Semen Characteristics of First and Second Ejaculates of Buffalo Bulls With and Without Sexual Stimulation

By

A. M. YASSEN¹ AND M. A. IBRAHEIM

Department of Animal Production,

Faculty of Agriculture,

University of Alexandria,

Alexandria, Egypt

ABSTRACT

FOUR treatments, no sexual preparation (control), 10 min restraint, three false mounts and 10 min restraint followed by three false mounts, were replicated with eight sexually mature buffalo bulls, before the first and second ejaculates to study their effects on the seminal characteristics of buffalo bulls.

Seminal characteristics of both first and second ejaculates were improved significantly by sexual stimulation. Animals allowed no sexual stimulation yielded inferior first ejaculates than second ejaculates in all seminal characteristics. First ejaculates, in this case, served as stimulus to second ejaculates and contributed to its superiority.

Moderate sexual stimulation (R or FM) before ejaculation improved the first ejaculates and reduced the difference between them and second ejaculates in all seminal characteristics. However, high degrees of sexual stimulation (R + FM) caused the superiority of the first ejaculates to the second ejaculates in seminal characteristics.

INTRODUCTION

Cows bred naturally, with first ejaculates, are occasionally characterized with low fertility, especially if the bulls are allowed to work at their own will. This rarely happens in artificial insemination. It is believed (Anderson, 1945) that the low fertility is a result of "low quality semen" which can be overcome by restraining the bull before breeding the cow.

Early in the history of Artificial Insemination, Lagerlof (1934) observed that bulls frequently yielded first ejaculates with few or no sperm. An improvement in the quality of first ejaculate was achieved by Hellstrom (1947), when he restrained the

bulls for a few minutes before ejaculation. Mercier and Salisbury (1946) compared the first and the second ejaculates of dairy bulls which were collected without sexual stimulation. They found that the second ejaculates were superior to first ejaculates in number of total and motile sperm. They suggested that this superiority is a result of accumulated sexual excitement at the second ejaculate.

It is generally accepted now that proper stimulation of domestic bulls helps in obtaining more sperm from the bull (Collins, Bratton & Henderson, 1951; Branton, D'Arensborg & Johnston, 1952; Almquist, Hale & Amann, 1958; VanDemark, 1956, 1961). The increase in sperm output per ejaculate, due to sexual preparation, ranged between 14 to 250 % over that yielded by the same bulls when allowed to work at will (VanDemark, 1961).

According to Hafs, Knisely & Desjardins, (1962), it was found that the intensity of sensation produced by varying stimulus were additive and sperm yielded per ejaculate in domestic bulls correlated positively with the degree of sexual preparation.

In the light of the previous reports it was planned to study the effect of different degrees of sexual stimulation on the seminal characteristics of the first and second ejaculates of buffalo bulls.

¹ Present address: Animal Science Dept., University of Nigeria, Nsukka, Nigeria.

MATERIALS AND METHODS

Eight sexually mature buffalo bulls, with an average body weight of about 580 kg and average age of about 3 years,

were used in this study. Four pre-ejaculatory treatments for stimulating the buffaloes were replicated with each of the eight buffalo bulls randomly.

TABLE 1

Model of the Experimental Design during one week out of four weeks

Day	Ejaculate	Buffalo bull No.							
		1	2	3	4	5	6	7	8
		Treatment No. *							
Monday	1st	3	4	2	4	1	3	1	2
	2nd	3	4	2	4	1	3	1	2
Friday	1st	3	4	2	4	1	3	1	2
	2nd	3	4	2	4	1	3	1	2

* The four treatments were assigned randomly for the eight buffalo bulls for four weeks and in a similar arrangement to the above tabulated design, resulted in 16 ejaculate/buffalo bull and 32 ejaculate / treatment. See text for treatment identification.

Two successive ejaculates, first and second were collected within one hour on every Monday and Friday.

The four treatments were, no sexual stimulation (Control), C; 10 min restraint, R; 3 false mounts, FM and 10 min restrain followed by 3 false mounts, R + FM. The first treatment (Control) allowed the animals no sexual preparation prior to ejaculation and was carried out by bringing the animal directly from the barn to the collection stall and to ejaculate at the first attempt to mount the teaser.

The second treatment, 10 min restrain, was carried out by teasing the buffalo subject to ejaculate for 10 min behind the teaser and collecting the semen immediately at the first attempt to mount the teaser after this period. During teasing period, animals were encouraged to smell the teaser, move back and forth but not allowed to mount the teaser, in order to keep the sex desire at a maximum. The third treatment allowed the animals three false mounts before ejaculation. After three false mounts, animals were allowed

to serve the artificial vagina at the next attempt. The fourth treatment was a combination of both treatments 2 and 3, in which animals were restrained for 10 min followed by 3 false mounts, then semen was collected at the next attempt to mount the teaser.

A total of 32 ejaculates were recorded for each treatment (8 buffalo bulls X 2 collection days X 2 ejaculates on each collection day). Overall mean of semen volume, total and motile sperm output per ejaculate were calculated for the four treatments.

Semen was collected by artificial vagina and all ejaculates were examined for volume, percentage of progressively motile sperm, total and motile sperm concentration per ml semen. Percentages of motile cells were estimated in duplicates immediately after collection at 300 magnification, on a microscope stage warmer to the closest 10 %. Semen was diluted with a drop of warm isotonic sodium citrate before it was examined for percentage of motile cells. Total and motile sperm

concentration per ejaculate were calculated from the previous information and analysis of variance was calculated in accordance with the procedures given by Steel & Torrie, (1960).

As a general procedure, two or more buffalo bulls were used as teasers and were provided in sequence to the buffalo bull, subject to ejaculation, prior to collection to keep up his desire at maximum as recommended by Almquist and Hale, (1956).

RESULTS AND DISCUSSION

Results of this study are presented in

table 2 and Fig. 1. Buffalo bulls significantly responded to the varying degrees of sexual stimulation imposed on them prior to ejaculation. Both first and second ejaculates were improved by sexual stimulation. Improvement was noticed in all seminal characteristics namely, semen volume, percentage of motile sperm, sperm number per ml semen, total and motile sperm number per ejaculate. There was a positive relationship between the degree of sexual stimulation and improvement in semen characteristics as presented in table 2.

TABLE 2

Effect of Sexual Stimulation on the Buffalo Seminal Characteristics of both first and second Ejaculates combined

<i>Treatments</i>	<i>Sperm number/ml semen</i>	<i>% motile sperm</i>	<i>Semen volume/ ejacul.</i>	<i>Total sperm/ ejacul.</i>	<i>Motile sperm/ ejacul.</i>
	<i>X10⁹</i>	<i>%</i>	<i>ml</i>	<i>X10⁹</i>	<i>X10⁹</i>
No sexual stimulation (O)	0.805	62	2.55	2.049	1.279
10 min. restraint (R)	1.121	68	4.27	4.789	3.236
3 False mounts (FM).	1.025	75	3.63	3.723	2.785
10 min R + 3 FM.	1.133	75	5.00	5.667	4.229
Level of significance (P)	<0.01	<0.01	<0.01	<0.01	<0.01

The increase in sperm number and semen volume of the buffalo bulls, as a result of sexual stimulation, can be explained on the basis of the neuromuscular relationship. Hafez (1960), stated that, nowhere in farm animals is the relationship between neuro-anatomical structure and physiological functions more readily demonstrated than the male reproductive behaviour. Salisbury and VanDemark (1961) reported that as a result of sexual stimulation a nervous stimulation is built up and series of muscular contractions begin in the vasa efferentia and pass through the epididymis, vas deferens

and accessory glands. The discharge of semen is brought about by the rhythmical contractions of the muscles of the penis.

Technique four, 10 min restraint followed by 3 false mounts (R + FM), seemed to be more effective than either R or FM, in improving the quantity and quality of both first and second ejaculates ($P < 0.01$) as it appears in Fig. 1. This superiority was suggested to be a result of the additive behaviour of the stimuli.

Semen characteristics of first ejaculates were compared with those of second ejaculates at the four techniques. Comparisons showed that when animals were

allowed no sexual preparation, first ejaculates were inferior in quantity and quality to second ejaculates. The superiority of the second ejaculates is believed to be a result of increased sexual excitement at the second ejaculates. The first ejaculate seems to serve as a stimulus to second ejaculate when sexual stimulation is not allowed.

When moderate sexual stimulation, R or FM, is allowed prior to both first and second ejaculates, an improvement occurred in quantity and quality of both ejaculates. Differences were also reduced between first and second ejaculates in sperm number yielded per ejaculate and differences were not significant.

Fig. 1. Effect of sexual stimulation on the seminal characteristics of first and second ejaculates of buffalo bulls (—1st ejaculate, ---2nd ejaculate). Values on the right side of the figure represent the difference between 1st and 2nd ejaculates at each treatment.

On the other hand, when a high degree of sexual stimulation was allowed prior to first and second ejaculates (technique 4 (R + FM)), second ejaculates were significantly inferior to first ejaculates in all seminal characteristics. Reduction in seminal characteristics of second ejaculates at high sexual stimulation is believed to be a result of partial epididymal depletion and limited storage capacity of buffalo bull epididymis. According to Yassen and Mahmoud (1971) the testicular and epididymal sizes of a buffalo bull was half that of a domestic bull of the same body weight.

It was concluded from this study that the more sexual stimulation allowed before ejaculation the better will be the quantity and the quality of the first ejaculates compared with those of the second ejaculates.

REFERENCES

- ALMQUIST, J.O. and HALE, E.B. 1956. An approach to the measurement of sexual behaviour and semen production in dairy bulls. *3rd Inter. Cong. Animal Reprod., Cambridge*.
- ALMQUIST, J.O.; HALE, E.B. and AMANN, R.P. 1958. Sperm production and fertility of dairy bulls at high collection frequency with varying degrees of sexual preparation. *J. Dairy Sci.* **41**: 733.
- ANDERSON, J. 1945. Seasonal variation in the reproductive capacity of the bull. *J. Agric. Sci. Cambridge* **35**: 184.
- BRANTON, C. D. ARENSBOURG, G. and JOHNSTON J.E. 1952. Semen production, fructose content of semen and fertility of dairy bulls as related to sexual excitement *J. Dairy Sci.* **35**: 801.
- COLLINS, W.J.; BRATTON, R.W. and HENDERSON, C.R. 1951. The relationship of semen production to sexual excitement of dairy bulls. *J. Dairy Sci.* **34**: 224.
- HAFEZ, E.S.E. 1960. Analysis of ejaculatory reflex and sex drive in the bull. *The Cornell Vet.* **50**: 384.
- HAES, H.D.; KNISELY, R.C. and DESJARDINS, C. 1962. Sperm output of dairy bulls with varying degrees of sexual preparation. *J. Dairy Sci.* **45**: 788.
- HALE, E.B. 1966. Visual stimuli and reproductive behaviour in bulls. *J. Animal Sci., Suppl.* **25**: 36.
- HELLSTROM, P. 1947. Bulls which appear too eager should be checked. Lantmannen (Stock). 31: 198: *C.F. Animal Breed Abstr.* **15**: 177.
- LAGERLOF, N. 1934. Morphological investigations of the changes in semen and testes of bulls with reduced or abolished fertility. *Acta Pathol. Microbiol. Scand. Suppl.* **19**.
C.F. HAES, H.D. et al, 1962, *J. Dairy Sci.* **45**: 788.
- MCKENZIE, F.F. and BERLINER, V. 1937. The reproductive capacity of rams. *Mo. Agric. Expt. Sta. Res. Bull.* **265**.
C.F. COLLINS et al 1951, *J. Dairy Sci.* **34**: 224.
- MERCIER, E. and SALISBURY, G.W. 1946. The effect of season on the spermatogenic activity and fertility of dairy bulls used in artificial insemination. *Cornell Vet.* **36**: 301.
- SALISBURY, G.W. and VANDEMARK, N.L. 1961. *Physiology of Reproduction and Artificial Insemination of Cattle*. Freeman & Comp., San Francisco, pp. 183.
- STEEL, R.G.D. and TORRIE, J.H. 1960. *Principles and Procedures of Statistics*. McGraw Hill Bk. Comp., N.Y.
- VANDEMARK, N.L. 1956. Quantitative aspects of semen production in bulls. *3rd Inter. Cong. Animal Reprod., Cambridge*, **4**: 80.
- VANDEMARK, N.L. 1961. Artificial insemination of cattle, In *Symposium on Recent Advances in Reproductive Efficiency*. *J. Dairy Sci.* **44**: 2314.
- YASSEN, A.M. and MAHMOUD, N. 1971. Relationship between body weight and testicular size in buffalo bulls. *J. Agric. Sci., Cambridge*, **78**: 367.