**SHORT COMMUNICATION**

**Cytogenetic analysis on prevalence of chromosomal fragile sites in Karan Fries calves**

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**Abstract**

Fragile sites are one of the structural chromosomal aberrations which aggravate infertility problem. The present investigation was carried out to search fragile sites in Karan Fries calves through cytogenetic analysis and further confirmation by R-banding. A total of 1284 metaphases or 50-100 cells per individual were analyzed. Fragile sites were found in 21.28% of total screened metaphase plates. Fragile sites on chromosomes were confirmed by conventional R-banding technique. The revealed fragile sites could be associated in future with reproductive problems for early screening of these calves.

**Keywords:** Fragile sites, Karan Fries, R-banding

**Introduction**

Using animals with chromosome aberrations causes economic losses, much higher than those spent on chromosome analysis (Popescu and Tixier, 1984). Fragile sites are specific heritable points on a chromosome that tends to form gaps and breaks. Cytogenetic tools are one of the potent tools with modest resources to unravel these fragile sites in cattle and buffalo and to find their association with reproductive problems such as infertility and sub fertility.

Extensive studies have been undertaken on the fragile sites in several species regarding different methods of induction and their clinical and biological significance (Riggs and Ronne, 2009). In the present study, Cytogenetic analysis was performed in Karan Fries (*Bos indicus x Bos taurus*) cattle calves. R-banding was performed for confirmation of common fragile sites. The main objective of the study was to search and evaluate the fragile sites in the chromosomes of these calves.

**Results and Discussion**

**Experimental design**

Cytogenetic studies were carried out on randomly selected 20 calves (16 females and 4 males) of Karan Fries cattle maintained in an organized herd at Cattle Yard, National Dairy Research Institute, Karnal. Data for all 20 calves were analyzed with Giemsa staining for a total of 1284 metaphases or 50-100 cells per individual. Conventionally stained metaphase plates of Karan Fries (*Bos indicus x Bos taurus*) cattle possess 50 chromosomes (2n=50) with 29 pairs of acrocentric autosomes whereas 'X' and 'Y' chromosomes are submetacentric. Krumrych (2009) reported similar description of normal diploid chromosomes in *Bos taurus* bulls. In the present study, we used RPMI-1640 medium along with aphidicolin (APH) for revelation of common fragile sites in Karan Fries calves. Aphidicolin (APH) inducible fragile sites have also been previously detected in the chromosomes of cattle (Rodriguez et al. 2002) and buffalo (Nicodemo et al. 2008). In our observation, fragile sites were ranging from 3.95% to 41.89% of metaphase plates with mean of 21.28%. In female calves fragile sites were ranging from 7.50% to 41.89% of metaphase plates with mean of 22.37% and in male calves the range of fragile site occurrence was varying from 3.95% to 25.0% with mean of 16.91%. Nicodemo et al. (2007) reported significant difference in fragile sites of male and female river buffalo mainly due to inactive X- showing twice as many breaks compared to the active counterpart in females. In different breeds of river buffalo, Pires et al. (1998) reported wide range
of fragile X-chromosomes (2.86 to 41.03%) in metaphase plates. Lopez-Corrales and Arruga (1996) observed non-staining gaps in 30 to 66% of cells with mean value of 48.3% in goats. Matejka et al. (1990) reported BrdU sensitive fragile sites in 40% of plates at the eighth pair in sheep. Moreover, Gripenberg et al. (1991) reported expression of fragile-X up to 86% in deer. Fragile sites observed by conventional Giemsa staining technique were further confirmed by R-banding revealing light and dark banding patterns. Verma and Lubs (1975) reported suitability of R-banding for routine cytogenetic analysis pertaining to easy identification and accurate comparison of homologue lengths of chromosomes.

Conclusions

From the results of the present study, we concluded that occurrence of fragile sites are more in female as compared to male calves. Conventional R-banding technique did confirm presence of fragile sites. In case, after reaching reproductive age any of these calves with higher incidence of fragile chromosomes shows repeat breeding, abortion or still birth; this could be an important tool for early detection and culling of these calves from the seed stock.

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References


Figure: Metaphase plates. Normal (a), Fragile (b), R-banding (c)