A NOTE ON MEIOTIC CHROMOSOMES OF THE GIANT ACRIDID *Eutropidacris collaris* (STOLL)

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So far as I know, none of the giant grasshoppers included in the tribe *Tropidacrini* of the subfamily *Cyrtacanthacrinae* (LIEBERMANN, 1939) (1), now in the family *Romaleidae* of CHOPARD, was yet studied cytologically.

Some males of the species *Eutropidacris collaris* (Stoll), still called *Eutropidacris cristata* (L.) by some authors, were dissected in Ringer's solution, and the testes squashed in acetic orcein or fixed in Bouin's fluid for insects (with addition of urea) and in its Allen-Bauer's modification. Sections were stained by the Feulgen's method and with Heidenhain's haematoxylin.

Of *Eutropidacris collaris* there occur in Brazil two quite distict forms not yet separated systematically, one having the tegmina and wings green, and the other, much duller in general coloration, having the tegmina yellowish brown and the wings deep blueish green. In addition, the latter has the disc of the wings more densely invaded by the dark markings of the marginal band. All my matrial consisted of representatives of the duller form.

The spermatogonia have 23 chromosomes, a number very commonly found in grasshoppers, all but 6 being clearly acrocentric rods of different sizes (Fig. 1). Even the 6 small autosomes which appear as short elements in the metaphase plates, to judge by their shape at later stages, are also acrocentric.

Primary spermatocytes have a single heteropycnotic sex chromosome of medium size, seen in the periphery of leptotene and pachytene nuclei, and outside the equatorial plane at metaphase. It passes undivided to one of the secondary spermatocytes.

All bivalents form a distal chiasma localized at the end.

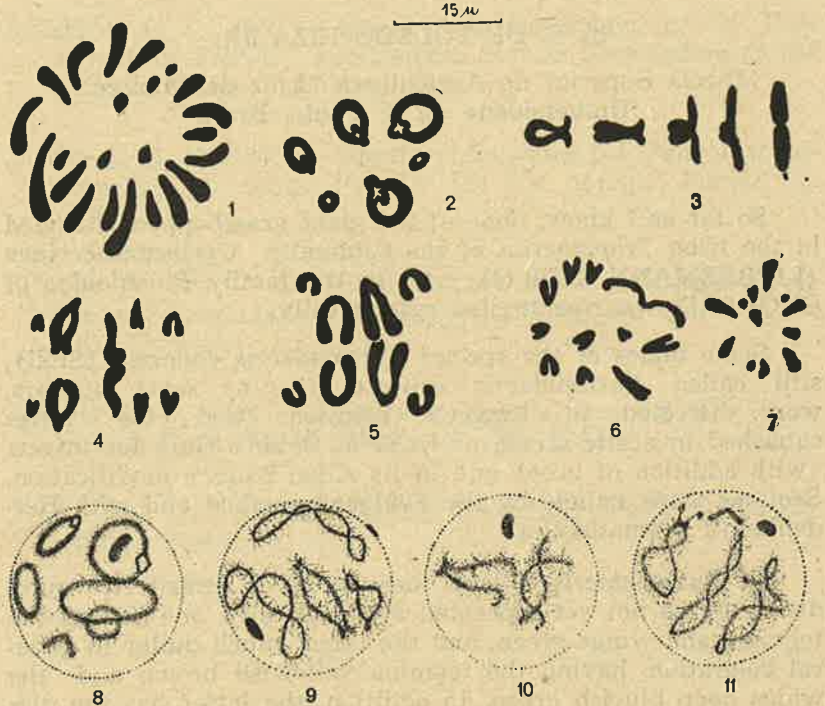

Fig. 1 — Spermatogonial metaphase in polar view. (Orcein).

Fig. 2 — Six ring-tetrads at diakinesis (Haematoxylin).

Fig. 3 — Different tetrads as they appear at metaphase (Haematoxylin).

Figs. 4 and 5 — Two first anaphases in side view (Haemat and Orc. respect.).

Fig. 6 — Secondary spermatocyte with 11 chromosomes a little before metaphase (Haemat.).

Fig. 7 — Metaphase of the secondary spermatocyte with 12 chromosomes (Haemat.)

Figs. 8 to 11 — Different nuclei at diplotene. (Orcein).

Excepting perhaps the 3 small bivalents which form rods at metaphase, the rest may have a second chiasma localized at the centromere region, thus forming ring (Figs. 2 and 8). This occurs with certainty in 6 of the large and medium sized bivalents (Fig. 2). Whether the 6 rings seen in some nuclei are always the same is not clear. If not, it becomes almost certain that at least two more bivalents may also form rings. It seems clear to me, that long rings formed at early diplotene may twist, giving rise to configurations simulating interstitial chiasmata like those shown in figs. 9 and 11.

The chromosomes at diplotene have a plummy surface very pronounced in acetic orcein preparations, and their chromatids are so closely united, that, in spite of their large size, it is fairly difficult to analize their mutual relations at the points they cross over each other. Chromatids passing from side to side in so clear a manner as seen for instance in *Schistocerca gregaria* (TJIO and LEVAN, 1954) (2), have never been found The impression gotten from slides stained with haematoxylin rather points to a fusion of peripheral substance taking place wherever two chromatids meet two others, which may be greatly facilitated by the plummy condition of their surface. It seems, therefore, probable, that an entirely different process, similar to that described by RESENDE and MANARTE (1951) (3), may give origin to configurations like those generally considered as being due to chiasma formation. In any event, I am convinced that chiasma does not constitute the only way to secure union of the chromatids when bivalents open out at diplotene.

It is a hard task to disclose the shorter arm of the chromosomes, for it is generally bent against the proximal end of the longer arm. However, aspects like that represented in fig. 11 (on the left), show clearly the acrocentric condition of the chromosomes.

At anaphase, with the centromeres moving toward opposite poles, the proximal chiasmata slip toward the distal extremity, and, as soon as the separation of the chromosomes finishes, they become V-shaped (Figs. 4 and 5).

At prometaphase of the second division all chromosomes are V-shaped, revealing in this way their acrocentric nature (Fig. 6). Metaphase plates with 11 and 12 chromosomes (Fig. 7) have been found. The X divides equationally in the second division.

Putting aside any speculation concerning the nature of the chiasmata, the conclusion to be drawn from the present study is that *Eutropidacris collaris* offers a remarkable exemple of strictly localized terminal chiasmata. In spite of having carried out no statistical analysis, some facts seem to be well established. We see for instance that all the bivalents almost invariably form a distal chiasma, and that at least 6 may associate this chiasma with a proximal one, forming ring, it being problabe that 2 more bivalents also behave in identical manner. Very small ring-tetrads seen in some cells show that even the 3 smallest bivalents seem capable of associating a proximal chiasma with the distal one. In *Bryodema tuberculatum* Zacher, an Acridid recently studied by WHITE (1954) (4), with the same chromosome number as *Eutropidacris*, only one of the 9 bivalents which invariably form a proximal chiasma is able to associate this chiasma with a distal one, in some individuals. From the other 2 bivalents, both forming inavariably a distal chiasma, one never forms a proximal chiasma, while the other does that in 64 out of 166 cases.

Summing up, the tendency to increase the number of chiasmata by the association of a distal and a proximal ones in the same bivalent, still low in *Bryodema*, assums a high level in *Eutropidacris*. In addition, since the localization of chiasmata at the ends of the bivalents almost completely suppresses genetic crossing-over, the way is opened to a re-examination of the chiasma problem in general. (See discussion in WHITE (4) and PIZA (5).

1) J. LIEBERMANN, *Physis* 17, 589 (1939).

2) J. H. TJIO and A. LEVAN, *An. Est. Exp. Aula Dei* 3, 225 (1954).

3) F. RESENDE and M. MANARTE, *Port. Acta Biol.* 3 (Ser. A), 219.

4) M. J. D. WHITE, *Evolution* 4, 350 (1954).

5) S. DE TOLEDO PIZA, *Caryologia* 10, 415 (1958).