

# SOME INTERESTING CYTOLOGICAL FEATURES OF MALE SPATHOSTERNUM PRASINIFERUM WALK.

N. BALAKRISHNAN ELAYIDOM AND M. K. SUBRAMANIAM

Cytogenetics Laboratory, Department of Biochemistry, Indian Institute of Science, Bangalore-12

**S**PATHOSTERNUM PRASINIFERUM is a common grasshopper having a wide distribution in the Indian continent. We know only that it has 23 ( $2n \sigma^7 = 22 + X$ ) chromosomes in the gonial metaphases,<sup>1</sup> that the X-chromosome is the third or one of the longest in the complement at gonial and second metaphases,<sup>2,3</sup> and that chromosome aberrations could be induced by injections of 0.67% saline having the pH of 3-4 or 9.<sup>4</sup> An initial survey revealed some interesting features.

The testes were fixed in acetic alcohol (1:3) or in formal-acetic alcohol (1:1:3) for two hours at room temperature and were either stored in 70% alcohol or processed immediately as hæmatoxylin squashes.<sup>5</sup> Some of the material was exposed to 0.9% sodium citrate solution for 30 minutes before fixation.

In the material pretreated with hypotonic sodium citrate solution, the X-chromosome alone had a matrix and a limiting membrane at gonial prophase (Photo 1). Photo 2 is a gonial metaphase. A measurement of the chromosomes revealed an inequality in the longest pair of autosomes (arrow, Photo 3). A rare gonial tetraploid metaphase is illustrated in Photo 4. During meiotic prophase, the nucleoli were found associated with the X-chromosome and two of the bivalents. It would appear that the association of the X-chromosome with the bivalents may be mediated by the nucleoli (Photo 5). At metaphase I, there were 11 bivalents and an allosome (Photo 6). Two among the 500 specimens screened had a supernumerary chromosome as illustrated in Photo 7 of metaphase I and Photo 8 of anaphase I.

On general considerations, only the meta- and ana-phase chromosomes may be expected to have limiting membranes.<sup>6-8</sup> As far back as 1900, Sutton<sup>10</sup> had recorded in some insects a limiting membrane for the X-chromosome alone at gonial prophase, when it was still enclosed within the nuclear membrane. The X-chromosome is intriguing in its staining behaviour.

While in some forms its synthesis of DNA is out of phase with that of the autosomes,<sup>11</sup> in others, it does not synthesize either DNA or RNA during the meiotic stages.<sup>12</sup> The fact that it is enclosed by a limiting membrane at gonial prophase is, therefore, interesting.

An inequality of the homologues has been reported only in the case of the small autosomes.<sup>13-15</sup> An inequality in the longest pair of chromosomes is perhaps being recorded here for the first time. Reports on the formation of nucleoli by the X-chromosome of grasshoppers are rather few.<sup>16-17</sup> Photo 5 is suggestive that the nucleoli may mediate the association between the X-chromosome and the bivalents during meiotic prophase.<sup>18</sup>

1. Rao, T. R., *J. Morph.*, 1937, **61**, 223.
2. Asana, J. J., Makino, S. and Niiyama, H., *Jap. J. Genet.*, 1939, **15**, 251.
3. Ray-Chaudhuri, S. P. and Dutt, M. K., *Proc. Roy. Soc. Edinb.*, 1947, **62**, 292.
4. Manna, G. K. and Roy, D., *Naturwiss.*, 1964, **51**, 493.
5. Elayidom, N. B., Royan-Subramaniam, S. and Subramaniam, M. K., *Curr. Sci.*, 1966, **35**, 265.
6. Subramaniam, M. K. and Royan, S., *Ibid.*, 1962, **31**, 227.
7. — and Subramanyam, S., *Ibid.*, 1964, **33**, 473.
8. Mangalangi, N. K., Subramanyam, S., Royan-Subramaniam, S. and Subramaniam, M. K., *Ibid.*, 1965, **34**, 278.
9. Subramanyam, S. and Subramaniam, M. K., *Naturwiss.*, 1965, **52**, 626.
- 10.\* Sutton, W. S., *Kan. Univ. Quart.*, 1900, **9** (2).
11. Lima-de-Faria, A., *Jour. Biophys. and Biochem. Cytol.*, 1959, **6**, 457.
12. Henderson, S. A., *Chromosoma*, 1964, **15**, 345.
13. Powers, P. B. A., *J. Morph.*, 1942, **71**, 523.
14. White, M. J. D., *Animal Cytology and Evolution*, II Edn.: Cambridge Univ. Press, 1954.
15. Nur, U., *Chromosoma*, 1963, **14**, 407.
16. Gates, R. R., *Bot. Rev.*, 1942, **8**, 337.
17. John, B. and Hewitt, G. M., *Chromosoma*, 1965, **16**, 548.
18. Darlington, C. D., *J. Genet.*, 1938, **33**, 465.

\* Not consulted in original.



PHOTOS 1-8. Photo 1. Spermatogonial prophase. Note the matrix and pellicle of the X-Chromosome. Photo 2. Spermatogonial metaphase with 23 chromosomes. Photo 3. Karyotype of gonial metaphase. Arrow indicates the unequal pair of long chromosomes. Photo 4. Tetraploid gonial metaphase ( $4n \text{ ♂} = 46$ ). Photo 5. Nucleoli (N) associated with the X-chromosome and two of the bivalents at pachytene. Photo 6. Metaphase I. Photo 7. Metaphase I with supernumerary (arrow). Photo 8. Anaphase I with supernumerary (arrow). Magnification of Photos 2-8 as given in Photo 3.