79.7% crossovers arose between b - Est-4 and 20.3% between Est-4 - bk. Hence, the locus for Est-4 is located at 192 ±.

References cited: Chino, M. 1937, Jap. Journ. Gen. XII:189-210, 257-283; Ohba, S. and F. Sasaki 1968, Proc. XII Intern. Cong. Genet. 1:156-157.

Childress, D. and W. Cantelo. USDA, Fargo, North Dakota; Beltsville, Maryland. Fitness of compound chromosome strains.

It has been suggested that compound chromosomes might be suitable for changing the genetic structure of insect populations, particularly of insect pest species (Foster et al., 1972). Because an unstable equilibrium is produced in a mixed population of compound and normal individuals (a mating between a compound and a wild type is sterile), it is possible for the compound strain to replace the native strain in a very small number of generations. The release ratio at which the compound strain will replace the normal strain depends almost entirely on the fitness of the compound strain relative to that of the native population. Theoretically, the fitness of compound strains in Drosophila is near 25%, due to the production of unbalanced

Table 1. Competition experiments between the Tokyo wild and the sepia compound strain. Samples were taken every generation (10 days).

Generation	Original release ratio Tokyo:se compound	Progeny normal (Tokyo)	Compound (sepia)	% Tokyo ± s.e.
1	1:1	323	49	87 ± 1.7
2	(20 pr + : 20 pr se)	136	32	81 ± 3.0
3		104	8	93 ± 2.4
4		223	14	94 ± 1.5
1	1:1 (Replicate)	145	108	57 ± 3.1
2		125	10	93 ± 2.3
3		264	17	94 ± 1.4
4		204	49	81 ± 2.5
1	1:3	57	169	25 ± 2.9
2	(10 pr + : 20 pr se)	111	257	30 ± 2.4
3		107	104	51 ± 3.4
4		103	270	28 ± 2.3
1	1:3 (Replicate)	28	145	16 ± 2.8
2		57	69	45 ± 4.4
3		1	149	7 ± .7
4		6	148	4 ± 1.6
1	1:5	49	161	23 ± 2.9
2	(7 pr + : 35 pr se)	33	264	11 ± 1.8
3		6	122	5 ± 1.9
4		7	165	4 ± 1.5
1	1:5 (Replicate)	26	133	16 ± 2.9
2		8	123	6 ± 2.1
3		9	154	6 ± 1.8
4		14	223	6 ± 1.5
1	1:9	3	217	1 ± .8
2	(4 pr + : 36 pr se)	-	154	0 ±
3		12	167	7 ± 1.9
4		4	324	1 ± .6
1	1:9 (Replicate)	3	84	3 ± 1.9
2		16	170	9 ± 2.1
3		5	183	3 ± 1.2
4		6	219	3 ± 1.1

gametes at meiosis. At this fitness, individuals bearing compound chromosomes have to be present six times as frequently as normal individuals in order to replace them. In this instance, replacement will occur in 4 generations (Childress, 1972).

Experiments performed using the Tokyo wild-type strain and a strain with wild-type compound 2nd chromosomes marked with yellow on the X chromosome closely approximate theoretical expectations. Additional experiments (Table 1) competing the Tokyo wild-type strain with a compound 3rd chromosome strain marked with sepia gave results that were also compatible with

Table 2. Results of competition experiments between the New Jersey wild-type strain and the sepia compound chromosome strain. Egg samples were taken from the cages at intervals.

Egg samples	Release ratio	% New Jersey wild replicates			
Days after release	New Jersey : se compound	1	2	3	4
5	1:5	57	75	100	0
12	(10 prs + : 50 prs se)	77	94	98	0
19		94	94	93	12
25		90	98	100	20
28		94	94	100	5
31		100	100	100	5
35		100	100	100	0
38		100	100	100	13
5	1:15	28	3	-	-
8	(10 prs + : 150 prs se)	-	-	65	0
11		0	-	48	20
15		77	55	38	28
18		63	61	22	4
22		77	61	2	2
25		82	48	6	32
29		99	87	-	-
5	1:20	11	27	18	16
8	(10 prs + : 200 prs se)	40	8	30	9
11		0	67	68	12
15		0	45	32	49
18		45	61	18	37
22		47	46	55	34
25		49	38	-	-
29		67	75	-	-

the theoretical expectation. At a release ratio of 1 Tokyo : 5 sepia, the compounds were very close to replacing the wild-type strain after 4 generations. However, when the same sepia compound strain was put in competition with a wild-type strain collected in New Jersey (Table 2), a ratio of 1 New Jersey wild : 5 sepia was not sufficient to fix the sepia compound strain. In fact, even a ratio of 1 : 20 did not result in replacement of the wild-type strain by the compound strain.

These contradictory results are undoubtedly due to the difference in fitness between the Tokyo wild-type strain and the New Jersey wild-type strain. Tokyo wild has been maintained in the laboratory for many years and has doubtless accumulated many genes that are detrimental to overall viability. The New Jersey strain was collected approximately 2 years ago and is evidently much more vigorous. Some preliminary field observations on the fitness of the sepia compound strain relative to the New Jersey strain verify the laboratory observations. It is clear that accurate estimations of the performance of a compound strain relative to a wild-type strain can be made only if the genetic background of the two strains is similar.

References: Childress, D. 1972, Genetics 72:183-186; Foster, G., M. Whitten, T. Prout, R. Gill 1972, Science 176:875-880.