Wright, C.P. Western Carolina University, Cullowhee, North Carolina.

Development of phenfultyrless-1, 1(1)EN11, a lethal mutant of Drosophila melanogaster.

Phenfultyrless-1, 1(1)EN11, is a sex-linked, lethal mutant of Drosophila melanogaster which was induced by Novitski (1963). Death in this mutant occurs in either the late larval or prepupal stage. Both weight and oxygen consumption measurements were made on individual larvae from the first-instar larval stage until the time at which oxygen uptake ceased. Oxygen consumption measurements were made with small respirometers in a 25°C water bath. A 20% NaOH solution was used to remove CO_2 from the respirometers which caused movement of the NaOH drop. By measuring the volume of the droplet displacement the oxygen consumption of a larva was determined.

Neither weights nor rates of oxygen consumption in phenfultyrless-1 larvae were significantly different from those in controls until 96 hours after oviposition. Beginning at 96 hours, weights of phenfultyrless-1 larvae began to decrease gradually, and rates of oxygen consumption began to decrease sharply. Control larvae formed puparia at about 110 hours. Most phenfultyrless-1 larvae failed to form puparia, remaining in the larval stage and showing increasing deterioration until death of all larvae had occurred by 240 hours. A few phenfultyrless-1 larvae did form puparia, but pupation never occurred. Phenfultyrless-1 individuals in this stage will be called pseudopupae. Oxygen consumption of these pseudopupae decreased until 40 hours after puparium formation, after which it increased sharply, reaching a peak at 80 hours which was even higher than that at the highest point of the control U-shaped curve. Then oxygen consumption dropped sharply, until at 128 hours none could be detected. Dry weights of pseudopupae dropped sharply, until at 128 hours they were less than half those at puparium formation.

Since they showed no signs of metamorphosis, it seems unlikely that the sharp rise in oxygen consumption was caused by metabolic activity of the pseudopupae themselves. It appeared that the pseudopupae died soon after puparium formation. The sharp rise in oxygen consumption was probably caused by rapid growth of microorganisms within the dead pseudopupae.

Reference: Novitski, E. 1963, List of biochemical mutants. DIS 37:51-53.

Hedrick, P.W. University of Kansas, Lawrence, Kansas.

Possible stable equilibrium for D. melanogaster and D. simulans.

Ayala (1971) described a case of interspecific competition where D. pseudoobscura and D. willistoni were maintained in a stable equilibrium for a period of six months. The maintenance of the equilibrium was attributed to frequency-dependent progeny production observed in a one generation test. In this study one generation tests have indicated that under certain conditions D. melanogaster and D. simulans might also be maintained in a stable equilibrium because of frequency-dependent progeny production.

Table 1. Mean percentage of melanogaster and mean number of flies emerging per vial. Simulans was given a two day head start and counts were made through 18 days. Values are based on six replicates.

	% melanogaster parents	% melanogaster progeny	No. progeny mel.	No. progeny sim.	Total
16 pairs of parents	100.0	-	101.7	-	101.7 ± 11.9
	87.5	72.7	90.8	30.5	121.3 ± 11.5
	50.5	42.0	46.3	61.3	107.6 ± 4.9
	12.5	26.7	23.3	69.0	92.3 ± 5.4
	0.0	-	-	80.7	80.7 ± 4.2
32 pairs of parents	100.0	-	141.0	-	141.0 ± 11.8
	87.5	80.0	98.0	23.3	121.3 ± 12.8
	50.0	60.2	63.0	35.8	98.8 ± 11.2
	12.5	26.3	19.5	55.2	74.7 ± 2.5
	0.0	-	-	93.7	93.7 ± 9.5

The strains used were a yw strain of melanogaster and a v strain of simulans, both obtained from J.S.F. Barker. When equal numbers of young adults (1-3 days old) were introduced simultaneously to half pint bottles, 90.4% of the progeny were melanogaster. But if simulans was given a two-day head start, 50.8% of the progeny were melanogaster. As a result an extensive experiment using vials was set up giving simulans a two-day head start at three different parental proportions and two parental densities. The results are summarized in Table 1 and show a strong degree of frequency dependence. When there was a high percentage of melanogaster parents (87.5%), the percentage of melanogaster progeny was reduced to 72.7 and 80.0% at the low and high parental densities, respectively. At a low percentage of melanogaster parents (12.5%), the percentage of melanogaster progeny increased to 26.7 and 26.3%. With equal numbers of parents from both species, there was a decrease in melanogaster (to 42.0%) at the low parental density and an increase (to 60.2% at the high parental density.

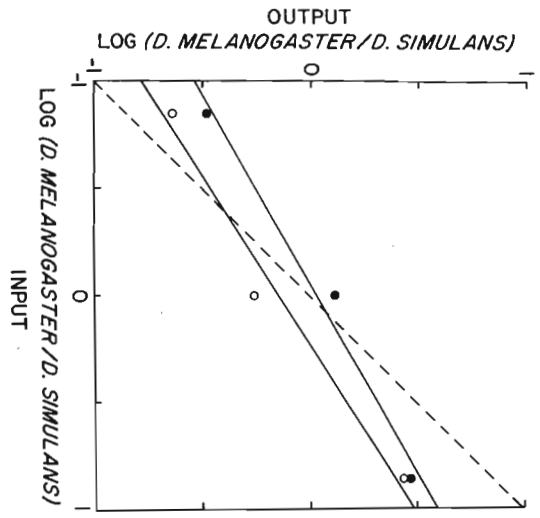

Fig. 1. The linear regression of the log input ratio on the log output ratio for 16 pairs of parents (closed circles) and 32 pairs (open circles). The broken line indicates a regression coefficient of one.

Another interesting aspect of these results was the increase in the number of progeny in pure cultures and the decrease or maintenance of numbers in the mixed cultures from the low to high parental density. As a result, a de Wit diagram analysis indicated facilitation at the low density and interference at the high density between the two species.

The data can also be examined using a ratio diagram (Fig. 1). The linear regressions of both parental densities are significantly less than one (.56 and .64), the condition indicative of a stable equilibrium. The percentage of melanogaster at equilibrium calculated from the ratio diagram is 44.8% at the low density and 60.3% at the high density, indicating that the equilibrium may be density dependent.

Reference: Ayala, F.J. 1971 Science 171:820-824.

Fleming, C. and F. DeMarinis. Cleveland State University, Cleveland, Ohio. A comparative study of electrophoretic protein patterns of the hemolymph of Bar series.

Amides in general, $-CONH_2$, and glutaramide specifically, $NH_2CO(CH_2)_3CONH_2$, when added to the media modify Bar to wild type eye (S. Kaji 1954, DeMarinis and Sheibley 1963). Later it was proposed that this effect could be explained best on the basis of the operon hypothesis, a modified form of Jacob and Monod model (DeMarinis and Sheibley 1965). In this case the amides act as derepressing agents during the sensitive period of Bar, thus permitting the double operon of Bar (wild type having a single operon) to operate as a wild type. This hypothesis gives us much promise in that it explains many facts of Bar that could not be explained before. Therefore, in line with this operon concept of Bar we have initiated a series of investigations in effort to test the validity of this hypothesis.

The present line of investigation describes the protein bands of the larvae hemolymph of Bar (B), double Bar (BB), double infra Bar (BiBi) and reverted Bar (wild type). The larval period investigated was between 60-74 hours. Test samples were taken at two-hour intervals, at 62, 64, 66, 68, 70, 72, 74-hour. This range includes the pre-sensitive and sensitive period of Bar (DeMarinis and Sheibley 1965). The age of the larvae were determined from the initial hatching period. Twelve male larvae were used for each test sample. The larvae were ruptured gently and the hemolymph collected was immediately stored at -60°C until ready for