**Casares, P. and M.C. Carracedo.** Universidad de Oviedo, Spain. Hybridization between sympatric and allopatric populations of **Drosophila melanogaster** and **D.simulans.**

The speciation process is in essence the formation of different sets of gene combinations reproductively isolated. Reproductive isolation comprises pre-mating and post-mating mechanisms. The former, sexual isolation, encloses all the mate recognition signals and stimuli that prevent the wastage of gametes between two coadapted gene pools. Two models are generally accepted for the origin of sexual isolation in allopatric speciation: in the first, isolation arises as a by-product of genetic divergence owing to local adaptation of allopatric populations. In the second, isolation appears as a direct product of natural selection acting in sympatry, selection that prevents the appearance of sterile, inviable, or poorly adapted hybrids. The sexual isolation mechanisms strengthen the initial post-mating barriers of reproductive isolation, a process generally referred to as "reinforcement" or more exactly, "reproductive character displacement" (Brown & Wilson 1956).

If there were natural selection for sexual isolation between related species, this isolation should be greater among sympatric than allopatric species populations. The pair of sibling species **D.simulans** and **D.melanogaster** are a good material to test this possibility. They show courtship displays that differ more quantitatively than qualitatively (Manning 1959; Bennet-Clark & Ewing 1969). Although the two species are cosmopolitan, **D.simulans** was practically unknown in Japan before 1972. Since then, this species has extended its geographical distribution and today it is found in coexistence with **D.melanogaster** in wide areas of Japan.

In 1982 Dr. T.K.Watanabe kindly sent us some isofemale lines of **D.melanogaster** (MKc) and **D.simulans** (SKc) sympatric populations caught in Kochi, and isofemale lines of one population of **D.melanogaster** (MKf) from Kofu which presumably had never been in contact with **D.simulans.** A first approach to examine sexual isolation between these populations is to assess the rate of hybridization under laboratory conditions. Because the break of sexual isolation is rare when pairs of the two species are in the same vial, we have used the no-choice method, only one sex of each species being present in the tests, as follows: five males and five females aged 24 hrs were left together for 3 days in a bottle with standard baker's yeast food. At the end, females were individually placed in vials, the frequency of hybridization being measured by the number of females out of five that left fertile eggs. Eight isofemale lines of each population were employed.

In general, the hybrid crossing between **melanogaster** males and **simulans** females occurs at an extremely low frequency (Sturtevant 1919). To confirm this, 4 lines, at random, of SKc were tested in the mentioned cross-direction with 4 lines of MKc, the remainder of 4 SKc lines do it with 4 MKf lines. Two replications were achieved for each test. None of the 80 **simulans** females was hybridized.

In the other cross-direction, **simulans** males and **melanogaster** females, a factorial 8x8 design was carried out with isofemale lines of both allopatric SKc x MKf and sympatric SKc x MKc species populations. A fully randomized system was followed to achieve two replications of all tests in a single experimental block. The arc-sine transformed data with the suggested corrections for small size (Snedecor & Cochran 1967) were subjected to factorial analysis of variance. Results appear in Table 1. The average of hybridization between sympatric populations was 42.3% while only an 8.3% occurred between allopatric ones. In both cases the male and female components of variation were significant. Notably, the sexual isolation was higher between allopatric than sympatric populations of **D.melanogaster** and **D.simulans.** This fact did not support the hypothesis that reproductive character displacement had been operating in these populations. This might lead us to think that sexual isolation between these species could have been originated through the general process of genetic differentiation and divergence of allopatric populations. Watanabe (pers. comm.) has found that different levels of sexual isolation (hybridization) between populations of **D.simulans** and **D.melanogaster** were unrelated with the number of years they have been in sympatry.

Table 1. Analysis of variance of the arc-sine transformed percentages of hybridization between sympatric and allopatric populations of **D.melanogaster** and **D.simulans.** Bottom, maximum-minimum value of hybridization for each sex and type of cross.

| | TYPE OF CROSS | | | |
|---|---|---|---|---|
| source of variation | sympatric x sympatric M.S. | F | allopatric x allopatric M.S. | F |
| males | 1523.68 | 4.65*** | 133.73 | 2.62* |
| females | 1001.62 | 3.06** | 194.11 | 3.81** |
| males x females | 414.69 | 1.27 | 58.36 | 1.14 |
| error | 327.49 | | 50.95 | |
| range of the means (in angles) | | | | |
| for males | 30.73-58.48 | | 12.18-22.18 | |
| for females | 29.88-48.82 | | 13.77-22.84 | |

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Our results show that there was intrapopulational genetic variation for hybridization in both species. This has been already noticed in some reports (Eoff 1975, 1977; Carracedo & Casares 1985). However, since these species appear to be almost completely isolated in nature, natural selection for sexual isolation seems to be improbable. Further work is necessary to understand the origin of sexual isolation between these sibling species.

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**References.** Bennet-Clark, H.C. & A.W. Ewing 1969, Anim. Behav. 17:755-759; Brown, W.L.Jr. & E.O. Wilson 1956, Syst. Zool. 5:49-64; Carracedo, M.C. & P. Casares 1985, Experientia 41:106-108; Eoff, M. 1975, Am.Nat. 109:225-229; Eoff, M. 1977, Am. Nat. 111:259-266; Manning, A. 1959, Behavior 15:123-145; Snedecor, G.W. & W.G. Cochran 1967, In Statistical Methods, Iowa Univ. Press, Ames; Sturtevant, H.T. 1919, Genetics 5:488-500; Watanabe, T.K. & M. Kawanishi 1976, Proc. Jap. Acad. 52:191-194.

**Castro, J. and J.L. Ménsua.** University of Valencia, Spain. Effect of the seeding site on viability and developmental time of three genotypes of **Drosophila melanogaster.**

Viability and larva-to-adult developmental time are two important components of fitness in Drosophila and they can be related to phenomena such as larval facilitation (Lewontin 1955; Beardmore 1963; Bos et al. 1977; Bos 1979), as well as to concepts of microniches (Tosić & Ayala 1981) and microenvironments (Barker 1971).

Viability and developmental time of three strains of **Drosophila melanogaster** in an uncrowded situation, but with different seeding sites in vials, were studied.

The strains employed here were: a wild strain and two mutant strains for eye colour; cardinal (III, 75.7) and sepia (III, 26.0). A total of 72 newly hatched larvae ±2 hr old were seeded into 10 x 2.5 cm vials with 10 ml of boiled yeast medium according to the following ways: (1) All larvae seeded at the same time

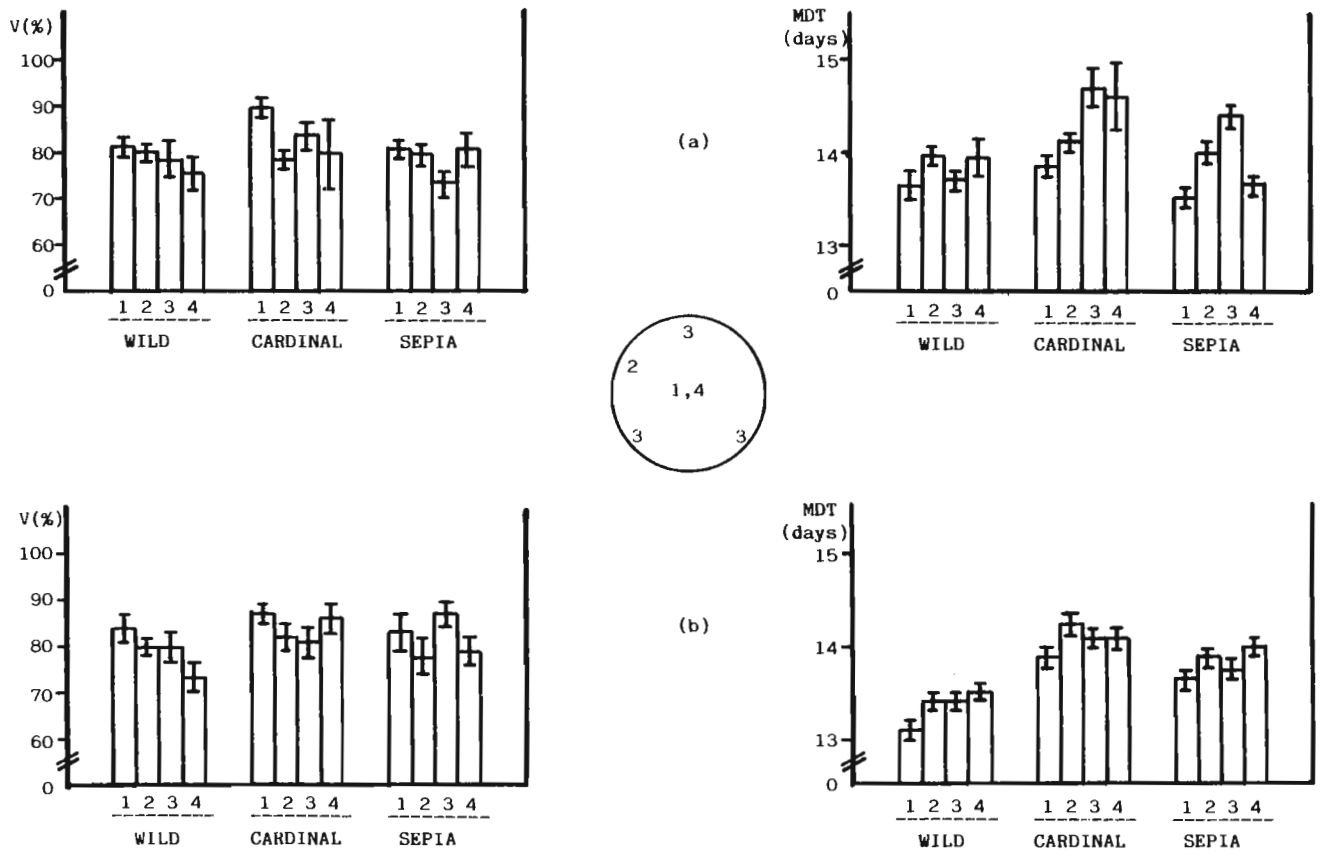


**Figure 1.** (a) Viabilities (V) and Mean Developmental Times (MDT) according to the four different seeding sites of the strains wild, cardinal and sepia in monocultures. (b) The same as before, but in tricultures. The circle represents a vial with the different seeding sites.