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# Influence of Seasons on Seminal Attributes of Crossbred Bulls and its Implications on Fresh, Diluted and Cryopreserved Semen

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**Abstract**

The present study was conducted on eight crossbred bulls (HFxGir, 50-75% HF inheritance) under Konkan Development Corporation Ltd. of Maharashtra. Semen ejaculates obtained at monthly interval were used for this study. Semen samples were subjected to routine macroscopic and microscopic evaluation. The study was planned for three seasons, viz., summer, winter and monsoon. The ejaculates were divided into two parts: one part was used for analysis as fresh semen and second part was diluted using egg yolk extender and then cryopreserved. It was observed that the sperm motility and live sperm percentage were significantly low during summer season as compared to winter and monsoon season in fresh semen samples. The semen volume was significantly higher during summer season whereas the sperm concentration was higher in winter season. The colour, consistency and density were not affected by season. Thus, it was concluded that summer season adversely affects the seminal attributes which may result in low quality semen production.

## Introduction

High quality bull semen is required for successful fertilization and improved herd health. The semen from individual bull may be used for many females and poor quality semen may affect herd fertility and productivity of the farm by lengthening calving intervals. In the breeding systems, their bio-economical effectiveness depends on bull fertility and performance in the field.

The bulls are subjected to environmental variations that interfere with their fertility and herd reproductive effectiveness (Berry *et al.,* 2011). Therefore, the successful evaluation of seasonal effects on thermoregulation and reproductive changes is crucial to identify these alterations in bovine physiology and health. Under tropical conditions the exotic breeds (*Bos taurus*) showed significant seasonal fluctuations in semen characteristics with higher sperm cell abnormalities, lower percentage of live sperm cells and lower sperm concentration during the hot periods (Bhorsekar *et al.,* 1980 and Parkinson, 1985). Hence, the present study was undertaken to assess the influence of seasons on seminal

attributes of crossbred bulls under the varied climatic conditions prevailing in the Konkan region of Maharashtra.

## Materials and Methods

The study was conducted on eight Holstein Friesian x Gir crossbred bulls maintained at Government Unit No. 16, Konkan Development Corporation (KDCL), Goregaon (East), Mumbai. Out of these eight bulls selected, two bulls each had 50% and 62.5% HF inheritance and four bulls had 75% HF inheritance. The experiment was conducted for one year period from October 2016 to September 2017.The bulls were in use regularly for semen collection throughout the year using artificial vagina. For the present study semen samples obtained at monthly interval were only included. According to agro-climatic conditions of the region, the study was undertaken in three seasons, viz., winter, summer and monsoon. The semen samples collected were subjected to macroscopic (volume, colour, consistency and density) and microscopic (mass activity, sperm concentration, live sperm percentage, abnormal sperm percentage) evaluation. The pH of the semen sample was also recorded by pH paper. The semen samples collected from the bulls were divided into two parts: one part was used for analysis as fresh semen sample and second part was diluted using egg yolk extender and cryopreserved for future use. In all 288 samples (fresh, diluted and frozen–thawed) were examined for macroscopic and microscopic examination.

The data collected was statistically analysed to visualize the effects of season of the year on macroscopic and microscopic characteristics of semen by using Completely Randomized Design as per Snedecor and Cochran (1980).

## Results and Discussion

The mean values of macroscopic and microscopic attributes of fresh as well as frozen-thawed semen samples observed during different seasons are presented in Table 1 and 2.

The highest ejaculate volume was observed during summer season and the lowest in winter ($P<0.05$). However, the values for winter and monsoon were statistically non-significant. The colour of semen collected during winter, summer and monsoon was creamy, milky white and creamy white, respectively, but the consistency of semen was found consistently thick in all seasons (Table 1).The colour and consistency of semen correlates positively with sperm concentration. The number of sperm cells in a given volume of ejaculate affects its appearance.

The density and mass activity scores recorded were numerically highest during monsoon season and lowest during summer, however, they did not differ significantly. The average pH of fresh semen also did not differ significantly between seasons, although the value was lower during monsoon than summer and winter (Table 1).

The average concentration of sperms (million/ml) in fresh semen ejaculate was significantly higher ($P<0.05$) during winter than summer and

**Table 1: Seminal attributes of fresh semen of crossbred bulls during different seasons**

| Seminal attributes | Seasons | | | |
|---|---|---|---|---|
| | Winter | Summer | Monsoon | Level of Significance |
| Ejaculate volume (ml) | $8.59\pm0.46^{b}$ | $10.25\pm0.27^{a}$ | $9.06\pm0.40^{b}$ | * |
| Colour | Creamy | Milky white | Creamy white | - |
| Consistency | Thick | Thick | Thick | - |
| Density (score 0-4) | 3.28±0.07 | 3.20±0.08 | 3.32±0.08 | NS |
| Mass activity(score 0-4) | 3.14±0.10 | 3.09±0.10 | 3.26±0.23 | NS |
| Sperm concentration (million/ml) | $1219.53\pm23.28^{a}$ | $1104.68\pm29.29^{b}$ | $1137.06\pm18.53^{b}$ | * |
| Seminal pH | 6.78±0.03 | 6.72±0.03 | 6.66±0.37 | NS |

Mean with different super scripts within a row differ significantly.

NS: Non-significant *: Significant at 5% level

**Table 2:Comparison of seminal attributes of Fresh, Diluted and Post thaw semen during different seasons**

| Seminal Attribute | Seasons | | | |
|---|---|---|---|---|
| **Sperm motility (%)** | **Winter** | **Summer** | **Monsoon** | **Level of Significance** |
| Fresh Semen | 83.43±1.39[a] | 78.03±1.56[b] | 82.50±1.00[a] | * |
| Diluted Semen | 75.15±1.85[b] | 76.56±1.31[b] | 80.93±1.02[a] | * |
| Post thaw semen | 64.37±1.41 | 62.50±1.30 | 60.93±1.41 | NS |
| **Live Sperm (%)** | **Winter** | **Summer** | **Monsoon** | |
| Fresh Semen | 83.46±0.89[a] | 79.84.±0.64[b] | 84.25±0.88[a] | * |
| Diluted Semen | 77.71±1.21 | 75.21±0.78 | 79.34±0.87 | NS |
| Post thaw semen | 66.90±1.20 | 66.06±1.12 | 67.09±1.32 | NS |
| **Abnormal Sperm (%)** | **Winter** | **Summer** | **Monsoon** | |
| Fresh Semen | 13.75±0.77 | 12.48±0.73 | 12.75±0.49 | NS |
| Diluted Semen | 17.46±0.60 | 17.50±0.53 | 16.31±0.71 | NS |
| Post thaw semen | 23.25±0.81 | 24.78±1.10 | 21.96±0.57 | NS |

Mean with different super scripts within a row differ significantly.

NS: Non-significant *: Significant at 5% level

monsoon, however, the values for summer and monsoon were comparable (Table 1). This trend is in accordance with Bhorsekar *et al.* (1980) and Rekwot *et al.* (1987) in exotic bull, Kumi-Diaka *et al.* (1981) in tropical bulls and Bhakat *et al.* (2014) in Karan Fries crossbred bulls. Salah *et al.* (1992) reported that under tropical conditions, the exotic breeds show significant fluctuations in semen quality with respect to ejaculate volume, sperm concentration and total sperm counts per ejaculate. Saxena and Tripathy (1984) worked on Jersey bulls in India and reported that there were no seasonal effects on the seminal attributes.

The average sperm motility percentage in fresh semen samples was significantly (P≤0.05) lower during summer than in winter and monsoon, however no significant effect was observed between winter and monsoon. The average sperm motility percentage in diluted semen samples was significantly (P≤0.05) higher during monsoon season than winter and summer. The average sperm motility percentage in post thawed semen samples did not show any significant difference between seasons (Table 2).

The live sperm percentage was significantly (P≤0.05) lower in summer as compared to winter and monsoon in fresh semen sample. However, the values of live sperm percentage in diluted and post thaw semen were statistically non-significant during different seasons. In the present study, the percentage of live sperm in fresh semen was 83.43±0.89 in winter season in HF crossbred bulls, which was in close agreement with Dhami and Sahni (1994) who observed the percentage of live sperm to be 86.83±0.48 in pure HF bulls during winter season in UP.

The average abnormal sperm percentages in post-thawed semen sample was numerically higher in summer season followed by winter and monsoon. However, the average abnormal sperm percentages in fresh, diluted and post-thawed semen samples during winter, summer and monsoon were statistically non-significant.

The results of the study indicated that the sperm abnormalities were increased from fresh semen to diluted and diluted to frozen-thawed samples in all three seasons. The fertility of animals is affected through changes in semen quality after variations in the environment such as heat stress, humidity and photo period (Kumavongkrit *et al.,* 2005). Crossbred animals produced by use of exotic semen are found more sensitive to high ambient temperature and humidity which leads to less productivity. Among the different seasons, summer may be regarded as the season exerting relatively more adverse

effect on the overall semen quality than other seasons (Bhakat *et al,* 2014).

## Conclusion

From the present study it is concluded that the season of the year affected the quality of crossbred bull semen. Environmental conditions prevailing during winter and monsoon seasons were better suited for HF crossbreds to maintain normal spermatogenesis and good quality semen. The semen quality was adversely affected during summer season due to the high ambient temperature and humidity.


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## Conflict of interest:

All authors declare no conflict of interest.

## References:


Berry, D.P., Evans, R.D. and Parland, S.M.C. (2011). Evaluation of bull fertility in dairy and beef cattle using cow field data. *Theriogenology*, **75**:172-181.

Bhakat M., Mohanty, T.K., Gupta, A.K. and Abdullah, M. (2014). Effect of Season on Semen Quality of Crossbred (Karan Fries) Bulls. *Adv. Anim.Vet. Sci.,* **2** (11):633-637.

Bhorsekar, M., Sane, S.N., Sharma, M.S. and Rangnekar, D.V. (1980). Studies on the semen production of exotic bulls at the central research station of the Bharatiya Agro-industries. *Indian J. Anim. Sci.,***50**:113-118.

Dhami, A.J. and Sahni, K.L. (1994). Comparative appraisal of physico-morphological and enzymatic attributes of semen and their interrelationships in ox and buffalo. *J. Applied Anim. Res*., **5**(1): 13-20.

Kumavongkrit, A., Suriyasomboon, A., Lundehein, N., Heardm, T.W. and Einarsson, S. (2005). Management and sperm production of boars under differing environmental conditions.*Theriogenology,* **63**: 657-667.

Kumi-Diaka, J., Nagaratanam, V. and Rwuaan, J.S. (1981). Seasonal and age related changes in semen quality and testicular morphology of bulls in a tropical environment. *Vet. Rec.,* **108**: 13-15.

Parkinson, T.J. (1985). Seasonal variations in semen quality of bulls and correlations with metabolic and endocrine parameters. *Vet. Rec.,* **117**:303-306.

Rekwot P. I., Voh, A.A., Oyedipe, E.O.. Opaluwa, G.I., Sekoni, V.O. and Dawida, P.M. (1987). Influence of season on characteristics of the ejaculate from bulls in an artificial insemination centre in Nigeria. *Anim. Reprod. Sci.,* **14**: 187-194.

Salah M.S., El-Nouty, F.D., Al-Hajari, M.R. and Mogawer, H.H. (1992). Effect of season on seminal characteristics of Holstein bull under semi-arid environment I. Biophysical characteristics. *AJAS,* **5**(3): 439-447.

Saxena V.B. and Tripathy S.S. (1984). Variation in semen quality and preservation in Jersey bulls due to seasons. *Indian J.Anim. Res*., **18**:11-16.

Snedecor, G.W. and Cochran, W.G. (1980).*Statistical Methods*.14th edn.Oxford and IBH Publishing House, New Delhi, India.


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