high sensitivity of the eggs to X-rays has been correlated to the high mitotic activity of the developing eggs[8]. Freshly laid eggs of *B. mori* have only yolk, and the sperm received from the male moth through the micropyle. The egg completes the maturation division, the sperm and egg nuclei unite and the egg is fertilized. The whole process is accomplished in about 3.5-4.5 h after egg deposition[9]. After fertilization the cleavage nucleus undergoes active repeated division and within 24 h the germ band appears in the blastoderm and the embryo develops. It is therefore clear that the mitotic activity in the silkworm egg is at a higher rate during the early phase of development; the highest percentage of lethal effects (low fertilization, low hatchability and high mortality) of X-ray irradiation observed in the present study on 1- and 3-h-old eggs of *B. mori* can be easily correlated with this fact.

The low fertilization percentage and 100% mortality of the fertilized eggs observed in 1-h-old eggs are due to the interference of X-rays with the developing eggs of *B. mori*. Kobayashi[6] has shown that in *B. mori* the germ band formed at the irradiated region shows perforations and is irregular in shape. It is said that the process of fertilization must normally be completed within a period of 3.5-4.5 h after egg deposition. However, in the present study, a certain percentage of eggs is fertilized in 3-h-old eggs and a certain percentage of eggs is not fertilized even in 6-9-h-old eggs exposed to varying X-ray treatments. Astaurov[9] showed that the maturation division of some eggs of *B. mori* prior to fertilization may be accelerated or delayed. It is not known whether this explains the above observation. However, the lethal effects of X-rays decreased with increasing age of the egg. Working on the effects of X-ray irradiation on the developing eggs of *Manduca sexta*, Ely and Jungreis[4] demonstrated 100% mortality in 96-h-old eggs; they exposed the eggs to higher dose (40,000-50,000 R) treatment. The doses of X-ray irradiation used in the present study were not sufficient to inflict any major damage on 12-24-h-old eggs.

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Heterochromatin blocks in the karyotype of the pencil-tailed tree-mouse, *Chiropodomys gliroides* (Rodentia, Muridae)[1]

H.S. Yong

Department of Genetics and Cellular Biology, University of Malaya, Kuala Lumpur 22-11 (Malaysia), February 15, 1983

Summary. Metaphase chromosomes of *Chiropodomys gliroides* (2n = 42) were studied by G- and C-banding. One arm of both pairs of biarmed autosomes and the Y-chromosome is totally heterochromatic. Most of the other autosomes and the X-chromosome have large pericentromeric C-bands.

Additions of heterochromatin and pericentric inversions have been suggested to be the principal mechanisms involved in the evolution of the karyotypes of the New World rodent genera *Peromyscus, Onychomys* and *Baiomys*[2,3]. The phenomenon of heterochromatin addition has not been reported in the Old World murid rodent genera *Mus* and *Rattus*[4-6]. The present report concerns the presence of heterochromatic blocks in the karyotype of an Old World murid rodent, *Chiropodomys gliroides* (Blyth).

Chiropodomys Peters, 1868 is considered to be one of the most primitive murid genera, making the transition between the *Lenothrix* and the *Parapodemus* groups[7]. It is probably closely related to *Vernaya, Vandeleuria* and *Micromys*. The species *C. gliroides* is a relict form which occurs from north-eastern India, Burma and southern China, southwards to Sumatra, Java and Borneo. The mitotic and meiotic chromosomes of *C. gliroides* have been previously described[8]. That report, however, did not include G- and C-banding.

Recently a male and 2 female specimens of *C. gliroides* collected from Peninsular Malaysia were available for study. Bone-marrow preparations and G- and C-bandings were performed by conventional methods.

The karyotype of the present material is identical to that reported previously - 18 pairs acrocentric, 1 pair metacentric and 1 pair submetacentric autosomes (m and sm, respectively, in the figures), metacentric *X* and submetacentric *Y* sex chromosomes. Figures 1 and 2 illustrate the G- and C-banding patterns respectively.

In both the G- and C-banded metaphase plates, one arm of the metacentric and the short arm of the submetacentric autosomes are wholly heterochromatic. Likewise, the *Y*-chromosome is entirely heterochromatic. Most of the other autosomes and the *X*-chromosome have large pericentromeric C-bands. The *X*-chromosome also possesses a terminal C-band block on the arm with a pericentromeric C-band.

The occurrence of whole-arm heterochromatin blocks in both the biarmed autosomes, the presence of large pericentromeric heterochromatin in most autosomes and the completely heterochromatic *Y*-chromosome of *C. gliroides* are very similar to the situation reported for the closely-related genus *Micromys*[9]. This phenomenon of large heterochromatin blocks in the autosomes is, however, not found in the other closely-related genus *Vandeleuria*[10].

It is evident from comparison between the karyotypes of *C. gliroides, Vandeleuria oleracea* and *Micromys minutus* that different mechanisms were involved in the karyological evolution of these closely-related murid genera. In the case of *Chiropodomys* and *Micromys*, the addition of heterochromatin plays an important role, as is the case in some New World rodent genera[2,3].

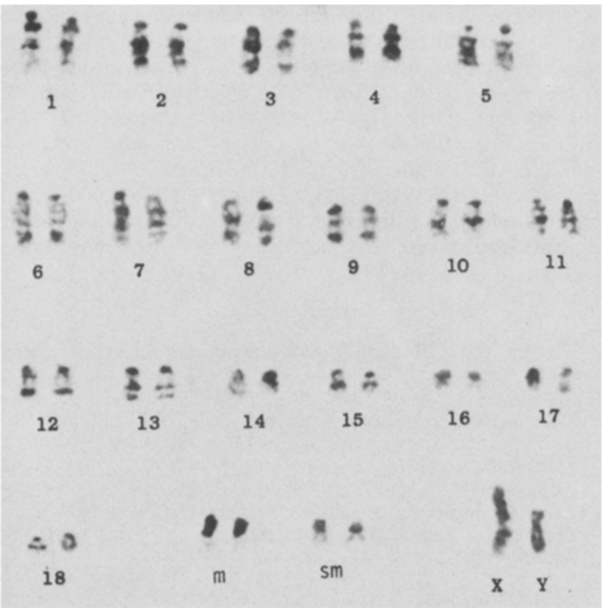

Figure 1. The G-banded karyotype of a male *Chiropodomys gliroides* from Peninsular Malaysia. G-bands were induced by the trypsin method.

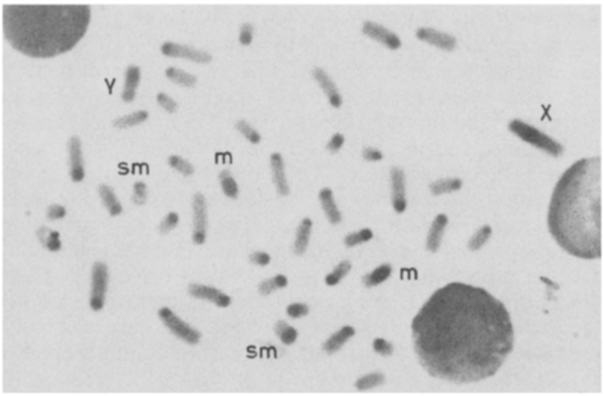

Figure 2. A C-banded metaphase plate of male *Chiropodomys gliroides* from Peninsular Malaysia. C-bands were obtained by $Ba(OH)_2$ treatment.

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B chromosomes in tetraploid pearl millet

J.V. Pantulu, P.S.R.L. Narasinga Rao, K. Jayalakshmi and G.J.N. Rao[1]

Department of Botany, Andhra University, Waltair-530003 (India), July 15, 1982

Summary. B chromosomes were found in a triploid which had no seedset in selfing, or in a cross with a highly fertile tetraploid (3nB × 4n). From the reciprocal cross (4n × 3nB) 8 progeny plants were obtained which contained B chromosomes. These plants had very low seedset and yielded only 24 eutetraploids ($4n = 28$) in the next generation. All except one of these plants had B chromosomes. The 4nB plants showed high frequencies of A chromosome chiasmata and multivalents, including complex configurations.

Until the present report there have been no studies of B chromosomes in tetraploid pearl millet. Pantulu[2], however, described meiosis in a triploid with 3-5 B chromosomes ($3n = 21A$ plus 3-5 B chromosomes in pollen mother cells, pmc). Against the maximum of 7 trivalents possible, he found a mean frequency of 6.18 trivalents per pmc at first metaphase (MI) and 15.9 chiasmata per pmc at MI (at diakinesis the means were 6.35 for trivalents and 18.1 for chiasmata). The triploid chiasma frequency was 1.5 times that of the related diploid; thus 2n and 3n pmc had about the same average chiasma formation 'per chromosome'. In non B triploids, however, chiasma and trivalent frequencies were lower[3]. In a colchicine-induced tetraploid (non B) calculation revealed that 'per chromosome' chiasmata were fewer at the higher ploidy level[4]. The comparison was made possible because in the induced sectorial tetraploid male florets had 2n pmc and bisexual florets had 4n pmc in the same earhead. The mean chiasma frequency in the 4n pmc (23.76 per cell) was lower ($p < 0.001$) compared to the doubled value of chiasmata in the 2n pmc ($12.62 \times 2 = 25.24$). The possibility was that the chiasma decrease due to higher ploidy was countered by B chromosome presence in the 3nB plant[3].

Among the progeny of an open pollinated (op) tetraploid a triploid with Bs was found. This 3nB plant[4] had 3-5 B chromosomes per cell and a mean chiasma frequency of 19.3 ± 1.3 per pmc at diakinesis. It did not set seed in selfing, nor were seeds obtained in a 3nB × 4n cross. In the reciprocal cross, when the high fertile (non B) tetraploid was the female parent, a few seeds were obtained. Eight plants raised from the cross contained B chromosomes; 6 were hyper tetraploids ($4n = 28 + 1$ or $4n\ 28 + 1 + 1$ chromosomes) and 2 were eutetraploids ($4n = 28$ as in autotetraploids).