1973

The Effects of Two Minute Mutations on Meiotic Crossing Over in Drosophila melanogaster

Charles Detwiler
Liberty University, cdetwiler@liberty.edu

J. Tonzetich

cm^3 of distilled water or ethyl alcohol, kept at 25°C where it attains a constant vapor pressure. An attractibility index (A.I.) was calculated: A.I. = (number of parasites which entered the odor trap minus number of parasites which entered the control trap) divided by the number of parasites started.

In this study, it has been demonstrated that females of Cothonaspis were attracted (IA = + 0.73) by odiferous substance (s) issued from synthetic medium in laboratory, on which D. melanogaster larvae are breeding. The same result was obtained with medium with live yeast (Saccharomyces cerevisiae) (IA = + 0.85).

Begon (1975) has shown that flies are instrumental in producing a very rich yeast and microbial flora in jars where fermentic process develops with production of ethanol.

The response of parasitic wasps to various concentrations of ethyl alcohol were assessed. As observed, females are attracted (+ 0.27 < A.I. < + 0.56) to this chemical over certain ranges of concentration (between 0.5% and 10%); above 50%, ethyl alcohol was slightly repellent (I.A. = -0.9). With Cothonaspis males, results are very different. For dilutions between 0.1% and 10%, attractibility index varies between -0.1 and -0.2; beyond 10% alcohol we noted a high repulsion. Consequently males are never attracted by ethyl alcohol (Figure 1).

Some authors (Fuyama, 1974, 1976) have shown that either fermentation fruits or solutions containing ethyl alcohol exert an attraction for D. melanogaster; it is clear that an environment in which D. melanogaster occurs is one of an alcohol associated resource. This fly has a tendency to lay eggs preferentially on these media. Consequently larvae of D. melanogaster in which females of Cothonaspis oviposit live also in these media. Cothonaspis is attracted to medium with ethyl alcohol (fermenting fruits in natural conditions) where live its host.

We decided to study ethanol tolerance of Cothonaspis: adult parasites are put in closed vials containing various quantities of ethanol and dead are counted every day. With this method, it has been shown that females of Cothonaspis were tolerant to ethanol and not the males (Figure 2). Consequently, females are able to live in contact with highly alcoholic substances like Drosophila melanogaster (David et al., 1974); the other species of Drosophila are more susceptible to ethanol.

References: Begon, M. 1974, DIS 51:106; David, J., P.Fouillet and M.F. Arens 1974, Arch. Zool. Exp. Gen. 115:401; Fuyama, Y. 1974, DIS 51:142; Fuyama, Y. 1976, Beh. Gen. 6: (in press).

Detwiler, C.R. and J. Tonzetich. Bucknell University, Lewisburg, Pennsylvania. The effect of two Minute mutations on meiotic crossing-over in D. melanogaster.

Females heterozygous for M(2)z and ed dp or M(2)S7 and c wt were crossed to males homozygous for the recessive marker genes. Each pair of markers represents loci on either side of the Minute locus being considered. Crosses using the corresponding marker systems but without the Minute mutants were used as controls. Females were mated 6 hours after eclosion and maintained at 25°C ±0.5°C over a 12 hr light-dark cycle. The results are presented in Table 1.

Table 1. Effect of Minute mutations on the percentage recombination in chromosomal segments containing a Minute locus.

Mutant	% recombination	Total count
+/ed dp	2.6	4000
M(2)z/ed dp	1.5	3000
Difference	1.1	
+/c wt	7.1	2600
M(2)S7/c wt	5.3	2500
Difference	1.8	

In both Minute heterozygotes, a sizable reduction occurs between markers on either side of the Minute locus. In the controls, the average values for percent recombination agree approximately with values given in Lindsley and Grell (1968). Two hypotheses may account for the Minute effect. The Minute phenotype has been postulated to result from a deletion (Ritossa, Atwood and Spiegelman, 1965). M(2)z is included in a very small deficiency but the salivary gland chromosomes of M(2)S7 appear normal. Alternately, the Minute mutation may modify some aspect of the recombination mechanism and hence should generally affect recombination throughout the genome. Although this hypothesis has not been tested, Kaplan (1953) has found that mitotic crossing over is increased in these two mutants.

References: Kaplan, W.D. 1953, Genetics 38:630-51; Lindsley, D.L. and E.H. Grell 1968, Gen. Var. in D.m. 156-157; Ritossa, F.M., K.C. Atwood and S. Spiegelman 1966, Genetics 54: 633-676.

Angus, D.S. and D.J. Colgan. University of Newcastle, N.S.W., Australia. Hybrid sterility in geographic races of D.m.

A strain of D. melanogaster was established from a single wild inseminated female from Para Wirra, South Australia, and maintained in the laboratory since 1972. This strain, PW, differs from standard Canton S in sternopleural chaeta number, PW = 17.3 ± .2 and Canton S = 24.6 ± 0.2 chaetae respectively.

Pair matings on semolina agar medium in 25 x 100 mm vials yielded the following results:

	Matings ♂ x ♀	Vials with Progeny	Vials without Progeny	% Successful
Parental Crosses	PW x PW	12	0	100
	CS x CS	12	0	100
	PW x CS	5	0	100
	CS x CS	6	0	100
F_1 Crosses	(CS x PW) x (CS x PW)	12	0	100
	(PW x CS) x (PW x CS)	1	11	8
Backcrosses to PW	PW x (PW x CS)	4	8	33
	PW x (CS x PW)	9	3	75
	(CS x PW) x PW	12	0	100
	(PW x CS) x PW	3	9	25
Backcrosses to CS	CS x (PW x CS)	2	10	17
	CS x (CS x PW)	11	1	92
	(PW x CS) x CS	3	9	25
	(CS x PW) x CS	10	2	83

From these data it is apparent that only the cross PW ♂ x CS ♀ produces F_1 progeny which are sterile. From the backcrosses it is apparent that both F_1 ♂♂ and ♀♀ are affected.

These results suggest a cytoplasmic interaction between the Canton S ♀ and the Para Wirra spermatozoa.

Voelker, R.A. and C.H. Langley. NIEHS, Research Triangle Park, North Carolina. Cytological localization of Roi (Rough eye).

During the course of experiments designed for other purposes, the following cross was performed at 25°C:

SM1, Roi/+ ♀♀ x Df(2L)X_i/CyO ♂♂

where X_i represents any of 15 different deficiencies in the pr region. The specific deficiencies (X_i's) used were: Df(2L)137, m cn bw; Df(2L)50, cn; Df(2L)E71, rdo hk pr; Df(2L)137, M cn bw; Df(2L)158, cn bw; Df(2L)130, cn bw; Df(2L)E55, rd hk pr; Df(2L)2, Tft 1(2)74i; Df(2L)9, Tft cn; Df(2L)12, Tft 1(2)74i; Df(2L)84, Tft 1(2)74i; Df(2L)150, cn bw; Df(2L)65, Tft 1(2)74i; Df(2L), Tft 1(2)74i; and Df(2L)161, M cn bw. Normally four classes of progeny would be expected in approximately equal frequencies from the above generalized cross: 1) +/CyO 2) SM1, Roi/CyO 3) +/Df(2L)X_i and 4) SM1, Roi/Df(2L)X_i. The expected progeny classes were obtained in all crosses, with the exception that the last class was rare or absent in four crosses. The frequencies of the last two progeny classes for these four crosses were as follows:

	Number of Progeny	
Deficiency	+/Df(2L)X_i	SM1, Roi/Df(2L)X_i
Df(2L)3, 1(2)74i	126	0
Df(2L)50, cn	103	6
Df(2L)E71, rdo hk pr	116	3
Df(2L)137, M cn bw	117	0

Since Roi/Roi homozygotes are reported to be lethal, the absence or near absence of the Roi/def progeny class suggests that the region common to these four deficiencies contains the Roi locus. The smallest of the four deficiencies, Df(2L)3, 1(2)74i, is wholly contained within the other three and has the following breakspoints: 36F7-37A1 and 37B2-B8. The Roi locus is, therefore, very likely located within that interval.