EFFECT OF HOUSING AND SEASON ON SEMEN MORPHOLOGICAL ABNORMALITIES OF UDA RAMS

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ABSTRACT

This study was conducted at the Usmanu Danfodiyo University, Sokoto, Livestock Teaching and Research Farm to evaluate the effect of housing type and season on **semen morphological abnormalities** in Uda rams. A total of sixty (60) yearling Uda rams were used in this study with twenty (20) rams in each season. Factorial completely randomised design (3x5) was used in this experiment with four (4) of animals representing replicates while five (5) housing types and three (3) season representing the factors (treatments). Four animals was allotted to each housing types with each animal serving as replicate, the housing types are half wall with zinc roofing (HZ), half wall with thatch roofing (HT), full wall with zinc roofing (FZ), full wall with thatch roofing (FT) and finally natural without wall and roofing (N). Data were collected each season on performance, climatic variables and stress indicators parameters. Animals placed in HT had significantly ($P<0.05$) higher normal cells in hot season compared to the other treatments. In rainy season higher ($P<0.05$) anomalies of bent tails was observed in FZ compared to HZ. In cold season the housing type HT had higher ($P<0.05$) normal cells while those placed under N had higher ($P<0.05$) number of anomalies of bent tail cells. The study concluded animals in HT housing type and cold season to have better semen.

Key words: Uda, semen, season, housing.

INTRODUCTION

Several factors increase the percentage of abnormal sperm being produced, one of which is heat stress. If high ambient temperatures are combined with a high humidity, a male can be rendered sterile for up to six weeks. Better management practices could minimize this effect of heat stress (Hafez and Hafez, 2008).

There is, however, a difference between the effects of acute vs. chronic stress on the production of testosterone. Studies have shown that chronic stress will decrease the production of testosterone, whereas the effects of acute stress on testosterone production are much more un-predictable. Stress then influences the quality of semen, as it lowers the motility and the density of sperm, and there even seems to be an increase in the amount of morphologically abnormal sperm (Janett *et al*., 2006). As a result this study is design to evaluate the effect of season and housing types on semen morphometric.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Teaching and Research Farm of the Department of Animal Science of Usmanu Danfodiyo University, Sokoto, Nigeria. The farm lies at longitude 5^{o} 27" E and latitude 13^{o} 08"N and at altitude of 266m above sea level, the readings were obtained from GNSS viewer software for androids. The average annual environmental temperature is 28.3^{o}C (82.9^{o} F). However, the maximum daytime temperature for most of the year are generally under 40^{o}C (104.0^{o}F). Rainfall starts late and ends early with annual rainfall ranging between 500mm to 1,200mm (SSMIYSC, 2010).

Experimental Design

A factorial design (3x5) was used in this experiment with four (4) animals representing replicates while housing types and season representing the factors (treatment combination). Four animals were allotted to each housing types with each animal serving as replicate. The weight of the animals was balanced between treatments. Five housing types were used; full wall with Zinc roofing (FZ), full wall with Thach roofing (FT), Half wall with zinc roofing (HZ), half wall with Thach roofing (HT) and

without walls and shade (N). The FZ, FT, HZ, HT and N environments received 4 animals each. The experiment was conducted in three seasons.

Experimental Animals and their Management

Twenty (20) yearling rams aged by dentition (Dyce *et al*., 2002) in each season were used in this experiment. The animals were purchased from local markets around Sokoto state. The apparently healthy sheep were quarantined at the Livestock Teaching and Research Farm for 14 days for adaptation to new environment. The gross composition of the experimental feed is presented in Table 1.

Table 1: Gross Composition of the Experimental Diet

Ingredients (%)	Diet
Maize	17.00
Wheat offal	15.20
Cowpea husk	7.60
Cowpea haulms	15.20
Rice offal	12.5
Cotton seed cake	32.0
Salt	0.5
Total	100
Calculated chemical composition	
Energy (Kcal/Kg)	2514
Crude protein (%)	14
Crude fibre (%)	22.1

Data Collection

Semen quantity and quality assessment

Semen was collected from each animal fortnightly using electric ejaculator (designed for sheep and goat) for each season. The semen was collected in graduated transparent test tubes. The percentage of abnormal spermatozoa were examined and recorded. Sperm morphologies/abnormalities were determined by placing small quantity of semen sample in buffered formal saline under microscope at x 40 eyepiece magnification (Rekwot *et al*., 1984).

Statistical Analysis

The data generated were subjected to analysis of variance with season and housing as the independent variables (Steel and Torrie, 1980), to determine their effects on other parameters, the interaction of season vs. housing was obtained. Duncan's multiple range test (DMRT) was used to determine the difference between treatments means each.

RESULTS AND DISCUSSION

Semen morphological abnormalities of Uda rams as influenced by housing type during hot, rainy and cold season

In the hot, rainy and cold seasons, there were significant ($P<0.05$) differences in all the parameters between the animals placed in housing types. Animals placed in HT had significantly ($P<0.05$) higher normal cells in hot season compared to the other treatments. Those in N recorded lower normal sperm cells ($P<0.05$). The differences between HT and HZ in terms of bent tail, detached head, proximal droplet and microcephalancy cells was not significant $P(>0.05)$. Animals placed in N has higher ($P<0.05$) number of microcephalancy, detached head and coiled tail cells, while animals placed in FT had significantly ($P<0.05$) higher number of bent tail cells (Table 2).

In the rainy season, animals placed in HT and HZ has significantly higher normal cells compared to those placed in N and FZ. Higher ($P<0.05$) anomalies of bent tails was observed in FZ compared to HZ. In terms of detached head, animals placed in N, HZ and FT have higher ($P<0.05$) values than those placed in HT and FZ (Table 2).

In the cold season (Table 2), the housing type HT had higher ($P<0.05$) normal cells while those placed under N had higher ($P<0.05$) number of anomalies of bent tail cells. Detached head cells was higher for animals placed in HZ and FZ, with no significant difference between animals placed on FT and N.

Proximal droplet cells was higher in FT while lower in HT (P<0.05) while coiled tails was higher (P<0.05) in HT and FT and the lower in N. Microcephalancy was only found in FT and FZ.

Table 2. Effect of housing types on sperm morphological abnormalities of Uda rams at different seasons

	Housing Type					
Parameter	**N**	**HT**	**HZ**	**FT**	**FZ**	**SEM**
			Hot Season			
Normal	27.70^{e}	84.30^{a}	81.30^{b}	62.30^{c}	51.40^{d}	0.92
Bent tail	26.80^{b}	3.30^{d}	3.50^{d}	36.40^{a}	13.90^{c}	0.95
Detached head	34.80^{a}	3.30^{c}	4.00^{c}	0.00^{d}	29.20^{b}	0.36
Proximal cytoplasmic droplets	0.00^{b}	0.80^{a}	9.50^{a}	0.00^{b}	0.00^{b}	0.02
Coiled tail	9.80^{a}	8.30^{a}	1.30^{b}	1.30^{b}	5.50^{ab}	1.46
Micro-cephalic	0.90^{a}	0.00^{b}	0.40^{ab}	0.00^{b}	0.00^{b}	0.02
			Rainy Season			
Normal	65.00^{bc}	78.00^{a}	81.00^{a}	69.70^{ab}	53.60^{c}	3.90
Bent tail	14.00^{b}	6.00^{d}	4.00^{e}	8.2.00^{c}	24.00^{a}	0.48
Detached head	10.00^{a}	3.50^{b}	10.00^{a}	10.10^{a}	0.80^{c}	0.54
Proximal cytoplasmic droplets	60.00^{b}	9.60^{a}	3.00^{c}	6.00^{b}	0.40^{d}	0.25
Coiled tail	5.00^{b}	2.90^{b}	0.00^{b}	4.00^{b}	20.70^{a}	3.41
Micro-cephalic	0.00^{c}	0.00^{c}	2.00^{a}	2.00^{a}	0.50^{b}	0.13
			Cold Season			
Normal	74.00^{c}	88.00^{a}	82.00^{b}	80.00^{b}	83.00^{b}	1.27
Bent tail	20.00^{a}	3.50^{d}	9.00^{b}	0.00^{e}	6.00^{c}	0.37
Detached head	0.00^{c}	3.5.00^{b}	4.00^{a}	0.00^{c}	3.70^{ab}	0.14
Proximal cytoplasmic droplets	6.00^{b}	0.00^{e}	1.70^{d}	10.00^{a}	4.00^{c}	0.36
Coiled tail	0.00^{c}	5.20^{b}	3.30^{bc}	8.50^{a}	2.30^{bc}	1.65
Micro-cephalic	0.00^{b}	0.00^{b}	0.00^{b}	1.50^{a}	1.00^{a}	0.23

*means in the same row with different superscripts are significant (P<0.05) different. N= without shade and walls, HT= Half wall with Thatch, HZ= Half wall with Zinc, FT= Full wall with Thatch, FZ= Full wall with Zinc.

Semen morphometric abnormalities of Uda Rams as Influenced by main (overall) and Interactive Effect of Housing Type and Season

The interaction and main effect of semen morphometric abnormality as influenced by housing and season is shown in Table 3. There were significant (P<0.0) differences between the animals in all the parameters (Normal sperm cells, bent tail, detached head, proximal cytoplasmic droplets, coiled tai and microcephalancy) tested across all the housing type and season.

Higher (P<0.0) values of normal cells was found for animals in HT, HZ and FT with insignificant variation (P>0.05) between among placed in FT, FZ and N. Animals placed in N, FT and FZ have significantly higher bent tail cells. Detached head cells was higher (P<0.05) in animals placed in N compared to those in HT and FT. There was significant difference (P<0.05) between the housing types with regards to proximal droplet is FT and FZ. Animals in FZ had significantly (P<0.0) lower values of coiled tails (Table 3).

Seasonal variation observed showed that higher (P<0.0) normal sperm cells was found during cold season. Higher (P<0.05) bent tail, detached head, coiled tail were found in hot season. There was no significant difference (P>0.05) between hot season and rainy season for bent tails anomaly, also between rainy season and cold season for bent tail, detached head, proximal droplets, microcephalancy and coil tail cells. The result showed no significant interaction between seasons and

housing type in terms of all the parameters measured (Normal sperm cells, bent tail, detached head, proximal cytoplasmic droplets, coiled tail and microcephalic) (Table 3).

Table 3. Semen morphometric abnormalities of Uda Rams as Influenced by main (overall) and Interactive Effect of Housing Type and Season

Parameter	**Housing Type**					**SEM**
	N	**HT**	**HZ**	**FT**	**FZ**	
Normal	55.57^{b}	83.43^{a}	81.43^{a}	70.67^{ab}	62.68^{b}	3.77
Bent tail	20.27^{a}	4.27^{b}	5.5^{b}	14.87^{a}	15.97^{a}	2.42
Detached head	14.93^{a}	3.43^{b}	6.00^{ab}	3.37^{b}	11.23^{ab}	2.71
Proximal cytoplasmic droplets	4.00^{ab}	3.47^{ab}	4.73^{ab}	5.33^{a}	1.47^{b}	1.18
Coiled tail	5.27^{a}	4.53^{a}	1.53^{b}	4.67^{a}	2.60^{ab}	0.99
Micro-cephalic	0.30^{bc}	0.00^{c}	0.80^{b}	1.17^{a}	0.50^{bc}	0.19
	Season					
	Hot season		**Wet season**	**Cold season**		**SEM**
Normal	61.40^{b}		69.47^{b}	81.40^{a}		3.59
Bent tail	16.78^{a}		12.04^{ab}	7.70^{b}		2.57
Detached head	14.26^{a}		6.88^{b}	2.24^{b}		1.84
Proximal cytoplasmic droplets	2.06^{b}		5.00^{a}	4.34^{ab}		0.93
Coiled tail	5.28^{a}		2.06^{b}	3.82^{ab}		0.79
Micro-cephalic	0.26^{b}		0.90^{a}	0.50^{ab}		0.17
	Interactive effect Housing Type/Season					
	Level of significant					
Normal	NS					
Bent tail	NS					
Detached head	NS					
Proximal cytoplasmic droplets	NS					
Coiled tail	NS					
Micro-cephalic	NS					

a,b,c means in the same row with different superscripts are significant (P<0.05) different. N= without shade and walls, HT= Half wall with Thatch, HZ= Half wall with Zinc, FT= Full wall with Thatch, FZ= Full wall with Zinc. NS= Not significant.

Effect of housing and season on semen morphological abnormalities of Uda rams

The morphology of spermatozoa is used as one of the important criteria in the evaluation of semen quality in domestic animals (Howard *et al*., 1965). Major defects are related to impaired fertility or abnormal conditions in the testis. Minor defects should be of concern only when they exceed 10% (Bearden and Fuquay, 1997). The findings of this study showed higher percentage of normal sperm cells for animals placed in HT and HZ compared to those placed in N. This suggest that high environmental temperature could have affected the morphological traits of sperm cells of animals placed in N housing. Most of the abnormalities found are minor except that at the hot season, up to 34.8% of detached head were found. This is similar to the findings of Skinner (1965) who reported that the effect of ambient temperature on semen quality to be dependent on the period of exposure to heat stress. In his trial, exposure of the animals to 40 °C for 6-8 weeks caused reduction in sperm motility, percentage of live spermatozoa and an increase in the number of morphologically abnormal spermatozoa in the ejaculates-with little effect on semen volume, semen pH, total fructose content and total number of spermatozoa ejaculated. The present study found out that season affect semen quality, with higher normal cells found in cold than in the hot and rainy seasons. It has been shown that seasonal factors, such as temperature, photoperiod, humidity and feed quality affect semen morphology (McDowell, 1972). Environmental temperature affect semen quality especially during hot season (Curtis, 1983). Thermal stress causes testicular degeneration and abnormal scrotal thermo

gram and hence lower semen output (Curtis, 1983; McDowell, 1972). This might be compared to the findings of the present study, higher percentage of normal cells were recorded in HT and HZ housing type and in the cold season when the level of stress is minimal.

CONCLUSION

The exposure of Uda rams to heat stress as a result of improper housing like in full wall with zinc roofing or not providing housing at all will negatively affect semen output in terms of sperm cell concentration, percentage of live spermatozoa and percentage abnormalities. Thus affecting reproductive capacity of the animal.

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