Band, H. T. Michigan State University, East Lansing, Michigan. Persistence of increased developmental homeostasis in a natural population of Drosophila melanogaster.

Recent investigations on the South Amherst natural population of D. melanogaster have indicated the population is undergoing another genetic change (Band, 1964). This change has been manifest largely as a reduction in environmental variance noted among the random heterozygotes in 1962 in comparison with previous estimates of this parameter obtained in 1961 and 1960. Environmental variance is a measure of developmental homeostasis. The results suggest an increase in developmental homeostasis.

Analysis of the population was undertaken in 1964 to determine if the reduced environmental variance persisted. No change had been noted among lethal and semilethal frequencies. The estimate of 34% lethal and semilethals among 141 second chromosomes from the Sept. 1964 collection likewise failed to indicate any significant change in the frequency of these variants. Table 1 presents the viabilities of the random heterozygotes, all homozygotes and quasinormal homozygotes at 25°C (77°F) in the 1964 sample. Two replicates were counted for each chromosome or combination. The results are in agreement with those obtained in previous years.

TABLE 1

	$\bar{x}$(%)	σ	N	no. counted
random heterozygotes	27.7± 0.33	5.32	133	29,728
all homozygotes	15.7± 0.64	10.82	141	27,540
quasinormal homozygotes	22.6± 0.40	5.42	93	19,201

TABLE 2

	σ^2_{ges}	σ^2_e	σ^2_s	σ^2_g
random heterozygotes	33.15	14.08	9.35	9.71
quasinormal homozygotes	29.75	20.16	8.84	0.75

Table 2 shows the "total", environmental, sampling and genetic variances, respectively, obtained from the data. Environmental variances for both random heterozygotes and quasinormal homozygotes are in excellent agreement with 1962 estimates. In that population, these estimates were found to be 14.13 for random heterozygotes and 20.79 for quasinormal homozygotes. The frequency of subvitals in 1964 was only 10%, the remaining quasinormal chromosomes falling into the normal category.

Concurrently, as a further test of the hypothesis that genetic changes have occurred in response to a more unfavorable environment, experiments on random heterozygotes and homozygous chromosomes were undertaken at F64/90 (°F, wide range environment). Again, there were two replicates per chromosome or combination. (Parents were the same for all 4 replicates: 4 ♀♀ x 4 ♂♂, transferred 4 times every 3 days, A and C replicates being in 77°F and B and D replicates in F64/90). There was no evidence of statistically significant viability differences among the random heterozygous classes. Viabilities were similar at 77°F and F64/90. Significant differences in viabilities among heterozygous classes at F64/90 had been found using chromosomes from the 1960 population (Band, 1963). In the 1964 analysis random heterozygotes were partitioned into drastic/drastic (d/d), drastic/nondrastic (d/nd), and nondrastic/nondrastic (nd/nd) classes both on the basis of homozygous chromosome performance at 77°F and F64/90 since no homozygous 1960 chromosomes had been analyzed at F64/90.

As a whole, the 1964 data are consistent with the hypothesis that the population is undergoing a genetic change and that the change is in response to more unfavorable environmental conditions. They also show that population viabilities and environmental variances at 77°F are reproducible even when performed in different laboratories. Alternative hypotheses to account for the reduced environmental variance among random heterozygotes in 1962 would fail to account satisfactorily for its persistence in the 1964 population and the lack of significant viability differences among heterozygous classes at F64/90 with 1964 chromosomes.

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