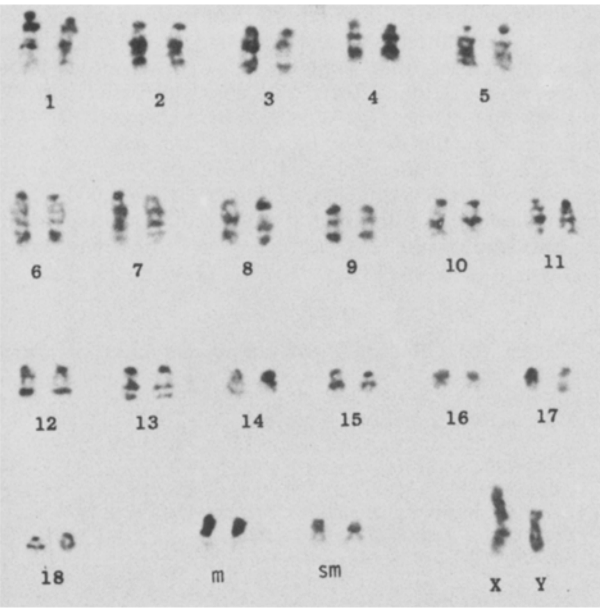

Figure 1. The G-banded karyotype of a male *Chiropodomys gliroides* from Peninsular Malaysia. G-bands were induced by the trypsin method.

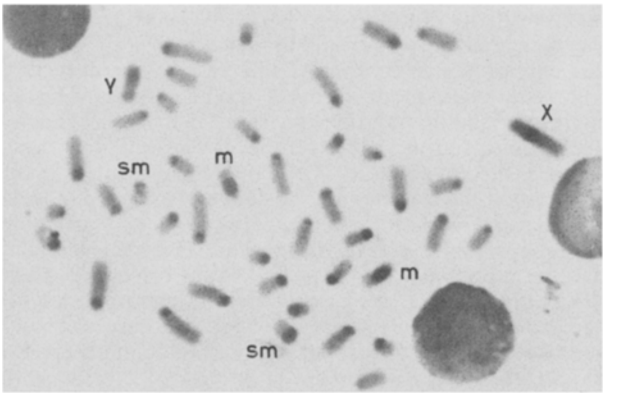

Figure 2. A C-banded metaphase plate of male *Chiropodomys gliroides* from Peninsular Malaysia. C-bands were obtained by $Ba(OH)_2$ treatment.

1 This work is supported by a University of Malaya research grant.
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B chromosomes in tetraploid pearl millet

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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 ($12.62\times2=25.24$). The possibility was that the chiasma decrease due to higher ploidy was countered by B chromosome presence in the 3nB plant[3].

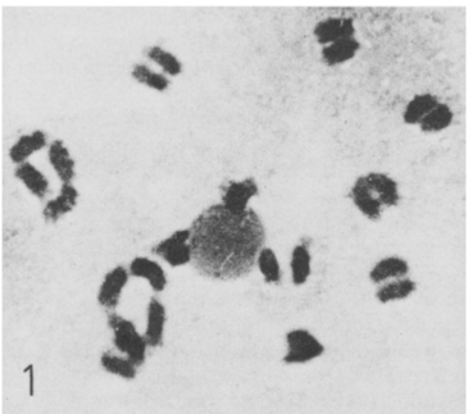
Among the progeny of an open pollinated (op) tetraploid a triploid with Bs was found. This 3nB plant[4] had 3-5 B chromosomes per cell and a mean chiasma frequency of 19.3 ± 1.3 per pmc at diakinesis. It did not set seed in selfing, nor were seeds obtained in a 3nB×4n cross. In the reciprocal cross, 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).

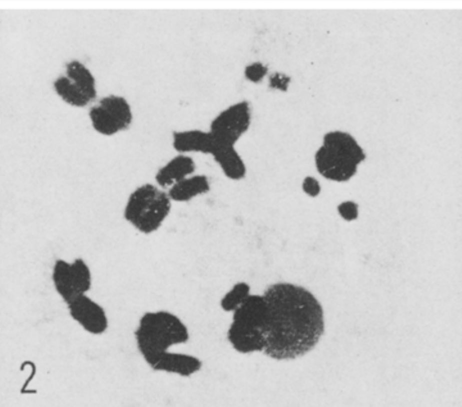
B-chromosome number per cell (means of B-totals and mode and range of standard and iso B-types) and A-chromosome chiasmata and multivalents per cell in 10 tetraploids*

B-chromosomes per cell			A-chromosome pairing		
Total Bs Mean	Standards Mode range	Isos Mode range	Chiasmata Mean per pmc	Quadrivalents Mean per pmc	Trivalents Mean per pmc
–	–	–	24.00	4.26	0.13
0.90	1 0–1	–	24.60	4.60	0.06
2.73	2 0–5	1 0–4	25.77	5.13	0.07
4.46	3 0–5	1 1–4	27.40	5.40	0.03
5.30	2 0–8	2 0–5	24.36	5.30	0.10
6.70	5.6 0–12	2 0–5	26.30	5.37	0.37
7.74	5 1–8	3 1–5	28.10	5.76	0.06
8.07	3.5 1–9	3 1–6	28.67	5.90	0.10
8.97	5 2–9	4 2–6	26.27	5.33	0.30
9.26	5 2–10	3 1–7	27.56	5.43	0.16

* Observations were from 30 pmc's at diakinesis from each euploid plant from among the 2nd generation progeny of a 4n × 3n B cross.

Seedset was very poor in these 1st generation 4nB plants; pooled 'op' and selfed seeds from them gave rise to a population of 24 eutetraploids (1 other plant was a hyper tetraploid). One of the 24 plants had no B chromosomes; 2 had 0–2 standard Bs per cell and 22 plants had a combination of standard and iso B chromosomes (standard and derivative Bs were described by Subba Rao and Pantulu[5]). Both B types showed 'within-plant' numerical variation (table). In the 4nB pmc population as a whole the range of Bs per pmc was from 0 to 14. The range of variation of standard Bs was from 0 to 12 and that of iso Bs was from 0 to 7. In contrast 2nB plants had a maximum of 8 Bs per cell, and in them intra plant variation of Bs was also low; for example, a typical 2nB plant could be described as a 2 B or a 3 B plant based on the modal B class which is identified from the frequency distribution of cells with different B numbers (usually about two-thirds of the pmc in a 2nB plant belonged to the modal class). Such a pattern is not obtained in 4nB plants, as indicated in the table; in some plants B distribution was bimodal.





Figures 1 and 2. Pollen mother cells at diakinesis, one cell with no Bs and the other with 6 Bs (2 standards next to the nucleolus plus 4 isos). In the OB cell A-chromosomes formed 2 ring quadrivalents and 10 bivalents while the 6 B cell has 7 quadrivalents; except the nucleolus organizer with 3 chiasmata the others have 4 or more chiasmata producing 'branched' or complex configurations.

The data show that plants with more Bs had higher mean frequencies of A chromosome chiasmata and multivalents. Many of the multivalents were of complex configurations (comparison of figs 1 and 2). Such multivalents would be expected to show numerical nondisjunction (NND) at first anaphase, leading to gametic aneuploidy and low seedset. It is of interest that despite the low seedset B chromosomes were maintained in the present 4nB plants. The present report places pearl millet, *Pennisetum typhoides* (Burm.) S. & H., among a small number of species[6–9] to tolerate B chromosomes in tetraploid genomes.

1 Acknowledgment. The authors are thankful to UGC, New Delhi for financial assistance.
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