

Karyological studies on chromosomes of Barking Deer (*Muntiacus muntjak*)

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Abstract

Karyological studies on chromosomes of the Indian muntjac (*Muntiacus muntjak*) commonly referred to as barking deer were carried out. The diploid (2n) chromosome number in *Muntiacus muntjak* was 7 in males and 6 in females. There were one pair of metacentric chromosomes and one pair of acrocentric chromosomes. The X chromosome was submetacentric. The two Y chromosomes exhibited acrocentric morphology. The relative length of chromosomes ranged between 21.57 ± 0.77 for chromosome 1 and 2.97 ± 0.41 for chromosome Y₂, the true Y chromosome. The G-banding revealed distinct bands on the homologous chromosome pairs with a total of 28 bands.

Introduction

Indian muntjac (*Muntiacus muntjak*) commonly known as barking deer or Katar is a small deer with bright chestnut coat color belonging to the family Cervidae. The adult buck is around 45 cm tall and weighs around 14 to 16 kg. The rudimentary antlers are 6 to 8 cm long and these deer have long upper canine teeth (2.5 cm). They are also called as rib faced deer. In both sexes, skull has deep depression between the frontal bones for sub orbital glands (Prater, 1971). Like the Chinese muntjac, Indian muntjac were introduced into Europe (Christopher, 1985), but have failed to establish themselves unlike the Chinese muntjac. Karyological studies in this species are scanty and no standardized nomenclature for the chromosomes of Indian muntjac has been reported. However, Pathak *et al.* (1977) have reported the diploid number (2n) 7 in males. Stephen *et al.* (2006) have compared the karyotype of North Indian muntjac (2n = 7) with that of the Chinese muntjac (2n = 46). However, very few cytogenetic analyses have been published about the Indian muntjac, a species with differing diploid chromosome number between sexes. This article presents the metaphase spreads and karyotype of the G-banded chromosomes of the Indian muntjac.

Materials and Methods

Among the herd of barking deer maintained at the Anna Zoological Park, Vandalur, Chennai, Tamil Nadu,



Fig 1. Metaphase spread displaying the diploid chromosomes (2n = 7) of Indian male muntjac (*Muntiacus muntjak*) deer (x 1000).



Fig 2. Karyotype of G-banded chromosomes of Indian male muntjac deer.

India; few animals, intended to be transferred, were subjected for the karyotyping of chromosome.

Blood samples from jugular vein were collected from 6 males and 6 females in heparinised vacutainer systems. Leucocyte cultures were set up in RPMI 1640 culture medium (8ml) with phytohaemmagglutinin (0.1 ml) as mitogen. Autologous plasma (1.5 ml) and buffy coat (0.2 ml) were added to cultures from the centrifuged blood samples. The cultures were incubated at 37°C for three cell cycles (72 h). One and a half hours prior to harvest, 0.01% colchicine was added to the cultures and incubation was continued.

The cultures were subjected to hypotonic treatment (0.075 M KCl) and fixed in Cornoy's fixative. The slides were prepared by air-drying and

stained with 4% Giemsa. Over fifty metaphase spreads were examined for numerical chromosome abnormality (Halnan, 1977). Metaphase spreads with clear and complete chromosome complement were photographed and karyotypes were prepared. The air-dried, aged, unstained slides were utilized for G-banding and slides were subjected to trypsin digestion followed by staining with 4 % Giemsa (Seabright, 1971).

Results and Discussion

The diploid (2n) chromosome number was observed to be 7 including sex chromosomes (X, Y₁, Y₂) in males and 6 in females. The metaphase spread displaying the diploid chromosomes is shown in Fig 1 and the Table 1 displays the relative length of chromosomes. The karyotypes with G-banding patterns are shown in Fig 2.

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In *Muntiacus muntjak*, an acrocentric autosome was translocated onto the original X chromosome but its homologue remained free, thereby giving rise to two Y chromosomes (Y₁, Y₂), the longer of which was actually an autosome (Macgregor, 1993). As per the karyotypes prepared in this study, the first pair was two long metacentric chromosomes and the second pair was acrocentric chromosomes. The translocated X chromosome (from an autosome) was a submetacentric chromosome. The longer acrocentric was the Y₁ and the shortest of all the chromosomes (an acrocentric) was designated as Y₂, the true Y chromosome.

The peculiarity of differing diploid chromosome number in males and females of this species drew attention to their survival with perfect pairing mechanism during gametogenesis. There are other few species like Gazelle and bats with similar differing chromosome numbers in males and females (Stephen *et al.*, 2006). However, *Muntiacus muntjak* (Indian muntjac) was the comparatively larger mammal that had different diploid chromosome numbers in males and females.

The relative length of the chromosomes ranged between 21.57±0.77 for the first pair of chromosome and 2.97 ± 0.41 for the chromosome Y₂ (Table 1).

Table: 1. Relative length of Chromosomes

Chromosomes	Mean ± SE
1	21.50±0.75
	21.57±0.77
2	13.70± 0.26
	13.63±0.24
X	14.83±0.43
Y₁	11.79±0.55
Y₂	2.97 ± 0.41

G Banding

The G-banding revealed distinct bands on all the homologous chromosome pairs except Y₂ with a total of 28 bands. However, more cytogenetic investigations on different banding methods are needed for conclusive statements about the banding patterns of the individual chromosome pairs.

Chromosome 1 Metacentric

p: two proximal and two distal dark bands.

q: One dark band near the centromere followed by two light bands.

Chromosome 2 Acrocentric

Dark band adjacent to centromere followed by a dark and lighter band.

X Chromosome Submetacentric

p: One dark band near the tip

q: Light band near centromere followed by two dark bands with an intervening light band

Chromosome Y1 Acrocentric

One dark band near the middle

Chromosome Y2 Short acrocentric

No detectable dark and light bands seen.

Conclusion

Karyological studies on chromosomes of the Indian muntjac (*Muntiacus muntjak*) commonly referred to as barking deer revealed diploid (2n) chromosome number as 7 in males and 6 in females. There were one pair of metacentric chromosomes, one pair of acrocentric chromosomes and the X chromosome was submetacentric. The two Y chromosomes exhibited acrocentric morphology. The relative length of chromosomes ranged between 21.57 ± 0.77 for chromosome 1 and 2.97 ± 0.41 for chromosome Y₂, the true Y chromosome. The G-banding revealed distinct bands on the homologous chromosome pairs with a total of 28 bands. As per the literature this is the first record of relative length and banding in Indian muntjac.

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