

**KARYOTYPE ANALYSIS OF MALE RAT (*Rattus rattus*) FROM AMALNER, MAHARASHTRA****ASHOK J. PATIL<sup>1</sup>**P.G. and Research Centre, Department of Zoology, Pratap College, Amalner, Maharashtra, India  
E-mail: yashapat@yahoo.in**ABSTRACT**

A survey of literature on karyotype analysis of male black rat (*Rattus rattus*) indicates that there is no unique consensus on number and morphology of chromosomes. Several workers have reported the diploid chromosome number (2N) in black rat as 38, 40 and 42. It was found that different strains of laboratory rats showed differences in the morphology of chromosomes. Because of the fragment demonstration of chromosomes polymorphism and the geographic variations at its karyotype, the black rat (Common house rat) has proved to be an interesting animal for chromosomal studies. The present investigation was undertaken with an objective of determining its diploid chromosome number and describing the nature of its chromosomes. The *Rattus rattus* was administered with 0.02% of colchicine for inducing mitosis. After 2 hours of colchicine treatment, the rat was sacrificed by using anesthetic ether and dissected out the femurs. The present experimental results indicated that the diploid chromosome number of *Rattus rattus* is  $2n=38$  and the karyotype formula is  $16m + 4sm + 16a + 1X+1Y$ .

**KEYWORDS:** Chromosomes, Karyotype, *Rattus rattus*

The chromosomes of common rat (*Rattus rattus*) were observed by using classical techniques all over the world by different workers (Baverstock et al., 1977; Lakhotia et al., 1973; Yosida, 1980a, b). The number of somatic chromosomes in black rat was reported to be 40 by Yosida, 1980a while others found the number of chromosomes to be 42. With the development of recent techniques, increasingly accurate analysis of the rat chromosomes have become possible. As to morphology of the rat chromosomes, three different groups were localized as per centromeric localization. There are Metacentric, Submetacentric and Acrocentric chromosomes.

First Chromosomal polymorphism was described by Yosida, (1973). It was found that different strains of laboratory rat showed differences in the morphology of sex chromosomes. Yosida et al., (1965) described the basic karyotype of *Rattus rattus* as  $2n=38$  (diploid number). Different workers described different diploid numbers for the house rats, available in their localities. This *Rattus rattus* which is available in India and Asia its diploid number confirming again in this study.

Karyotype is a phenotypic appearance of the somatic chromosomes. Because of the fragment demonstration of chromosomes polymorphism and the geographic variations at its karyotype, the black rat has proved to be an interesting animal for chromosomal studies.

**MATERIALS AND METHODS**

The technique for chromosome preparation used in this study was essentially the same as that reported by other workers (Yosida et al., 1965). The *Rattus rattus* common house rat was administered with 0.02% of colchicines. This solution was injected intra peritonally in the abdomen. After 2 hours of colchicine treatment the rat was sacrificed by using anesthetic ether and dissected out the bones of femur. The bones were separated from associated muscles or stripped from the bones. The ends of the bones were cut off by using a strong scissors,

The hypotonic solution (1% Sodium citrate) was prewarmed at 37°C taken in to a clean centrifuge tubes. The marrow was mixed with hypotonic solution thoroughly by agitating the solution with the help of Pasteur pipette. This makes the marrow clean from bone fragments.

After 30 minutes, the tubes were taken out from the incubator and centrifuged for 5 minutes at 300 rpm. The supernatant was discarded and added the 7-8 ml of methanol + acetic acid fixative (3:1), gently to the cell palate. The cells were to undergo fixation for 30 minutes at 4°C. After 30 minutes, the fixative was removed by centrifugation. This step has done 3-4 times for the proper separation of cells and cleans the cells from the cell debris. Repeated fixation and centrifugation improves spreading. The final cell palate was resuspended in 1-2 ml of fixative depending on the quantity of cell palate. The suspension is dropped on a clean and

<sup>1</sup>Corresponding author

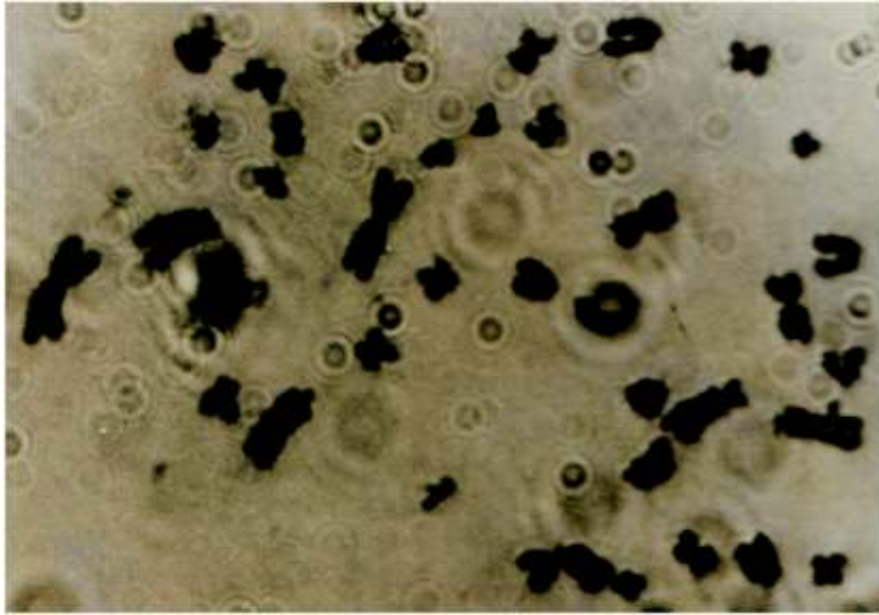


Figure 1: Somatic Metaphase Chromosomes of Male House Rat (*Rattus rattus*)

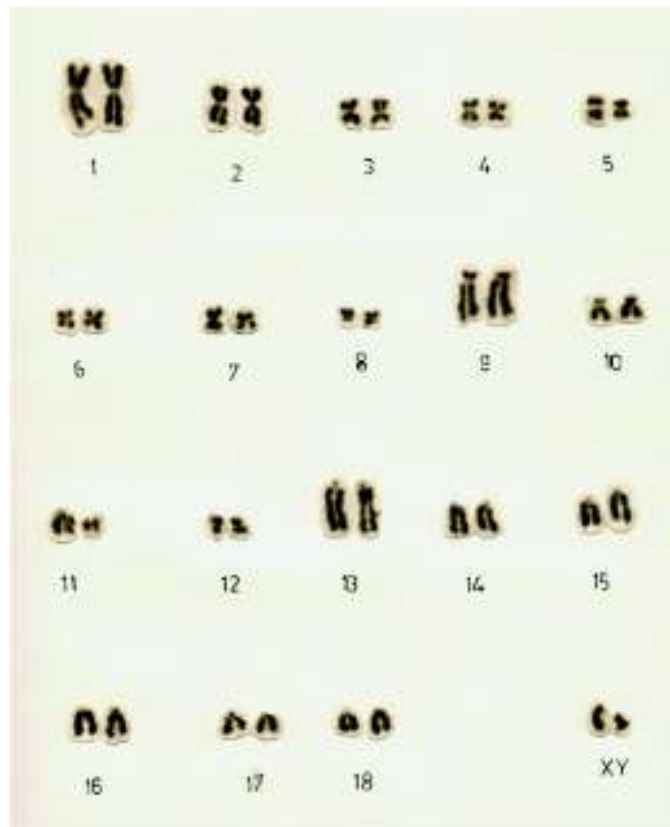


Figure 2 : Karyotype of Somatic Metaphase Chromosomes of Male House Rat (*Rattus rattus*)

chilled slide from a Pasteur pipette held 10-15cm over it. The slides were flame dried for normal metaphase cells and air dried completely before staining (Lee, 1969). Photographs of well spread chromosomes were made as shown in figure,1. Pairing of homologous chromosomes was made as shown in figure, 2.

## RESULTS AND DISCUSSION

For chromosomal analysis we have screened nearly 25 metaphases of male and the photographs were taken. The metaphase plate of male chromosomes was pasted. The total numbers of chromosomes were 38 (18 autosomal and 1 pair of sex chromosomes).

The karyotype was prepared for male rat, autosomes contain 16 metacentric, 4 sub-metacentric and 16 acrocentric chromosomes which are arranged in decreasing order of each group in table. The male contain two different sex chromosomes the X which was sub-metacentric and Y chromosome was acrocentric which we have arranged separately.

The diploid number of the common house rat (*Rattus rattus*), was found to be 38 in the specimen under study. The numbers of metacentric, sub metacentric and acrocentric chromosomes were 16, 4, and 16 respectively. The sex chromosomes viz. X and Y are submetacentric and acrocentric.

The results of the present work was interestingly parallel to that of the reports of karyotype analysis done by Yosida et al., 1965 and therefore the present work can be referred to as a confirmatory effort in karyotyping of the common house rat.

## ACKNOWLEDGEMENTS

The author is thankful to the Principal, Pratap College, Amalner for providing necessary facilities.

## REFERENCES

- Baverstock P.R., C.H.S. Watts J.T., Hogarth A.C., Robinson and J.F. Robinson, 1977. Chromosome evolution in Australian rodents II. The *Rattus* group. *Chromosoma* (Berl.), **61**:227-241.
- Lee M.R., 1969. A widely applicable technique for direct processing of bone marrow for chromosomes of vertebrates. *Stain Technol.*, **44**: 155-158.
- Lakhotia S.C., S.R.V. Rao and S.C. Jhanwar, 1973. Studies on rodent chromosomes.VI. Co- existence of *Rattus rattus* with 38 and 42 chromosomes in South Western India. *Cytologia* (Tokyo), **38**: 403-410.
- Yosida T.H., Nakamura A. and Fukaya T., 1965. Autosomal polymorphism in *Rattus rattus* (L.) collected in Kusudomari and Misima. *Chromosoma*, **16**:70-78.
- Yosida T.H., 1973. Evolution of karyotypes and differentiation in 13 *Rattus* species. *Chromosoma*, **40**: 285-297.
- Yosida T.H., 1980a. Cytogenetics of the Black Rat. Karyotype Evolution and Species Differentiation. University of Tokyo Press. Tokyo.
- Yosida T. H., 1980b. Segregation of Karyotype in the F2 generation of the hybrids between Mauritius and Oceanian type black rat with a note on their litter size. *Proc. Jpn. Acad. Ser.*, **B 56**:557-561.

**Table : Karyotype of Male Rat**

Name of specimen	Diploid Number	Autosomes			Sex Chromosomes	
		M	Sm	A	X	Y
<i>Rattus rattus</i>	38	16	4	16	1	1

### Abbreviations used:

M - Metacentric; Sm - Submetacentric; A - Acrocentric