SEMEN CHARACTERISTICS OF RHODE ISLAND RED AND WHITE BREEDER COCKS

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ABSTRACT

One hundred and three adult cocks of two different strains (Rhode Island White, 59 and Rhode Island Red, 44) were subjected to weekly semen collection for four weeks. The Rhode Island White cocks had a gross sperm motility of 80.76±1.45% while the value for the Red cocks is 79.43±1.68% but the difference was insignificant. The Rhode Island White cocks had a higher (P<0.001) sperm concentration (1.93 0.10x10^9/ml) than the Red cocks (1.27±0.12x10^9/ml) while semen volume (0.58±0.04ml) and colour (1.96±0.14) for the Rhode Island White cocks were lower (P<0.001) than the corresponding values of 0.80±0.05ml and 2.82±0.16 for Rhode Island Red cocks. Colour was found to be positively correlated (r= 0.89) with concentration and total sperm (r=0.61). The correlation between sperm concentration and volume, and concentration and total sperm, were 0.72 and 0.67 respectively.

KeyWords: Rhode Island Breeder, Cocks, Semen traits.

INTRODUCTION

For the successful performance of the reproductive function, it is imperative that male animals should be in a state of good physical and sexual health either for natural mating or collection of good quality semen for artificial insemination. (Zemjanis, 1970, Roberts, 1971). As a powerful tool for genetic manipulation, artificial insemination has been reported to increase fertility and hatchability rates in turkeys and chickens (Lake, 1967; Clarke, *et. al.*, 1982 and Mahanta *et al.*, 1991). The technique of artificial insemination in poultry was developed by Burrous and Quinn (1937). Breed and seasonal differences in semen production of cocks has been reported (Saeid and Al-Soudi, 1975; Egbunike and Oluyemi, 1979). The effects of season on semen quality with concommitant effect on fertility in birds have been reported (Lorenz, 1959; Romanoff, 1960; Marshall, 1961; Nayak and Misra, 1991). Onuora (1982) reported significant effects of low relative humidity, high temperatures, low rainfall and peak amount of sunshine on seminal characteristics resulting in poor quality semen. Genotype differences affected body size and semen characteristics of cocks while age differences significantly affected variation in body size, semen volume and pH (Omeje and Marire, 1990). It is desirable to incorporate the technique of artificial insemination into poultry breeding programme in Nigeria in order to increase the rate of genetic progress. Breeding soundness examination in the area of semen collection and evaluation of the breeding cocks is important in identifying and selecting sires of superior genetic worth. This present study was aimed at quantifying semen characteristics of Rhode Island White and Rhode Island Red cocks in Norther Nigeria.

MATERIALS AND METHODS

Experimental cocks

The experimental cocks comprised 44 Rhode Island Red and 59 Rhode Island White cocks of the dam sire lines of Rhode Island Breeders maintained at the Poultry Breeding Unit of National Animal Production Research Institute, Ahmadu Belllo University, Zaria, Nigeria. The birds had been on *ad-lib.* Feeding on conventional chick and growers rations containing 20 and 16% crude protein levels respectively from hatching to 18 weeks of age and then on breeders mash containing 17% crude protein to 45 weeks of age. Water

was provided *ad-lib*. While all the necessary vaccines and veterinary health care were given when due. Weekly body weight of each cock was determined at each time of semen collection.

Semen collection and evaluation

One hundred and three cocks were subjected to weekly semen collection for four weeks. Prior to the experiment, the cocks were given preliminary training so as to ejaculate and emit semen (Phalic tumescence) by gentle massaging of the abdomen with one hand while simultaneously stroking the lower back and tail feathers with the other hand (Hafez,1990). During the cloacal stroke the thumb and forefingers of the upper hand squeeze the cloaca with downward and inward pressure while the lower hand exerts slight upward pressure; semen which pools in the groove in the medial aspect of the phallus is collected into a clean graduated vial (Hafez, 1990).

Each ejaculate was immediately evaluated for color, volume, motility and concentration as described by Zemjanis (1970). This included the visual or gross evaluation of the ejaculate soon after collection in respect of volume, color, and absence or presence of foreign material as well as microscopic examination of wave pattern (gross motility) and percentage sperm count. Three different colour categories were used to roughly estimate sperm concentration or consistency (Zemjanis, 1970). These were: 1, creamy and grainy (2.0-3.5 x 10^9/ml); 2, milky (1.5-2. $0x10^9$/ml); 3, watery (0.5-1.4x10^9/ml) Gross motility (wave pattern) was determined by examining a drop of raw undiluted semen on a prewarmed slide under a light microscope at 100^x magnification. The percentage live sperm was evaluated by using the eosin-migrosin vital staining technique. Samples fixed in buffered formol saline were used for evaluating sperm abnormalities. Semen concentration was determined by use of a digital photometer.

Statistical analysis

Data collected were analysed using SYSTAT(Wilkinson 1988).

RESULTS

The semen characteristics of the two strains of cocks are presented (Table 1). Mean body weights for the White and Red cocks were not significantly different. Semen volume for the

TABLE 1. MEANS (±SE) OF BODY WEIGHTS AND SEMEN CHARACTERISTICS OF TWO STRAINS OF COCKS.

Reproductive traits	White cocks	Red cocks
Number of Cocks	59	44
Body weight, kg.	2.59±0.03	2.55±0.04
Semen volume, ml.	0.58±0.04a	0.80±0.05b
Color (consistency).	1.96±0.14b	2. 82±0.16a
Gross sperm motility, (Wave pattern)	80.76±1.45	79.43±1.68
Sperm concentration, x 10^9/ml	1.93 0±10b	1.27±0.12a
Total sperm, x 10^9/ml	1.1.22±0.01	1.11±0.13
Live sperm, %	79.58±1.32	78.52±1.53
Total abnormal sperm, %	9.66±0.65	8.57±0.75

[ab]Mean values in rows with different superscripts are significantly different (P < 0.001).

TABLE 2. CORRELATION COEFFICIENTS FOR BODY SIZE AND SEMEN TRAITS OF COCKS

		1	2	3	4	5	6	7	8
1.	Body weight	-							
2.	Volume	- 0.06	-						
3	Colour	-0.06	-0.06	-					
4.	Motility	0.02	- 0.06	- 0.28	-				
5.	Conc.	- 0.01	0.10	0.89	0.29				
6.	Total sperm	- 0.08	0.67*	0.61	0.16	0.72*			
7.	Live sperm	0.08	- 0.016	- 0.05	0.09	-0.01	- 0.10	-	
8.	Total abnormal sperm	0.04	0.04	-0.04	0.07	0.05	0.01	0.16	-

*p < 0.001.

Rhode Isalnd White cocks were significantly lower than the corresponding values for the Rhode Island Red cocks ($P<0.001$). The colour of semen ranged from creamy to grainy. The Rhode Island White birds had a higher gross sperm motility than the Rhode Island Red cocks but These were not significantly different ($P>0.05$). Average sperm concentration ($1.93\pm0.10 \times 10^9$/ml) for Rhode Island White cocks was higher ($P<0.001$) than the sperm concentration for the Rhode Island Red. There were however no significant differences in total sperm, live sperm and total abnormal sperm ($P>0.05$). Some common sperm morphological abnormalities encountered were head defects, mid-piece defects and tail defects, These were present in both the white and Red cocks respectively ($P>0.05$). The pearson correlation matrix for body weight and semen characteristics is presented (Table 2). The color of the semen was found to be positively correlated with sperm concentration (correlation coefficient of 0.89) and total sperm (correlation coefficient of 0.61). Sperm concentration was found to be positively correlated with total sperm ($r=0.72$) Volume of semen was found to be positively correlated with total sperm ($r=0.67$). Body weight of the cocks was negatively correlated to semen volume, concentration and total sperm.

DISCUSSION

The ejaculate characteristics of the adult cocks in this study were within the acceptable values (Hafez, 1990). Although the white cocks had lower semen volume than the Red cocks, their semen was better in consistency (colour) and sperm concentration. This resulted in non-significant differences in total sperm output between the two strains. This is corroborated in the findings of Omeje and Marire (1990) that these conditions lower ejaculate volume, better semen consistency (color) and higher semen concentration, naturally adjust the male towards stable fertility all the time.

The results also show that the birds, though almost of equal body weights, had differences in semen volumes, colour and sperm concentrations. This finding deviates from other reports which indicated that semen output is a function of body size (Williams and Mc Gibbon, 1956; Egbunike and Oluyemi, 1979). The percentage gross motility in this study is far higher than the values (47.3 to 65.5%) reported by Omeje and Marire (1990). Similarly the percentage total abnormal sperm of 48% and 42% as reported in the work of Omeje and Marire (1990) appear to be on the high side when compared to an average of less than 10% total abnormal sperm in this report. This less than 10% total abnormal sperm is, however, understandable because in this study semen collected from each cock was immediately evaluated for motility in a pre-warmed slide. In Omeje and Marire's work (1990), semen collected per replieate were put in a flask and evaluated within 6 minutes of collection leading to time delay in evaluation, hence lower motility and higher percentage sperm abnormalities especialy tail abnormalities. Semen evaluation should be rapid and effective so that carefully collected samples can be processed to preserve initial semen quality and fertility (Hafez, 1990). Immediately after semen is collected, proper semen handling is crucial to the survival of the spermatozoa which are delicate and can easily be damaged by many external factors such as exposure to sudden temperature fluctuations (cold shock) and prolonged waste of time before evaluation.

It is concluded that both strains of cocks are efficient in optimum sperm cell production with acceptable sperm picture. The two strains could be recommended for genetic improvement programmes without any disastrous effects. However, there is need to do more work to examine the effects of season and environmental factors on semen characteristics and fertility rates of artificially inseminated birds with diluted semen.

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