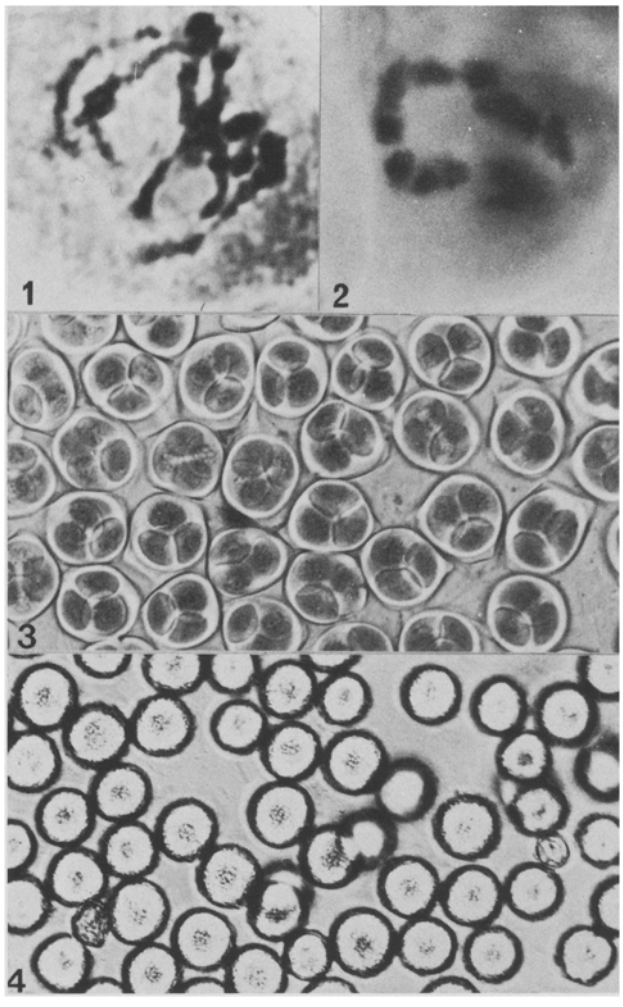

containing the pollen lethal and so the selective system can operate while full fertility is maintained. Either the system in *Chelidonium majus* does not operate perfectly or the observed sterility is attributable to the greenhouse conditions. Further studies on fertilization and embryology are necessary to anwer this question.

Such a genetic system tends to lead to a diversified taxon with series of smaller populations and subpopulations sometimes referred to as demes, as in *Oenothera.* But in this case, the situation is drastically different and thus unique; in spite of its large distribution and its genetic system, the genus is monospecific with but one rare variety *(laciniatus).* The case of *Rhoeo,* also a monospecific genus, is rather different; indeed, its distribution is limited to the tropical forest of America, a stable environment. Furthermore, *Rhoeo* is a long-lived perennial with an active vegetative reproduction and a poor sexual reproduction.

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1 Meiotic prophase showing the multiple association of chromosomes. × 350. *2* Polar view of metaphase I. × 900. *3* Regular tetrads. × 130. *4* Mature pollen. × 130.

Absence of recombination in the male of *Ceratitis capitata*[1]

J.L. Cladera[2]

Departamento de Genética, INTA, 1712 Castelar (Argentina), 28 July 1980

Summary. The linkage relationship between a morphological and a biochemical locus was studied. Results suggest that recombination does not occur in the male of the Mediterrannean fruit fly although its meiosis is typically chiasmatic.

The male *Drosophila* and the female *Bombyx mori* are typical of organisms in which crossing over does not occur in the meiotic cells of the heterogametic sex. Early observations were interpreted as a cytological basis for the absence of crossing over in *Drosophila*[3]. Later on it was established that chiasmata regularly occur during meiosis in the bivalents of this species at an incidence of at least 1-7.6%[4]. This fact casts doubt on the 1:1 correspondence between chiasmata and crossing over.

The Mediterrannean fruit fly *Ceratitis capitata* shows a typically chiasmatic meiosis[5]. In reference to this, it was suggested that in contrast with most other higher diptera, recombination occurs in the male spermatocyte[5]. It has previously been impossible to test this hypothesis either because the known genes were located in different recombination groups[6,7] or their linkage relationships had not yet been tested[8-10].

The existence of 2 codominant alleles in the pupal enzyme esterase, referred to as *Est-1a* and *Est-1b*[11], was recently detected through electrophoresis. This communication reports on the study of the relationship between the gene Est-1 and the autosomal recessive gene *niger* (*nig*/*nig* = black pupa)[8].

The flies used here belong to a laboratory strain obtained at the Department of Genetics, INTA, Castelar, Argentina. Previously-reported breeding methods and electrophoretic technique[11] were used.

The $\frac{nig\ Est\text{-}1a}{nig\ Est\text{-}1a}$ females and $\frac{+\ Est\text{-}1b}{+\ Est\text{-}1b}$ males were crossed, and the pupal esterase pattern in the 1st generation (F_1), in the 2nd generation (F_2) and in both backcrosses were studied. All the F_1 pupae were wild brown. 13 F_1 individuals were electrophoretically analyzed and all of them were heterozygotes for the gene *Est-1 (1a/1b).*

The F_2 pupae segregated according to the expected 3:1 ratio, and 154 wild pupae and 51 black pupae were obtained ($X^2=0.0016$). Only 32 black pupae were analyzed (table 1). These data seem to fit better in the hypothesis of linkage in only one of the sexes, and 50% recombination in the other. Imagos emerging from F_2 pupae confirmed the autosomal condition of the gene *niger:* 24 black males, 27 black females, 75 wild males and 79 wild females were found ($X^2=0.28$).

Table 1. Observed F_2 frequencies of esterase patterns among black pupae compared with expected frequencies in 3 alternative hypotheses

	Esterase pattern		
	1a/1a	1a/1b	1b/1b
Black F_2 pupae	14	18	0
Total linkage hypothesis	32.0	0	0
No linkage hypothesis	8.0	16.0	8.0
Linkage in only 1 sex	16.0	16.0	0

Esterase pattern 1a/1a = homozygote for *Est-1a* allele; 1b/1b homozygote for *Est-1b;* 1a/1b = heterozygote.

Table 2. Esterase pattern frequencies among backcross individuals

	Pupa color	Esterase pattern	
		1a/1a	1a/1b
♀ $F_1 \times \frac{nig\ 1a}{nig\ 1a}$	w	9	12
	n	9	11
♂ $F_1 \times \frac{nig\ 1a}{nig\ 1a}$	w	0	16
	n	16	0

Pupa color: n, *niger* homozygote; w, wild brown (heterozygote).

The results summarized in table 2 were obtained by backcrossing F_1 males and females with the maternal strain. It is evident that only parental type gametes (*nig Est-1a* and *+Est-1b*) are produced in F_1 males while the F_1 females produce all 4 types - 2 parentals and 2 recombinants (*nig Est-1b* or *+Est-1a*).

These results suggest that a) gene *Est-1* is probably in the same chromosome as gene *niger* but at nearly 50% recombination distance, and b) recombination does not occur in the male *C. capitata.* An alternative but somewhat queer explanation would be to assume that both genes are in separate chromosomes and that the centromeres of the same paternal origin tend to migrate to the same pole.

The apparent lack of agreement between cytological and genetical data now reported confirms that the occurrence of chiasmata during meiosis does not always indicate the existence of crossing over, i.e. the exchange of genetic material between homologous chromosomes, which means either that not all chiasmata are related to crossing over or that other pairing conditions can give rise to chromosomal configurations that simulate chiasmata.

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Germ cell chromosomes in two species of terrestrial isopods from India

O.P. Mittal and S. Pahwa[1]

Department of Zoology, Panjab University, Chandigarh-160014 (India), 7 January 1980

Summary. In 2 species of terrestrial isopods, namely *Porcellio assamensis* and *P. laevis,* the diploid and haploid numbers of chromosomes have been established to be 48 and 24 respectively for the former species and 50 and 25 respectively for the latter species. Female heterogamety of the ZW type has been found to exist in *P. laevis.*

Only a few sporadic references are available on the chromosomes of isopod crustaceans[2-16]. In fact, very little work has been done in India on the cytology of these isopods. So far there are only 3 species[14,15] on the cytological record. The present paper reports studies on the chromosomes of 2 more species of isopods belonging to the family Porcellionidae (suborder Oniscoidea).

Materials and methods. The male and female individuals of *Porcellio assamensis* and *P. laevis* were collected at Raigarh (M.P.) and Chandigarh, from underneath débris lying in moist places. Whereas in the case of *P. assamensis* only the testicular material was utilized, for *P. laevis* both the testicular and ovarian tissues were used for the chromosomal studies. The chromosome preparations were made by employing the air drying technique[17] and stained in Carbol Fuchsin.

Results. Each spermatogonial metaphase of *P. assamensis* reveals the diploid number of 48 chromosomes which form 24 homologous pairs (figure, a) according to their size and shape. Of them, 13 pairs are metacentric, 5 are submetacentric and the remaining 6 are acrocentric. The largest pair in the karyotype is submetacentric and measures about 6.46 µm. The 2nd and 3rd pairs measure about 5.23 µm and 4.13 µm respectively. However, the rest of the chromosomes reveal a gradual decrease in their size from 4.08 µm to 1.41 µm. Each of the metaphase I plates (figure, b) carries 24 bivalents showing a rather low frequency of chiasmata. The chiasma frequency per cell, at this stage, has been calculated to be 24.28 ± 0.45. Metaphase II (figure, c), again shows 24 chromosomes.

After scanning a number of spermatogonial metaphase plates of *P. laevis* (figure, d) a diploid number of 50 chromosomes has been established for this species. Of these, 42 are metacentric, 6 are submetacentric and the remaining 2 are acrocentric chromosomes. The last 2 might be the ZZ chromosomes corresponding to the acrocentric Z of the female. Metaphase I (figure, e) carries 25 bivalents of different configurations. However, most of them are dumbbell-shaped. Metaphase II (figure, f) again shows 25 chromosomes, each displaying its chromatids quite distinctly.