were obtained, too, with cyclohexanoneoxime, probably another product of cyclamate metabolism.

In summary, out of all compounds tested, 1.2-dibromoethane and 1.2-dibromopropane were found to be definitely mutagenic in *Drosophila*. The effects produced by MCPA and, to a lower extent, also MCPB, are not sufficient to decide whether these two compounds are also active in producing recessive lethals or not. At least MCPA seems to be a weak mutagen in *Drosophila*[21].

*Zusammenfassung.* 15 Substanzen, vorwiegend Pestizide, wurden an männlichen Keimzellen von *Drosophila* auf ihre genetische Wirksamkeit untersucht. Für 1.2-Dibromäthan, 1.2-Dibrompropan und MCPA konnte eine genetische Aktivität nachgewiesen werden. Halogenalkane zeigen eine klare Struktur-Wirkungsbeziehung.

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[21] We should like to thank Mrs. M. KLUG and Miss G. KOLODZIEJ for their careful technical assistance.

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## Tertiary Trisomics in *Pennisetum typhoides*

In tertiary trisomics the extra chromosome is translocated; the ends of extra chromosome are homologous with the ends of 2 different chromosomes. The diagnostic characteristics of tertiary trisomics are the formation of pentavalents (chain of 5 chromosomes or 2 ring bivalents linked by a translocated chromosome- 'dumb-bell' shape) and the absence of ring quadrivalents.

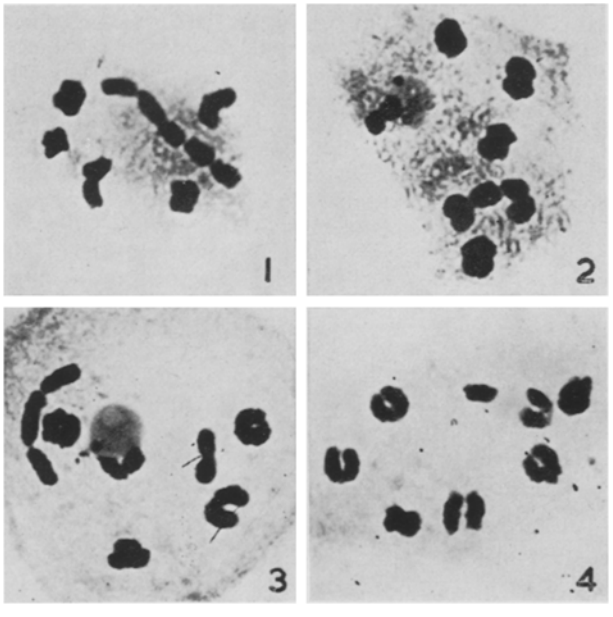


Fig. 1–4. Chromosome associations at diakinesis/metaphase I in tertiary trisomics. ×1300. 1. $1_V+5_{II}$ (chain-shaped pentavalent). 2. $1_V+5_{II}$ (dumbbell-shaped pentavalent). 3. $1_{III}+6_{II}$. 4. $7_{II}+1_I$.

Inspite of great usefulness of tertiary trisomics in assigning genes to a particular chromosome arm and the determination of centromere position, these have been produced only in *Datura*, corn, barley, tomato and rye. In tomato several genes have been located using tertiary trisomics[1]. The present communication reports for the first time the production of tertiary trisomics in pearl millet, *Pennisetum typhoides* (Burm.) S. & H. ($2n = 14$).

Several progenies of selfed interchange-heterozygotes and their crosses with different gene markers were examined. The off-type plants having short stature, thin stem and narrow leaves were marked. The PMC analysis of majority of thus selected plants revealed them to be trisomics. Besides interchange trisomics, 25 tertiary trisomics were isolated from a population of 5,000 plants.

On an average, the tertiary trisomics showed an association of 5 chromosomes at diakinesis/metaphase I in 15.0% of the cells. The pentavalents were either chain-shaped (Figure 1) or dumbbell-shaped (Figure 2). As seen in the Table, the modal configuration was $1_{III}+6_{II}$ (Figure 3) and the next most frequent class was $7_{II}+1_I$ (Figure 4). Chromosome associations of $1_{IV}+5_{II}+1_I$, $1_{III}+5_{II}+2_I$ and $6_{II}+3_I$ were rare, the frequency being 0.54, 1.36 and 1.09% respectively. The chromosomal distribution of 8–7 was predominant (95.1%), only a few cells showed laggards. Pollen fertility in these trisomics, as studied from mature anthers by staining with acetocarmine, was reduced to 51.1 to 87.8% of the diploid.

The tertiary trisomics showed the characteristic features of trisomy in pearl millet. In contrast to the primary trisomics[2], the change in morphology of tertiary trisomics was not attributable to particular chromosomes.

[1] G. S. KHUSH and C. M. RICK, Can. J. Genet. Cytol. *9*, 610 (1967).

[2] B. S. GILL, S. S. VIRMANI and J. L. MINOCHA, Can. J. Genet. Cytol. *12*, 474 (1970).

Meiotic behaviour of tertiary trisomics in pearl millet, *Pennisetum typhoides*

| | Chromosome association at diakinesis/metaphase I | | | | | | Anaphase I distrib. | |
|---|---|---|---|---|---|---|---|---|
| Cells | $1_V+5_{II}$ | $1_{IV}+5_{II}+1_I$ | $1_{III}+6_{II}$ | $1_{III}+5_{II}+2_I$ | $7_{II}+1_I$ | $6_{II}+3_I$ | 8-7 | 7-1-7 |
| Number | 55 | 2 | 187 | 5 | 144 | 4 | 233 | 12 |
| Percent | 14.99 | 0.54 | 50.95 | 1.36 | 31.06 | 1.09 | 95.10 | 4.90 |

The heterozygosity of the trisomic parent may be the reason, as the majority of the tertiaries were isolated from the $F_1$ population. From the inter-crosses of parental interchange stocks, it is inferred that 10 tertiaries had different chromosomal combinations.

In addition to the primary trisomics[2] and interchange stocks[3], tertiary trisomics will be useful in linkage studies and chromosome mapping in pearl millet.

[3] B. S. GILL and J. L. MINOCHA, Proc. 58th Ind. Sci. Congr. *3*, 756 (1971).

*Zusammenfassung.* In den Pollenkörnern der $F_1$-Generation von heterozygotem *Pennisetum typhoides* (Hirse) wird tertiäre Trisomie nachgewiesen.

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## Diploidization in *Eleutherodactylus* (Leptodactylidae-Amphibia)[1]

Chromosome mechanisms of evolution, such as rearrangements by translocation, assembly of new favorable linkage groups by centric fusion and polyploidy have been described in Anura. The former two processes do not necessarily involve quantitative alterations of genetic material, but the last implies always duplication of the DNA content. Cytophotometric measurements of DNA content in cells of several species showed that in some instances, increase of DNA content, is not detectable just by the study of the karyotype. This increase is ascribed mainly to tandem chromosome duplications[2–5]. In the present paper we report karyotype diploidization of the polyploid species *Eleutherodactylus binotatus*. *E. binotatus* ($2n = 22$) has fourfold the DNA content of *E. guentheri* ($2n = 22$) and *E. parvus* ($2n = 22$). Concomitantly we found in the former, multivalent meiotic configurations originated by multiple translocations and/or centric fusions.

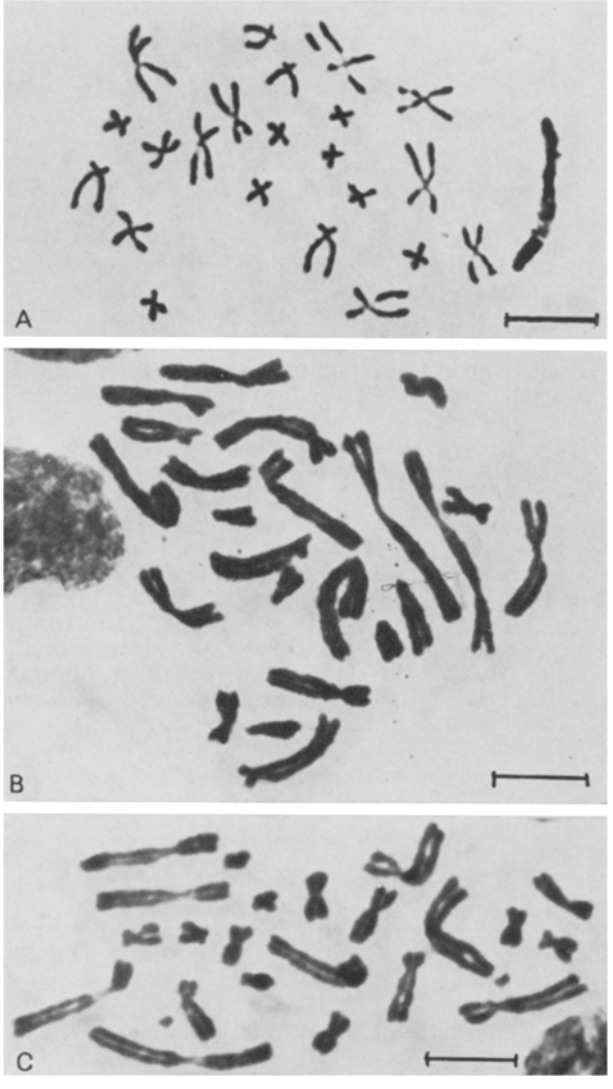


Fig. 1. A) Metaphases of *Eleutherodactylus guentheri*; B) *E. binotatus*; C) *Syphonops paulensis*, at the same magnification. Bar = 10 µm.

The material studied consisted of specimens of *E. binotatus* collected in the State of São Paulo (Ilha Queimada Grande 1 ♂; Boracea 3 ♂) in the State of Guanabara (Rio de Janeiro 1 ♀), and in the State of Bahia (Ilheus 1 ♀). Cytological preparations were obtained by the squash technique of intestine and gonads of animals previously treated with colchicine (1% solution; 0.01 ml/g weight, 2 h prior to the cytological preparation). Small organ fragments were placed into cold distilled water for 15 min, fixed in 50% acetic acid for 15 min, and squashed. The preparations were hydrolized in HCl N at 60 °C for 10 min, and stained by the Feulgen or Giemsa method.

DNA content was measured in erythrocyte nuclei, of blood smears, stained by the Feulgen method. A Zeiss Scanning Microscope Photometer MPM with a basic step of 0.5 nm at the cytoscan stage, was used. The total magnification used was 100 × (objective) 1.6 × (optovar) 10 × (projective). Measurements were made at extinction at 540 nm. The apparatus was connected to a Facit 4070 and the punched paper tape analyzed by computer.

The blood smears analyzed include *E. binotatus*, *E. guentheri* and *E. parvus*. Smears from *Bufo ictericus* were used as a standard.

The most interesting aspect found in *E. binotatus* was the increased width and length of its chromosomes in relation to most Anura species. Chromosome dimensions in this species resemble that of the Gymnophyona, *Syphonops paulensis* (Figure 1, a, b, c).

[1] This work was supported by the Brazilian CNPq, FAPESP and FEDIB. The authors acknowledge the skilful assistance of M. SOMA.

[2] M. L. BEÇAK, W. BEÇAK and M. N. I. RABELLO, Chromosoma *19*, 188 (1966).

[3] M. L. BEÇAK, L. DENARO and W. BEÇAK, Cytogenetics *9*, 225 (1970).

[4] W. BEÇAK, M. L. BEÇAK, D. LAVALLE and G. SCHREIBER, Chromosoma *23*, 14 (1967).

[5] W. BEÇAK, M. L. BEÇAK, G. SCHREIBER, D. LAVALLE and F. O. AMORIM, Experientia *26*, 204 (1970).