION OF PROBLEM

One of the important factors that significantly account for the variability in semen quality is the ejaculation frequency (1). Studies with the boar have shown that in animals that do not possess high sexual capacity collection of semen should be adequately regulated (2). The effects of different collection frequencies on the ejaculate characteristics of some farm animals have been investigated by a number of workers (3,4). In poultry, Parker (5), Buckland *et al* (6) De Reviers (7), and Gbadamosi and Egbunike (8) investigated the effects of frequency of ejaculation on semen quality of cocks and toms and observed that the concentration of sperm per ejaculate reduced significantly when semen were collected more frequently from chickens and turkeys.

*Author for correspondence

In view of the fact that cocks have the habit of mating more frequently and at close interval it becomes imperative to investigate the influence of frequency of ejaculation on fertilizing capacity of the domestic cocks under the prevailing production conditions in Nigeria. This is aimed at standardizing the optimum collection frequency and improving the reproductive efficiency of poultry in Nigeria.

MATERIALS AND METHODS

The experimental cocks comprised 12 Native cocks aged 35-40 weeks and 12 Harco cocks aged 38 weeks maintained at the poultry breeding unit of the Department of Animal Science, Enugu State University of Science and Technology, Enugu. These birds were housed in deep litter floors and provided ad libitum with custom mix broiler finisher ration and water. A pre-experimental period of three weeks was used in training the birds for artificial ejaculation. Cocks within each genotype were divided into three treatment groups and randomly assigned into pens. Cocks in treatment 1 were ejaculated every 30 minutes while those in treatments 2 and 3 were ejaculated at 60 and 120 minutes interval respectively. Collection of semen was done between 5 a.m – 10 a.m. and from 3p.m to 9.00 p.m. on Tuesdays, Thursdays and Saturdays consistently for four weeks. Semen was collected by the manual massage technique and gentle squeeze of the cloaca (9,10). The semen were collected into a clean test tube and evaluated with 6 minutes after collection. A total number of 240 semen samples were evaluated under the 30 minutes collection frequency while 120 samples and 60 samples were evaluated under 60 minutes and 120 minutes collection frequencies respectively within each genotype.

Semen evaluation The colour and consistency of the ejaculates were evaluated adopting the criteria outlined by Omeje and Marire (11). Semen volume was determined using the method by (12) in which the semen in the test tube was drawn into a tuberculin syringe of 1.00 ml capacity and 0.01 ml calibration. Gross motility and sperm vigour were determined using the method of Ekpenyong (13). The percentage of motile sperm as determined by motion was scored 0-90%. Sperm vigour was determined as the speed at which the sperm cells travelled across the microscopic field and was scored 0-5. The concentration of sperm per ejaculate was determined by the use of Lévy-Hauser haemocytometer as described by Ekpenyong (13). The percentage live and dead sperm and morphologically abnormal sperm were evaluated by using the eosin – nigrosin vital staining technique.

Data analysis

All the data generated were subjected to the analysis of variance procedure by Steel and Torrie (14). Statistically significant mean values of the treatment groups with regard to each semen trait were separated by means of the multiple range and F test (15).

RESULTS AND DISCUSSION

Table 1 shows the mean values and standard error of semen characteristics of the two genotypes of cocks ejaculated at various frequencies while the average weekly ejaculate characteristics of the native and exotic cocks are presented in Table 2. Ejaculate volume was significantly higher ($P < 0.05$) in the native than the exotic cocks at the various frequencies of collection adopted and at the different weekly ejaculation intervals (Tables 1 and 2). Within the native cocks, the volume of semen collected at 60 minutes and at 120 minutes were similar but higher ($p < 0.05$) than semen voided at 30 minutes interval. A different trend was obtained with the exotic strain where cocks ejaculated every 120

minutes gave the highest semen and those ejaculated at 30 minutes the least. The weekly ejaculate volume of the domestic cocks did not differ within each genotypic group. The effects of genotype, frequency of ejaculation and ejaculation intervals (weeks) on sperm motility, vigour and sperm concentration were highly significant ($p < 0.05$) but not on percent live sperm. The mean values for these parameters under the three frequencies of collection adopted and under different ejaculation intervals were higher ($p < 0.05$) in the native than the exotic cocks semen (Tables I and II). While no significant effects of frequencies of collection and ejaculation interval were observed within the native cocks in sperm motility and sperm concentration, significant ($p < 0.05$) variation was obtained in the exotic cocks in these parameters. Total sperm abnormalities were affected ($p < 0.5$) by frequency of ejaculation but not genotype and ejaculation intervals. While frequency of ejaculation exerted significant effects ($p < 0.05$) on total sperm abnormalities within the exotic semen, no significant variation was observed within the native cocks in the same parameter (Table I). Time of collection had no significant effect on all the semen traits studied.

The colour and consistency of ejaculates recorded in this study were within the range of normal cock semen which is usually pearly white or milky and thick. The volume of semen collected in the experiment was significantly ($P < 0.5$) higher in the native than the exotic cocks. It had been established earlier that lighter breeds of cocks, including the native, gave more semen than the heavier ones (11,12). The results of the study also showed that frequency of ejaculation exerted significant effect on ejaculate volume and the concentration of sperm per ejaculate. These results support those of Parker (5) and Buckland *et al* (6) who had earlier reported that higher ejaculate frequencies reduced semen volume and concentration in cocks and toms. Based on this observation, Etches (16) recommended an optimum collection frequency for artificial insemination purposes depending on the objective of the matings. According to the author, if the largest number of offspring per mating is desired, semen should be collected at approximately weekly intervals. If however the maximum number of offspring per male is desired, the male should be ejaculated up to five times per week. However, the results of this present study indicate that the highest number of sperm per ejaculate was obtained in both genotypes at 60 minute collection frequency. For instance, the mean sperm concentration at 60 minutes frequency was $6.09 \pm 0.15 \times 10^6$ in the native and $3.95 \pm 0.21 \times 10^6$ in the exotic cocks. At 120 minutes ejaculation interval, mean values for sperm concentration were $5.18 \pm 0.47 \times 10^6$ for the native and $3.90 \pm 0.17 \times 10^6$ for the exotic. The recommendation of Etches (16) was based on temperate condition. Thus, there is need to establish an optimum collection frequency for our local tropical environment.

Sperm motility varied with genotype, collection frequency and ejaculation interval. Sperm motility was higher in the native than the exotic cocks at the various collection frequencies and ejaculation intervals. The present results were in agreement with the observation of Egbunike and Oluyemi, (17) that breed produces significant effect on most semen traits including sperm motility. Since sperm motility is a very good indicator of semen quality and fertilizing ability (18), it follows that the native chicken possesses more fertilizing capacity than the exotic type. The mean scores for sperm vigour of the native was higher than the exotic cocks at the various collection frequencies and ejaculation intervals. This observation together with the result of sperm motility apparently suggests that the native cock could be more virile than the exotic cocks in terms of breeding.

Table 1: Effects of genotype and frequency of ejaculation on physical characteristics of cocks semen

Semen characteristics	Frequency of collection					
	30 minutes		60 minutes		120 minutes	
	Native	Exotic	Native	Exotic	Native	Exotic
Volume /ejaculation (ml)	0.21+0.007 ^c	0.16+0.009 ^a	0.29+0.007 ^a	0.19+0.009 ^b	0.28+0.007 ^d	0.22+0.006 ^c
Concentration (x10 ⁶ cells /ejaculate)	4.95+0.21 ^b	3.69+0.22 ^a	6.08+0.15 ^d	3.95+0.21 ^a	5.18+0.17 ^c	3.90+0.17 ^a
Progressive Motility (%)	73.33+1.12 ^b	58.71+2.06 ^a	75.49+1.06 ^b	61.04+1.78 ^a	76.45+1.00 ^b	64.52+1.66 ^a
Sperm Vigour (scores)	3.35±0.14 ^b	2.32±0.14 ^a	3.36±0.09 ^b	2.47±0.89 ^a	3.52±0.72 ^b	2.80±0.96 ^a
Live Sperm (%)	78.36±1.05 ^a	79.76±0.73 ^a	88.58±1.24 ^b	87.13±0.88 ^b	87.61±0.35 ^b	86.03±0.91 ^b
Total abnormal Sperm (%)	3.36±0.12 ^b	3.13±0.12 ^b	3.31±0.13 ^b	2.68±0.97 ^a	3.26±0.86 ^b	2.40±0.10 ^a

For all row values, a<b<c<d (P<0.05)

TABLE 2: Average weekly semen characteristics of the native and exotic cocks

Semen Characteristics	Genotype	Ejaculate interval (weeks)			
		1	2	3	4
Volume/ejaculation(ml)	Native	0.29+0.01 ^b	0.26±0.01 ^b	0.25+0.01 ^b	0.24+0.01 ^b
	Exotic	0.22±0.01 ^a	0.20±0.01 ^a	0.19±0.01 ^a	0.16±0.01 ^a
Concentration (x10 ⁶ cells/ejaculate)	Native	5.20+0.20 ^c	5.54+0.22 ^c	5.25+0.21 ^c	4.90+0.26 ^c
	Exotic	4.42±0.23 ^b	4.03±0.23 ^b	3.77+0.19 ^a	3.18+0.18 ^a
Progressive Motility (%)	Native	80.64±0.89 ^c	79.09±0.69 ^c	73.06±0.91 ^c	71.58±1.27 ^c
	Exotic	63.39±1.28 ^b	62.87±2.54 ^b	62.39±2.20 ^b	57.03±1.90 ^a
Sperm Vigour (scores)	Native	3.72±0.69 ^b	3.41±0.61 ^b	3.24±0.10 ^b	3.27±0.14 ^b
	Exotic	2.81±0.10 ^a	2.57±0.45 ^a	2.54±0.13 ^a	2.19±0.13 ^a
Live Sperm (%)	Native	84.63±0.64 ^a	84.87±0.78 ^a	82.92±0.83 ^a	85.68±0.76 ^a
	Exotic	83.15±0.08 ^a	84.67±0.86 ^a	83.98±1.00 ^a	84.97±0.87 ^a
Total abnormal sperm (%)	Native	2.94±0.12 ^a	3.27±0.13 ^a	3.26±0.14 ^a	3.50±0.13 ^a
	Exotic	2.68±0.12 ^a	2.93±0.17 ^a	2.77±0.13 ^a	2.56±0.12 ^a

a.b.c.d values in the same row not bearing the same superscript are significantly different (p<0.05).

The proportion of abnormal sperm observed in this study varied significantly with frequency of collection while other factors remained constant. Graham *et al* (3) had earlier observed that frequency of ejaculation had little or no effects on sperm morphology except in young males where it may lead to production of immature sperm cells with head deformities and mid-piece cytoplasmic droplets.

CONCLUSION AND APPLICATION

In view of the observed effects of increased frequency of ejaculation on semen quantity, it is necessary to establish the right mating ratio for different cock breeds, and to regulate the mating intervals of cocks over time to avoid unnoticed lapses in fertilizing capacity.

In conclusion further research in this area is recommended to standardize the optimum mating frequency of cocks in our environment.

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