Table 1. Urea and uric acid concentrations in larvae, pupae and adults from crowded and uncrowded cultures of **Drosophila melanogaster** throughout development.

Stage	Development (days) crowded	uncrowded	Body Density	Mean weight (mg) (20 individuals) crowded	uncrowded	Uric acid level (mg/100ml) crowded	uncrowded	Urea level (ml/100ml) crowded	uncrowded
Larvae	13	12	1.05±0.01	22.8±1.0	34.7±1.8	31.7±3.4	142.6±5.0	18.5±3.5	13.5±1.8
	25	--		22.1±3.0		22.1±4.1		27.0±2.7	
Pupae	24	14	0.85±0.04	17.0±0.8	28.6±1.0	121.4±8.8	80.4±5.5	25.9±2.9	3.5±1.5
	33	20		13.0±0.3	32.3±0.9	140.7±7.9	99.7±4.3	14.9±2.6	18.6±6.0
Adults	Excretion of newly emerged adults		--	--	--	169.7±30.4	173.3±21.0	20.8±4.7	11.9±7.0
	20 hr old adults		0.97±0.1	9.2±0.6	20.4±0.6	173.9±31.3	161.2±12.8	29.2±4.0	33.3±7.1

The differences found between larvae, pupae and adults from crowded and uncrowded cultures are explained as follows: (i) larvae from crowded cultures must be metabolically less active than those from uncrowded ones; (ii) when uncrowded larvae approach pupation they must eliminate a large amount of their uric acid content, while crowded larvae should activate their metabolism in order to pupate producing as a result a large amount of uric acid, similar to the level found in larvae from uncrowded cultures; (iii) all pupae that are able to attain adult stage must be included within a physiological optimal range which allows them to emerge as adults. These physiological limits would in turn explain the similarity in the uric acid content found in adults coming from crowded and uncrowded cultures.

References: Botella, L.M., A. Moya & J.L. Mensua 1983, DIS 59:23-24; Botella, L.M. & J.L. Mensua 1984, DIS 60:66; Botella, L.M., A. Moya, C. Gonzalez & J.L. Mensua 1985, J. Insect Physiol. 31:179-185.

Carracedo, M.C. and P.Casares. Universidad de Oviedo, Spain. Hybridization between **Drosophila melanogaster** and **D.simulans** in competition experiments.

Most of the papers dealing with interspecific competition between the pair of sibling species **D.melanogaster** and **D.simulans**, assumed that the possibility of interspecific hybridization is negligible. This assumption is based on the supposition that in these competition cultures, in which males and females are present, the frequency of hybridization must be very low or null, since each individual has a chance to elect (free-choice) a partner of its own species. This situation is different from the well-known methods of "no-choice" (one sex of each species), where the females are forced to accept a foreign male, and the frequency of hybridization reaches, in some instances, high values (Manning 1959; Watanabe et al. 1977; Carracedo & Casares 1985). We have carried out a study on interspecific competition between a "sparkling-poliert" laboratory mutant of **D.melanogaster** and a "white" strain of D.simulans derived from a natural population. All competition tests were made at an adult density of 10 pairs and with relative species frequencies of 0.1-0.2....0.9. A factorial 2 x 2 design was carried out by using two temperature regimes for the first factor, room variable temperature or fixed 21°C. As the second factor, two types of adults were utilized, based on that their larval development were in mono-specific or bi-specific cultures. For each combination of temperature-development-frequency, five replications were made. Ten pairs of virgin adult flies coming from mono- or bi-specific cultures were placed in culture bottles for 10 days. At the end, the females were placed into individual vials and their progenies examined. The appearance of wild phenotypes was taken as evidence of hybridization. We have only examined the females of **D.melanogaster** because in a simultaneous study with the same strains, the hybridization between **simulans** females and **melanogaster** males (no-choice method) was null (Carracedo & Casares 1984).

Table 1 shows the values of hybridization (i.e., hybridized females divided by total females), which represents the sum of all the relative frequencies for each of the four factorial combinations. These values, as percentages,were submitted to a weighted analysis of variance in the logit scale with the transformation for small size suggested by Snedecor & Cochran (1967), and the results are also shown in Table 1. The factorial effect of the conditioned adult development was not significant, which differs from the results of Eoff (1973), but the temperature showed a significant effect, being hybridization higher at room temperature than at 21°C. This result appears to be related with better general fitness showed by **D.simulans** in the former temperature regime (Carracedo 1984). It is of interest to ascertain whether the values

Table 1. Values of hybridized **melanogaster** females in each of the 2x2 factorial combinations, previous larval development and temperature, and results of a weighted analysis of variance of the percentages of hybridization in the logit scale.

previous development	room temperature	21°C
mono-specific cultures	9/225	4/225
bi-specific cultures	13/225	5/225

factorial effect of temperature: 0.862±0.385 (t=2.23, $p < 0.05$)

factorial effect of development: 0.318±0.359 (t=0.88 n.s.)

Table 2. Number and percentage of hybridized **melanogaster** females for each species frequency. Data of the 2x2 factorial combinations were pooled.

number of **D.melanogaster** pairs								
9	8	7	6	5	4	3	2	1
number of **D.simulans** pairs								
1	2	3	4	5	6	7	8	9
hybridized/ total **melanogaster** females								
0/180	1/160	2/140	2/120	7/100	3/80	6/60	4/40	6/20
percentage of hybridization								
0%	0.62%	1.43%	1.67%	7%	3.75%	10%	10%	30%

of hybridization are related with the relative frequencies of both species. Owing to the low values of hybridization found in some frequencies, we have grouped the data of the four factorial combinations under the supposition that in each combination, the possible effect of species frequency was the same.

Table 2 shows the percentages of hybridized females in each relative frequency and the total number of examined females. Apparently, when the relative frequency of **D.melanogaster** diminished, the number of **melanogaster** females hybridizing with **simulans** males increased. To confirm this, we have obtained a weighted linear regression of the percentages of hybridization in the logit scale on the frequencies of **D.melanogaster**, using an iterative routine that yields maximum likelihood estimates (Finney 1971). The 0.1-0.2 and 0.3 frequencies were grouped to increase the expectatives. Regression was highly significant (b=5.6±0.9 in logits) and the data fit well with the model (chi-square = 7.02 with 5 degrees of freedom, no-heterogeneity). Therefore, the hybridization of **melanogaster** females increased when its frequency in the mixture decreased. If we suppose that any female may be simultaneously courted by all present males, then the probability of mating between **melanogaster** females and **simulans** males increases with the decrease of the relative frequency of **D.melanogaster**. This was confirmed by the notable fact that when the relative **melanogaster** frequency was 0.1 the value of hybridization (30%) was not different from that one found in a "no-choice" test carried out with these same strains of **D.melanogaster** and **D.simulans** (Carracedo & Casares 1984).

Summarizing, our results showed that the possibility of hybridization between **D.melanogaster** and **D.simulans** in competition cultures can not be rejected, especially when the relative frequency of **D.melanogaster** is low. Thus, if hybridization occurs, the **melanogaster** progeny may be lower than expected. Furthermore, hybrids could not be detected because they have reduced viability, particularly at the commonly used temperature of 25°C (Sturtevant 1920). In this way, results of competition could be erroneously imputed to factors other than hybridization.

References. Carracedo, M.C. 1984, Doctoral Thesis, Univ. of Oviedo, Spain (unpubl.); Carracedo, M.C. & P. Casares 1985, Experientia 41:106-108; Carracedo, M.C. & P. Casares 1984, Bol. Cien. Nat. I.D.E.A. 33:15-29; Eoff, M., Am. Nat. 107:247-255; Finney, D.J. 1971, Probit Analysis, 3rd ed., Cambridge Univ. Press; Manning, A. 1959, Anim. Behav. 7:60-65; Sturtevant, A.H. 1920, Genetics 5:488-500; Watanabe, T.K. et al. 1977, Jap. J.Genet. 52:1-8.

Carracedo, M.C. and P. Casares. Universidad de Oviedo, Oviedo, Spain. A study on the dynamics of crossing between **Drosophila melanogaster** females and **Drosophila simulans** males.

Pontecorvo (1942), Manning (1959) and Barker (1967), among others, have shown that hybridization between **D.melanogaster** females and **D.simulans** males is more frequent when flies are aged a few hours than 3 or more days. As a possible explanation it has been suggested that young females have not well developed their sexual discriminative sense and may mate with almost any courting male. Nevertheless, it is also probable that when very young male and female flies of both species are kept together and they mature in proximity, they may become accustomed to each other and facilitate interspecific mating, once sexual