

Semen quality of Permer x West African Dwarf rams*

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Resumen

Se colectó semen de ejemplares de carneros de la cruce Permer x West African Dwarf (Permer x WAD) por un período de seis semanas durante la época seca (diciembre/enero) y por otro período de seis semanas en la época húmeda (mayo/junio). Se evaluó el semen en cada una de tales épocas, respecto a volumen, porcentaje de motilidad progresiva, porcentaje de células espermáticas anormales, porcentaje de esperma vivo y concentración de células espermáticas.

La semana en que se recolectó el semen afectó la anomalía espermática total del semen y el porcentaje de esperma vivo durante la época seca solamente. El volumen del semen, el porcentaje de motilidad progresiva y la concentración de células espermáticas, determinados en la época seca, no fue diferente de los valores respectivos en la época de lluvias. El porcentaje total de células espermáticas normales fue del 70 por ciento aproximadamente para la época seca, en contraste con el 90 por ciento en la época de lluvias.

Además, el porcentaje de células espermáticas vivas, aunque relativamente alto en la época seca, fue más bajo que el valor correspondiente en la época lluviosa.

Introduction

There is a paucity of information on semen characteristics of West African Dwarf (WAD) rams and even more so on the semen quality of crosses between these rams and exotic breeds. This lack of basic information constitutes an obstacle towards improving the reproductive potential of the indigenous breeds of rams in the humid tropics. Pilot work (4) indicates that rams have best semen quality in rainy season.

The present study is aimed at evaluating the quality of Permer x WAD ram semen collected during the peak of two seasons (dry and rainy) to establish to what extent crossing has affected semen characteristics. The Permer breed of sheep is a cross between Persian and Merino breeds. It is hoped that in the event that the semen quality of these rams proves promising, semen of exotic breeds will be imported to artificially inseminate the local stock in a programme to improve the overall productivity of the local sheep.

Material and methods

Semen was collected by means of an electro-ejaculator (SPE - Ejaculator, Standard Precision Electronics, Denver, Colorado) from Permer x WAD rams once a week, every Thursday (9.00 A. M.) for six weeks in dry season. The routine housing, feedings, and management of the rams has already been described (3). The mean ambient temperature (maximum and minimum), rainfall and relative humidity for the periods of the experiment are given in Table 4. Test rams were confined and were prevented from mating between semen harvests.

During the dry season, semen was collected from the second week of December through the first three weeks of January, 1979; for the rainy season, from the second week of May through the first three weeks of June, 1979. Before the experimental readings were taken, semen was harvested and evaluated once a week (every Thursday, 9.00 A.M.), for three weeks, to standardise experimental procedure and ensure normal semen output and that aged sperm cells stored in the epididymis were not harvested and used in the evaluation. This work was carried out on the Teaching and Research Farm of the University of Ife, Ile-Ife, Nigeria. Two of the seasons for semen collection and evaluation coincided, respectively, with periods of

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Table 4: Temperature, rainfall and relative humidity distribution for the periods of the experiment

Periods		Temperature °C		Rainfall (mm)	Relative humidity %
		Maximum	Minimum		
December	1978	32.2	21.1	0.1	83.0
January	1979	31.1	21.2	0.0	84.0
May	1979	31.0	21.1	261.1	81.0
June	1979	29.1	21.0	140.6	86.2

intense drought and rain in this part of Nigeria. The dry season usually is a period when all forages are dry; while the best grazing conditions abound during the rainy season.

Each ejaculate was examined for volume, progressive motility, total abnormality, live sperm cells and sperm cell concentration. The pH was determined using hydrion paper immediately after harvest; sperm concentration was determined photometrically using a Bauch and Lomb (Spectronic 20) spectrophotometer set at a wavelength of 560 millimicrons. A total of five smears of semen stained with negrosin-eosin were prepared per ram, to determine the number of live-dead and morphologically abnormal spermatozoa. The mean of the five observations was recorded in each case.

The design was considered as completely randomized and was analyzed as such. The semen volume, progressive motility, percentage abnormal cells, percentage live sperm and sperm cell concentration were analyzed by analysis of variance and the means were compared by Duncan's New Multiple Range Test (8, 9).

Results

There were significant week effects ($P < .05$) in percentage total abnormal sperm cells during both dry and rainy seasons and in percentage live sperm in dry season. The other variables measured did not differ significantly ($P > .05$) within seasons. Semen volume, percentage progressive motility and sperm cell concentration in dry season did not differ ($P > .05$) from those of rainy season; the remaining criteria, in dry season, differed from those in rainy season which proved to be superior (Tables 1 and 2).

By Duncan's test, there were significant week differences ($P > .05$) in semen volume, percentage sperm cell motility, and sperm cell concentration for dry and rainy seasons and in percentage abnormality and percentage live sperm for rainy season. The remaining variables showed significant ($P < .05$) differences (Table 3).

Discussion

Ordinary seasonal fluctuations have been found to markedly affect semen quality in rams (1, 2, 4, 5, 6, 7). Breeds of rams exist which can breed throughout the year (1). Examination of Tables 1, 2, and 3 shows that, all things being equal, the Permer x WAD rams semen can be effectively fertile in both dry and rainy seasons though greater volume of semen might have to be inseminated to offset the apparently lower percentage of live sperm in the dry season, unlike the findings of pure WAD rams in which percentage live sperm appeared significantly lower in dry season than its counterpart Permer x WAD ram semen (4). A project is currently underway to establish the ovulation pattern of both WAD ewes and their crosses with Permer throughout the year.

During the dry season especially in December/January in Nigeria, there is usually a spell of Harmattan, when the relative humidity is reasonably low though the temperature still remains high. This allows the rams to lose some evaporative heat or latent heat of evaporation which tends to offset the detrimental effect of hyperthermia. This might account for some of the absence of differences between dry and rainy seasons in some of the variables measured.

Since breeds of rams exist which can breed throughout the year (1), besides improving semen quality of the progeny of crosses between indigenous and exotic

Table 1: Semen characteristics of Permer x West African Dwarf rams.

Variable	Periods of collection	
	December/January (D)	May/June (R)
Volume (ml)	1.09 ± 0.08*	1.14 ± 0.20
Motility %	62.80 ± 1.10	59.16 ± 0.08
Total abnormality %	27.70 ± 1.20	10.06 ± 0.12
Live sperm %	65.00 ± 0.09	84.16 ± 1.00
Sperm conc x 10 ⁹ /ml	1.30 ± 0.30	1.27 ± 0.15

D = Dry season

R = Rainy season

Mean pH value = 7.20 (D) and 7.30 (R)

* SEM = Standard Error of the Mean

Table 2: Analysis of variance – Permer x WAD Dec/Jan (D) and May/June (R) collections.

Source	df	Mean Squares									
		Volume (ml)		Motility %		Total abnormal %		Live Sperm %		Sperm conc x 10 ⁹ /ml	
		D	R	D	R	D	R	D	R	D	R
Weeks	5	0.39	0.10	63.00	1.40	911.82*	1.90*	246.80*	1.47	0.48	0.90
Error	24	0.19	0.28	42.20	0.80	70.22	0.69	39.40	1.30	0.35	0.13
S.D.		± 0.20	± 0.50	± 2.80	± 0.40	± 3.70	± 0.37	± 2.80	± 1.10	± 0.30	± 0.14
Mean		1.09	1.14	62.80	59.16	27.70	10.10	65.00	84.20	1.30	1.30

* P < .05

D = Dry season

R = Rainy season

Table 3: Duncan's new multiple range test - Permer x WAD rams

Week	Volume (ml)		Motility %		Total abnormality %		Live Sperm %		Sperm conc x 10 ⁹ /ml	
	D	R	D	R	D	R	D	R	D	R
1.	1.14 ^a	1.24 ^a	60.20 ^a	58.60 ^a	24.40 ^a	12.40 ^a	57.40 ^a	84.80 ^a	1.16 ^a	1.19 ^a
2	1.04 ^a	1.00 ^a	57.40 ^a	58.40 ^a	23.40 ^b	13.60 ^a	61.20 ^a	84.20 ^a	1.30 ^a	1.40 ^a
3	1.08 ^a	1.06 ^a	67.60 ^a	59.40 ^a	13.00 ^a	12.80 ^a	57.80 ^a	84.00 ^a	1.28 ^a	1.32 ^a
4	0.86 ^a	1.24 ^a	64.00 ^a	59.60 ^a	25.60 ^c	13.40 ^a	69.80 ^b	84.40 ^a	1.30 ^a	1.31 ^a
5	0.96 ^a	1.00 ^a	63.00 ^a	59.60 ^a	25.80 ^b	12.40 ^a	73.40 ^b	84.40 ^a	0.90 ^a	1.04 ^a
6	1.60 ^a	1.30 ^a	64.40 ^a	59.40 ^a	26.20 ^b	13.80 ^a	70.40 ^a	83.20 ^a	1.80 ^a	1.40 ^a

D = Dry season

R = Rainy season

Means with the same superscript are not significantly different (P > 0.5).

breeds of rams in Nigeria, there is a possibility of getting offspring that will be so adapted that they could be fertile almost all year round, through artificial insemination with imported semen from the right breed of rams. This approach to sheep improvement will not only be useful to Nigeria but also to countries with similar sheep production problems.

Summary

Semen was collected from Permer x West African Dwarf (Permer x WAD) rams for six weeks in dry season (December/January) and for another six weeks in rainy season (May/June). In each season, semen was evaluated for volume, percentage progressive motility, percentage abnormal sperm cells, percentage live sperm and sperm cell concentration.

The week in which semen was collected affected total sperm abnormality and percentage live sperm during dry season only. Semen volume, percentage progressive motility and sperm concentration in dry season did not differ from those of rainy season. Total percentage normal sperm cell in dry season was about 70 as opposed to 90 in the rainy season. Percentage live sperm though fairly high in dry season was lower than the corresponding value in rainy season.

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