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The present study was carried out on Murrah bulls maintained at Artificial Breeding Complex, NDRI, Karnal from July 2007 onwards. The investigation was proposed to assess the reproductive activity of Murrah bulls on the basis of sexual behavior characteristics and seminal attributes parameters, subsequent to introduction of the management interventions.

To study the effect of various managemental interventions viz., type of collection floor, semen collection frequency, exercise, and surface cooling, a series of four experiments were conducted. Data recorded on sexual behavior and seminal attributes were analyzed and the results are discussed separately for each experiment. Sexual behaviour characteristics studied in the experiments were: Reaction time (RT) (sec), dismounting time (DMT) (sec), total time taken in mounting (TTTM) (sec), flehmen's response (FR), erection score (ES), protrusion score (PS), intensity of thrust (ITS), temperament score (TS) and libido score (LS). Seminal parameters studied in experiments were: Semen volume, semen colour density, mass activity, initial progressive motility(IPM), post thaw motility (PTM) and non eosinophilic spermatozoa count (live sperm %) and hypo osmotic swelling test (HOST).

In experiment I types of Semen Collection Floor considered were: 1. Concrete floor. 2. Brick clay floor. 3. Rubber mattress floor.

Sexual behaviour traits:- The results indicated that bulls were very active and had higher sexual stimulation before semen collection on rubber mattress followed by brick clay floor and concrete collection floor as reflected by reaction time, dismounting time, Total time taken in mounts and other behavioral manifestations. Erection score,
Protrusion score, Intensity of thrust, Temperament score and Libido score were highly influenced by rubber mattress.

Seminal attributes:- Ejaculate volume showed highly significant variation between bulls exposed to different types of collection floor. Rubber mattress showed significantly highest value of semen volume which confirmed its superiority in semen collection than other types of semen collection floor. Physical appearance, Mass activity, Initial progressive motility, Non eosinophilic spermatozoa count, Post thaw motility, Hypo Osmotic Swelling Test were not significantly affected by the type of floor. Thus the rubber mattress collection flooring helped in improving the semen output without having any detrimental effect on semen quality.

In experiment-2 frequency of semen collection numbers of semen collection per week were: One time a week (two ejaculates) and two times a week (four ejaculates)

Sexual behaviour traits:- Reaction time, Protrusion score, Dismounting time, Total time taken in mounts and various behavioural parameters were significantly influenced by the frequency of semen collection bulls in second group where semen was collected twice a week, were still active, and had highest sexual stimulation as compared to that of bulls of 1st group, whose semen was collected once a week. So it was evident, that collection twice a week can be adopted comfortably, without affecting the ability of the bull. Erection score, Temperament score, Intensity of thrust, Protrusion score as well as Libido score were not adversely affected by twice weekly collections.

Seminal attributes:- Volume of semen showed highly significant differences due to semen collection frequency. Group-1 (semen collected once a week-2 ejaculates) showed significantly higher value of semen volume than group-2 (semen collection twice a week- ejaculates). However total output estimated by adding volume of four ejaculates week in
Group 2 was found to be much higher than total output as sum of two ejaculates/week in Group-1.

The effect of collection frequency was found to be significant on mass activity of the ejaculates. The results revealed that semen collected twice a week was having an adverse effect on the semen mass activity than semen weekly collection schedule. However, no significant effect was found on IPM due to the effect of semen collection frequency, indicating that semen collection frequency twice a week was not affecting the semen IPM in Murrah bulls. No significance differences in NESC, PTM and HOST could be detected due to the effect of semen collection frequency. Thus no adverse affect was observed on semen quality and its preservability on obtaining four ejaculates per week.

In experiment 3 to study the effect of exercise, bulls were divided into two exercise groups: Group-1: the bulls were exercised by bull exerciser once a week, one hour before semen collection. Group-2: the bulls were exercised daily.

Sexual behaviour traits: RT was significantly influenced by the exercise. It was found that RT was significantly higher in the daily exercised group than exercise group of one day per week. Similar results were observed with regards to Dismounting time. Total time taken in mounts, Protrusion score and Intensity of thrust. Daily exercised group showed significantly higher values of ES than once a week exercised group, which indicated positive effect of continuous exercise in the bulls of daily exercised group. Daily exercised group showed significantly higher values than once a week exercised group which indicated a positive effect of continuous exercise on the bulls. Daily exercised group revealed significantly higher values of ITS than once a week exercised group which indicated positive effect of continuous exercise on the bulls of daily
exercised group. Daily exercised group showed significantly higher values of Libido Score than once a week exercised group thereby indicating the positive effect of continuous exercise on the bulls.

Seminal attributes:- Volume was found significantly influenced by exercise. Daily exercised group showed significantly higher values of volume than once a week exercised group. Colour of semen was significantly influenced by exercise. Daily exercised group showed significantly higher values of colour appearance than once a week exercised group revealing the effect of continuous exercise on the semen colour of the bulls. The color of semen was which is milky to creamy owing to higher yield of spermatozoa. Daily exercised group also showed significantly higher values of mass activity than once a week exercised group. Daily exercised group showed significantly higher values of initial progressive motility than once a week exercised group. No significant effect was found on NESC, PTPM and HOST due to the effect of exercise. Thus no adverse affect was observed on semen quality and its preservability.

In experiment 4:- amelioration of heat stress using cooling treatment by mist cooling and fanning was studied. Experimental animals were divided into two groups Group-1: control group in which bulls were not exposed to cooling treatment. Group-2: treatment group in which bulls were exposed to mist cooling and fanning thrice/ a day, 15 minutes for each time.

Sexual behavior traits studied revealed that RT was not significantly influenced by the cooling using mist cooling and fanning, which indicated that the bulls were active in control group in spite of fact that these were not exposed to cooling treatment; this might be due to well adaptation of Murrah bulls to the stress of heat. DMT and TTTM were significantly influenced by the effect of the cooling using mist cooling and fanning.
Erection score was found to be significantly influence by cooling using mist cooling and fanning in dry summer season. Bulls exposed to the cooling treatment by mist cooling and fanning showed significantly higher values of ES than control group which was not exposed to cooling with value Protrusion score was significantly influenced by cooling using mist cooling and fanning in dry summer season. Intensity of thrust was found significantly influenced by cooling using mist cooling and fanning in dry summer season TS was not found to be significantly influenced by cooling.

Libido score was found to be significantly influence by the effect of cooling treatment. Bulls exposed to the mist cooling and fanning.

Seminal attributes:- The results showed no significant effect of cooling treatment by mist cooling and fanning on ejaculated volume. Colour showed significant variation in terms of creamy semen on cooling treatment which meant more spermatozoa per ejaculate. Bulls exposed to the cooling treatment by mist cooling and fanning showed significantly higher values of semen mass activity than control group which was not exposed to cooling which indicated that mist cooling and fanning improved the semen quality of Murrah bulls in dry summer. IPM was found significantly influenced by the cooling treatment by mist cooling and fanning. Non eosinophilic spermatozoa count was significantly higher in value than control group that not exposed to cooling treatment using mist cooling and fanning, bulls exposed to the mist cooling and fanning showed significantly higher values of semen PTPM. Influence of the cooling treatment by mist cooling and fanning on HOST was also significantly influenced, thereby indicating that cooling by mist cooling and fanning improved the semen quality of Murrah bulls in dry summer than control group which was not exposed to cooling.

From our investigation it could be concluded that:
1. Management interventions such as proper collection floor, semen collection frequency, exercise and cooling by mist cooling and fanning in hot dry summer season should be considered to develop the semen production performance of Murrah bulls.

2. Sexual behaviour traits and seminal attributes should be given adequate attention in recording and measuring accuracy to evaluate the actual reproductive performance of bull and selection should be done accordingly.

3. A package of practices incorporating various managemental interventions could be developed for obtaining maximum sperm harvest for availability and subsequent proliferation of superior Buffalo germplasm.