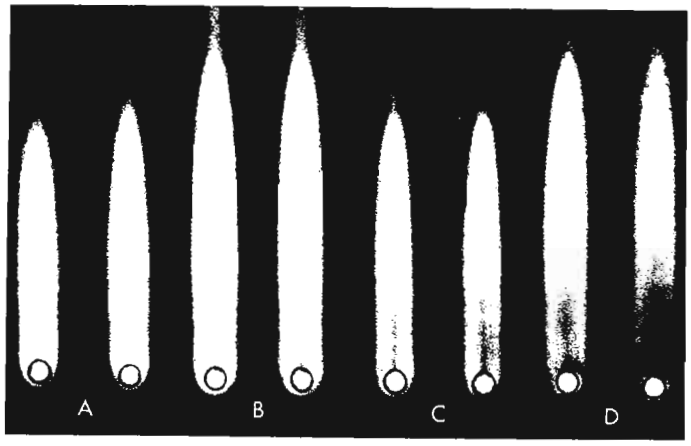

Figure 1. Rocket immunoelectrophoresis of male whole fly extracts bearing 2-doses (A and C) and 3-doses (B and D) of the cytogenetic region 75D-78A. Mean rocket areas ± 1 standard deviation are 258.8 ± 13.9 mm^2 for euploid and 392.9 ± 17.2 mm^2 for hyperploid flies giving a ratio of 1.52.

The data on enzyme levels, CRM levels, and enzyme turnover rate constants all corroborate the notion that the cytogenetic region 75D-78A contains the structural gene for catalase.

Nomenclature Note: There has been some confusion in the literature concerning the gene symbol for catalase and choline acetyltransferase. We have conferred with Jeff Hall on this matter and have mutually agreed that the gene symbol for catalase will remain Cat^+ and that for choline acetyltransferase will be changed to Cha.

References: (1) Lubinsky & Bewley 1979, Genetics 91:723; (2) Nahmias & Bewley 198 , Comp.Biochem. and Physiol. 77B:355.

Najera, C. Universidad de Valencia, Espana.
The maintenance of variability in artificial populations. I. Heterozygotes frequency.

The problem of variability and its maintenance is basic in population genetics.

Considering variability from a selective point of view, one of the several explanatory mechanisms for its maintenance is heterosis (Dobzhansky 1952,1970).

In a previous work the behavior of four eye colour mutants from a cellar was tested against their wild allele from the same cellar, in artificial populations, comparing two culture mediums, one supplemented with alcohol at 10% and the other without alcohol (Najera & Mensua 1983).

Table 1. X^2: Level of significance.

			Without Alcohol		With Alcohol	
2/58A (sepia)	first replica	1° count	1.252	ns	7.429	0.01
		2° count	4.301	0.05	4.657	0.05
		3° count	1.672	ns	8.813	0.005
	second replica	1° count	1.584	ns	18.780	0.001
		2° count	0.111	ns	1.304	ns
		3° count	0.000009	ns	0.092	ns
1/51.3 (Safranin)	first replica	1° count	10.395	0.001	8.562	0.005
		2° count	7.736	0.005	4.149	0.050
		3° count	6.215	0.010	25.169	0.001
	second replica	1° count	10.674	0.001	4.518	0.050
		2° count	3.618	0.050	6.603	0.010
		3° count	5.492	0.025	9.087	0.001
2/54A (cardinal)	first replica	1° count	20.823	0.001	53.760	0.001
		2° count	28.192	0.001	55.370	0.001
		3° count	47.453	0.001	80.606	0.001

Table 1 (contin.)

			Without Alcohol		With Alcohol	
	second replica	1° count	28.021	0.001	28.211	0.001
		2° count	41.056	0.001	34.788	0.001
		3° count	57.591	0.001	74.871	0.001
2/74B (cd+cn+?)	first replica	1° count	2.516	ns	21.973	0.001
		2° count	8.592	0.005	16.213	0.001
		3° count	0.886	ns	21.744	0.001
	second replica	1° count	11.704	0.001	33.394	0.001
		2° count	16.585	0.001	8.575	0.005
		3° count	6.437	0.010	6.128	0.010

Table 2. Gene frequencies.

		Without Alcohol	With Alcohol	t	
2/58A se	1° count	0.453±0.014 0.372±0.012	0.432±0.015 0.410±0.014	0.20	ns
	2° count	0.335±0.014 0.344±0.015	0.380±0.016 0.337±0.016	0.87	ns
	3° count	0.344±0.014 0.321±0.014	0.298±0.011 0.275±0.012	2.86	ns
1/51.3 sf	1° count	0.229±0.013 0.233±0.011	0.285±0.014 0.308±0.017	5.74	0.05
	2° count	0.226±0.015 0.241±0.015	0.280±0.014 0.280±0.015	6.35	0.05
	3° count	0.239±0.014 0.222±0.013	0.259±0.011 0.291±0.011	5.76	0.05
2/54A cd	1° count	0.271±0.013 0.219±0.014	0.299±0.015 0.237±0.015	0.57	ns
	2° count	0.216±0.014 0.225±0.016	0.203±0.014 0.244±0.018	0.14	ns
	3° count	0.221±0.015 0.217±0.013	0.254±0.012 0.236±0.012	2.83	ns
2/74B	1° count	0.153±0.014 0.158±0.011	0.179±0.013 0.187±0.014	6.11	0.05
	2° count	0.120±0.013 0.134±0.014	0.128±0.014 0.161±0.016	1.01	ns
	3° count	0.090±0.012 0.106±0.013	0.131±0.012 0.098±0.011	0.92	ns

The four mutants (2/58A-sepia; 1/51.3-safranin; 2/54A-cardinal and 2/74B-strain segregating cardinal and cinnabar mutants), attained different gene frequencies at equilibrium: 0.32, 0.27, 0.15 and 0.08 approximately.

In order to test whether this equilibrium frequency is due to an excess of heterozygotes, the heterozygote frequency of the populations was studied at 18, 36 and 84 weeks from starting, coinciding with three of the counts.

One hundred wild phenotype male were taken from each of the sixteen populations and were crossed with mutant virgin females, and the heterozygote frequency was verified by means of the Cotterman (1954) formula. By means of this formula, the gene frequency of the mutant and its variance was calculated.

Periodically, in every case except in the 2/58A mutant(se), there was an excess of heterozygotes over the number expected.

Table 1 shows the level of significance of the excess of heterozygotes observed compared to the number expected.

It can be seen that in the 2/58A mutant (sepia) there is not a significant excess of the heterozygotes in the non alcohol medium whereas in the alcohol medium there is.

In the 1/51.3 mutant (safranin), there is always a significant excess of heterozygotes, the same as in the 2/54A mutant (cardinal), although in this latter the significance is higher and more homogenous.

In the 2/74B mutant in non alcohol food there are some cases of non significance but in alcohol food there is always a high degree of signficance.

On comparing the gene frequencies obtained by this method (Table 2) in the two media, it was observed that in the 2/58A mutant (se) there is no significant difference between the two media, and the same was found in 2/54A (cd) populations. In the 2/74B mutant there is only a case of significance at the first count. In the 1/51.3 mutant (sf) the frequency is always higher in the alcohol medium, at a 0.05 level of significance, which confirms the findings for the artificial populations (Najera & Mensua 1983).

It can be concluded that in these populations there is a higher frequency of heterozygotes than could be expected. For this reason one can consider a gene heterosis effect in the maintenance of these mutations which affect the eye colour.

References: Cotterman, C.W. 1954, Statistics and Mathematics in Biology, Iowa State College Press, Ames, Iowa; Dobzhansky, Th. 1952, Heterosis, J.Gowen (ed), Iowa State College Press, Ames, Iowa; Dobzhansky, Th. 1970, Genetics of the evolutionary process, Columbia University Press, New York; Najera, C. & J.L.Mensua 1983, DIS 59:94-95.

Najera, C. and R.deFrutos. Universidad de Valencia, Espana. The maintenance of variability in artificial populations. II. Frequency of inversions.

The existing knowledge of chromosome polymorphism due to the presence of inversions (Chigusa, Mettler & Mukai 1969), together with seemingly permanent linkage disequilibrium between these inversions and some isozyme genes (Mukai, Mettler & Chigusa 1971) gives occasion for numerous investigations of chromosome variants in D.melanogaster populations.

The environmental conditions which determine differences in species distribution, could also determine changes in the frequency of inversions. For example, studies of the distribution of the ecological niches of D.melanogaster and D.simulans show that the first species, more tolerant to ethanol, is distributed both inside and outside cellars but the second is found only outside cellars (McKenzie & Parson 1972,1974); in the same way D.melanogaster is polymorphic for chromosome arrangements and D.simulans is monomorphic.

A study of the inversions frequencies was made in the artificial populations described in the previous work as well as in the five strains which gave rise to these populations, to verify if the strong heterosis present could be explained by the maintenance of inversions in heterozygosis.

The inversions were analyzed through crosses with the "rucuca" strain, homozygous for standard-sequence chromosomes.

One male was crossed with two rucuca virgin females. From the offspring of the cross seven third instar larvae were collected and the giant salivary glands extracted.

A chromosomic line was considered non-carrier of inversions if in none of seven preparations observed, inversion handles appeared.

Ten crosses per population and per strain were made.

The probability of observing the two male chromosomes was $1-(1/2)^7 = 0.99$.

The method used was the conventional: stain in orcein-lactic-acetic (80-20) and squash.

The cytological nomenclature followed that of Lindsley & Grell (1968) and the breakpoints of the inversions were identified by reference to the standard map of Bridges (1935).

The inversions found and their frequency are shown in Table 1.

The mutations were not found within any of the inversions found in the strains.

Table 1. Types and frequencies of inversions in strains and populations.

STRAINS	NUMBER OF CHROMOSOMES ANALYZED	INVERSIONS	FREQUENCY % 2°	3°
2/63(wild)	20	In(2R)NS	5	
2/58A(sepia)	20	-		
1/51.3(safranin)	20	In(3R)87C-93D*		30
2/54A(cardinal)	20	-		
2/74B(cd+cn+?)	20	In(2L)t	100	

POPULATIONS	NUMBER OF CHROMOSOMES ANALYZED	TYPES AND FREQUENCIES OF INVERSIONS WITH ALCOHOL	W/O ALCHOHOL
2/63/2/58A	40	In(3R)87C-93D*--5%	
2/63/1/51.3	40		In(2R)NS--5%
2/63/2/54A	40	In(3R)P--5%	In(3R)P--5%
2/63/2/74B	40	In(2R)NS--10%	In(2R)NS--15%

* = new chromosomal inversion.