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EFFECT OF STORAGE TEMPERATURE ON THE MOTILITY OF WEST AFRICAN DWARF RAM SEMEN

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ABSTRACT

Eight (8) West African Dwarf rams were used to examine the effect of storage days and storage temperature on the motility of ram semen. One standard diluent was used throughout the four replicates (R). The experiment lasted for five weeks. Semen was collected weekly from the rams using an electro-ejaculator. Each day the same diluent was used to store the semen under room temperature of 27°C and refrigerator temperature of 5°C. The storage days result revealed significant differences (P<0.01) in the mean values of motile spermatozoa in all the trials. In week 1 the motility of the spermatozoa dropped from 70.00±2.5% at day one to 1.25± 1.17% at day 4. A similar trend was observed in weeks 2, 3,4 and 5 respectively. Semen stored under refrigerator has significantly higher value (P<0.01, P<0.05) when compared to semen stored under room temperature. This implies that refrigerator temperature preserved ram sperms motility better than room temperature under the same storage diluent.

Keywords: Effect, Storage temperature, Motility, Ram Semen
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INTRODUCTION

Africa has a population of 225 million sheep and 195 million goats representing approximately 20% and 35 % of the world population of sheep and goat respectively (FAO, 2010). About 75% of African livestock are associated with small holders and agro-pastoral farming systems (Akinlade, *et al.,* 2017). In Nigeria, there are about 25 and 36.5 million sheep and goats respectively (RIM, 2001). Of these breeds, the sheep have some special attributes which make their further development as a productive breed, imperative (Odo *et al,* 2000). The special attributes include being able to survive and successfully reproduce in the trypanosomiasis infested humid forest area of west and central Africa. It is a hardy breed and can handle very coarse fibrous and aromatic feeds and survive other conditions inimical to other ruminant stock and produce more young at faster rate (Osakwe, 2004). The domestic sheep is a multi-purpose animal and more than 200 breeds known in existence were created to serve these diverse purposes (Simons and Ekarius, 2001).

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Generally, sheep are thought to be either "Ewe breeds" or "ram breeds". Ewe breeds are those that are hardy, and have good reproductive and mothering capabilities. They are for replacing breeding ewes in standing flocks. Ram breeds are selected for rapid growth and carcass quality, and are mated with ewe breeds to produce meat lambs. Sheep have distinct economic advantages when compared with other livestock. They do not require the expensive housing such as that used in the intensive farming of chickens or pigs (Nwafaq *et al.,* 2013).

Sheep are an efficient user of land; roughly six sheep can be kept on the amount that would suffice for a single cow or horse (Ososanya, *et al.,* 2013). Sheep are especially beneficial for independent producers, including family farms with limited resources, as the sheep industry is one of the few types of animal agriculture that has not been vertically integrated by agro-business (Adedeji *et al.,* 2016).

In order to sustain sheep production, there is need to collect semen from rams with high proven qualities that can withstand longer preservation of such semen through proper dilution and storage until it is needed for reproduction; hence this study is carried out to know the effect of storage days, room and refrigerator temperatures on the motility of ram semen.

MATERIALS AND METHODS

The study was conducted at the Delta State University, Asaba Campus. Goat and Sheep Research unit of the Department of Animal Science, Faculty of Agriculture, Delta State falls within the humid tropics of Nigeria and Asaba lies precisely between longitudes 6˙E and 8°E, and latitude 06° 49' North of the Equator. Asaba has a mean annual rainfall of 1500- ' 849.3mm It has a moderate climate with very high temperature during the dry season (October to February) with mean annual temperature and precipitation of 20°±6°C and 1117mm respectively.

Eight West African Dwarf rams were used for the study. The rams were purchased direct from the open market in Asaba cattle market. Visual appraisal was used to detect animals that were sound and free from obvious physical defects health wise. They were managed semi-intensively.

Semen Collection

Semen was collected from eight (8) rams once weekly using an electro-ejaculator. This collection lasted for five (5) weeks. Prior to semen collection, the prepuces of the rams were properly steamed and cleaned using a tissue paper. All sets of equipment used in semen collection were washed and dried to prevent contamination of the semen with dirt, water etc. which have negative effect on sperm quality and motility. The collection was done by fixing a probe that has been lubricated into the rectum of the rams which stimulate the rams to ejaculate.

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Semen Evaluation: Each ejaculation was immediately evaluated for volume, color, motility and pH. The color is usually creamy, which was observed with the eyes. Motility was determined by examining a drop of raw undiluted semen on a pre-warmed slide under a light microscope. The pH was evaluated using a pH adrion.

Buffer preparation

One standard buffer was prepared for the experiment, the composition is made of sodium citrate (20.5g), sodium bicarbonate (2.1 g), Potassium chloride (0.4g) and Boiling distilled water(1000ml).

Dry ingredients of the buffer were weighed into a volumetric flask of 1000ml. Boiling distilled water was added to dissolve the solid ingredients present in the flask. Volumetric flask was properly shaken to dissolve the solid ingredients. More boiled distilled water were added to bring the buffer to the final volume after which it was left to cool in a dark room.

Preparation of Extender/Diluent

Extender/diluents were prepared using buffer, egg yolk, penicillin and streptomycin. The buffer was poured into a graduated glass cylinder until the recommended volume was reached. Egg yolk was added to the buffer until the 100ml mark was reached. 1ml of penicillin and streptomycin was added to the diluents and then after which was, properly shake. The diluents were further put in a centrifuge machine at 300rpm for 10minutes.

Storage Condition

After collection the semen of the rams were immediately stored under room temperature of 27°C and refrigerator temperature of 5°C. The samples were examined under the light microscope daily to know if they were still motile.

Data Analysis

Data collected were analyzed using two way analysis of variance in a completely randomized design. Treatment means were separated by Duncan's multiple range test-using SPSS package 2001.

RESULTS AND DISCUSSION

Table 1 presents the effect of storage days on the motility of ram's sperm cell. From the table, the results showed that there were significant differences ($P<0.01$) in the motility of sperm cells from the first day to the fourth day of storage throughout the period of the trials. In week 3 and 4 motility lasted for just two days (2). While in week 2 the sperm cells survived for 3 days.

The result also showed that the highest value was obtained in the first day of storage throughout the 5 weeks period of the trials.

The results demonstrated that semen motility declined with storage days in both refrigerator and room temperature conditions. This is in agreement with the reports of Kommisrud *et al.,* (2002), who demonstrated that the motility of boar semen stored in Beltsvile thawing solution (BTS) declined with days of storage.

The higher mean values recorded in the motility of Ram Semen stored under refrigerator temperature (5°C) as clearly shown in this result, implied that refrigerator temperature preserved ram semen better than room temperature (27°C) under the same storage diluent. This is in line with an earlier observation by Lopez (2000), which showed that there was significant effect of temperature on liquid ram semen stored at 5°C.

However, motility alone does not secure the fertilizing capacity of sperm cells. Spermatozoa also need intact acrosome to penetrate the barriers around the ovum. This presumption is in accordance with experiments performed by Buhr (1990), stating that the decrease of membrane fluidity during storage is greater for head plasma membrane than for sperm membrane. This is not surprising as storage of diluted semen capacitation possibly followed by acrosome reaction (Vishwanath and Shannon,1997). It is observed that sperm motility rates gradually declined over the period of storage with mark variation. Although no attempt was made to determine the probable causes of such variations, it could be as a result of differences in pH levels between the seminal plasma and the diluting solution (Cosson *et al.,* 1999), thermal shock (Billard *et al.,* 1993). It could also be as a result of difficulty in adequately evaluating contamination of the semen with urine (Saad and Bilard, 1995; Legendre *et al.,* 1996).

CONCLUSION AND RECOMMENDATION

From this experiment, it is seen that storage days and storage temperature have effect on the motility of spermatozoa. Therefore, it is better to educate farmers to store their ram semen under refrigerator temperature, if it is to be stored for a short period than storing under room temperature.

REFERENCES

Adedeji, T.A., Amao, S.R., Matthew, O.W., Fasoyin, A.O and Olugbemiga K.S (2016) comparative study of semen characteristics, egg fertility and hatch ability of naked neck, Fulani ecotype, isa brown and their F1 crossbreds. Proceedings of the 41st Annual conference of Nigeria Society for Animal production. March 2016. Federal University of Agriculture, Abeokuta, Ogun State, Nigeria

Billard R., Cosson J., and Crim L.W. (1993). Motility of fresh and aged halibut sperm. Aquat. Living Resour. 6, 67-75.

Buhr M.M. (1990). Preservation of boar sperm alters membrane molecular dynamics., Proc. 21 in conf. Boar semen preservation, Beltsville. Pp 81-93.

Cosson, J., Billiard R., Cibert C., Dreanno C. and Suquet M. (1999). Ionic factors regulating the motility of fish sperm. In: Gagnon C.- (Ed.) The male gamete: From the basic science to clinical applications. Vienna: Cache river press. Pp 162-186.

FAO (2010) Food and Agriculture Organization of the United Nations Statistical Database.

Komminsrud E., Paulenz H., Schested E., and Grevie I. (2002). Influence of boar and semen parameters on the motility and acrosome integrity in liquid boar semen stored for 5days. Acta. Vet. Scand, 43 (1): 49 -55.

Legendre M., Linhart O. and Billard R. (1996). Spawing and management of gametes fertilized eggs and embryos in Siluroidie. Aquat. Living 9, 51-80.

Lopez S.A., Ortiz N., Gallego L. and Garde J.J. (2000). Liquid storage (5°C) of ram semen in different diluents. Arch. AndroL, 44 (2): 155.

Nwafaq, S.Q., Araz, Q.S. and Hawar, M.H Zebari. (2013). Influence of prostaglandin f_2 injection on semen characteristics and some enzymatic activity in Meriz bucks. Journal of animal science. 1(1): 6-10

Odo B.I., Alaku S.S.O and Omeje S.I. (2000) Contribution of small ruminants sheep and goats to meat supply in Enugu State, Nigerian Journal of Applied Animal Research, 18:165 169.

Osekwe I.I. (2004). Livestock Nutrition: In Effective Techniques of "Livestock and Fish Farming: A tool for poverty alleviation (Ogunji, J. and Osakwe ieds) ESSU Abakaliki Ppl 1.

Osasanya, T.O., Adewunmi, M.K., Oyeyemi, M.O and Adeosun A.O (2013). Semen characteristics of pubertal West African Dwarf rams fed pineapple waste silage as replacement for dried cassava peels. *African Journal of Agricultural Research.* 9(4): 501-506.

RIM (Research Inventory and Management Ltd (2001). Nigeria national -"Livestock survey Federal Department of Livestock and Pest Control Services, Abuja, Nigeria 287 pp.

Saad A. and Billard R. (1995). Production et gestion des spermatozoids chez / le poissonchat europeen silurus glanis. Aquat Living Res, 8, 323 -328.

Simmons P. and Ekarius C. (2001). Storey's Guide to Raising Sheep. Storey / Publishing L.LC. North Adams, MA,

SPSS (2001) Statistical package for social scientist SPSS inc. Chicago IL.

Vishwanath R. and Shannon P. (1997). Do Sper Cells Age? A review of the Physiologic Changes in Sperm During Storage Ambient Temperature. Reprod. Fert. Dev. 9,321-331.

Vishwanath R. and Shannon P. (1997). Do sperm cells age? A review of the physiological changes in sperm during storage at ambient " temperature. Reprod. Fert. Dev., 9.321 331.

Wooster, C. and Hansen G. (2005) Living with Sheep: Everything You Need to Know to Raise Your Own Flock, Guilford Connecticut: The Lyons Press.

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Table 1: The effect of storage days on the rams spermatozoa (%)

Weekly		Storage days		
Collection	D1	D2	D3	D4
*	70±2.5[b]	2.5±9.01[a]	16.25±6.11[a]	1.25±1.17[a]
1				
2	75±1.77[b]	26.25±9.51[a]	12.5±5.23[a]	0
3	62.5±1.53[b]	13.75±6.36[a]	0	0
4	62.5±1.53[b]	13.75±6.36[a]	0	0
5	70±2.5[b]	25±9.35[a]	17.5±7.45[a]	6.25±3.51[a]

Mean values on the same row with different superscripts differences are significantly difference P<0.01)

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Table 2, effect of storage temperature on the motility of Ram's Sperm Cell (%)

Weekly collection	Refrigerator Temperature				Mean	Room Temperature				Mean
	R1	R2	R3	R4		R1	R2	R3	R4	
	40 ± 2.75'	40±10.61[b]	42.5±15.16[b]	32.5±1.92	38.75+12.75	17.5±5.16[a]	17.5±16[a]	20±17.32[a]	15±2.99[a]	17.5±15.16[a]
2	50.5±14,44	40±14.14	53.33±9.81	60±9.43	50.96±14.44[b]	26.67±21.77	23.13±9.05	23.33±19.05	26.67±1.77	24.95±4.75[a]
3	45±7.68	35±17.68	40±14.14	45±17,68	41.25±17.68[b]	35±24.75	30±1.21	30±1.21	30±1.21	31.25±1.77[a]
4	50±7.70	30±1.21	45±0.61	55110.61	45±15.16[b]	30±21.21	30±1.21	20±21.21	35±4.75	28.75±17,32[a]
5	55±7.5'	37.5±5.16'	32.5±11.39	42.50±10.23[b]	41.88±21.21	20±17.32[a]	20±17.32[a]	17.5±15,16[a]	15±2.99[a]	18.13±21.21[a]

Mean values on the same row with different superscripts are significantly different (P<0.01 and P<0.05)