

A CHANGE IN THE BAR GENE OF DROSOPHILA INVOLVING FURTHER DECREASE IN FACET NUMBER AND INCREASE IN DOMINANCE.*

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As part of a study of the factors controlling eye facet number in *Drosophila melanogaster*, selection has been carried on with a view to the determination of the germinal changes appearing during the course of selection. One of the most interesting of these changes occurred during the second generation of downward selection in the white bar stock. An exceptionally "low" male of this generation was shown to possess a changed gene with a marked increase in dominance. This individual appeared on November 20, 1917, and had but 19 facets, while the mean of its 62 brothers was 82.6 facets with a range of 41 to 134. With class sizes such that the range of a class is 10 per cent of its mean this represents a departure of -16.80 10 per cent class units from the mean of the males of the unselected bar stock, while the departure of the brothers of the mutant is only -3.44 units. The new stock derived from the third hybrid generation of a mating of the mutant with a sister possesses the characteristics of the original male, and at the present writing (May 10, 1919) has remained without change for nearly 18 months except for the appearance of a few additional mutants.

The name ultra-bar has been given to the new character. Its symbol, B^v , indicates that ultra-bar is a dominant allelomorph of bar. Full-eyed (wild-type) females at 27°C . have an average facet number of 810.6, bar females of the second low selected generation have 61.8 facets, and ultra-bar females 22.0 facets. The corresponding numbers for males are respectively 849.8, 75.6, and 23.0.

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The change in dominance as a result of the mutation is very striking. A cross between a 35.2 facet bar stock of the twenty-fourth generation of the low selection line and an 810.6 facet full-eyed stock gives 399.9 facets in the females, while a cross between the 22.0 facet ultra-bar and the 810.6 facet full gives only 36.5 facets. Ultra-bar thus has a much greater degree of dominance than bar. This is further shown by the cross between the 22.0 facet ultra-bar stock and the 61.8 facet bar stock of the second generation of the low selection line which gives 26.3 facets. Calculated on the basis of 10 per cent class units the ultra-bar has pulled the full-eye down 85 per cent of the distance between the two, while bar has pulled it only 23 per cent. Likewise ultra-bar pulls bar down 85 per cent of the distance between the two, while bar pulls ultra-bar up only 15 per cent.

That the factor for the new character is located in the X chromosome is shown by the reciprocal matings between ultra-bar and bar. Ultra-bar females mated with bar males give ultra-bar males, while the reciprocal matings give bar males.

In order to determine the locus of the new factor the crossing over test was applied. If the new factor is at a different locus from that of bar, crossing over should take place between the two. A mating between ultra-bar and full-eye should then give some bar males in the second hybrid generation, the percentage of such individuals depending upon the distance between the locus of bar and that of ultra-bar. In case, however, the new locus is identical with that of bar there should be no bar males in this generation.

Crosses between ultra-bar females and wild full males give in the second hybrid generation only three males which are not ultra-bar as opposed to 1,238 ultra-bar males. These three males have 88, 51, and 60 facets respectively, all being within the range of bar-eye. On the basis of crossing over this would mean that the locus of the new factor is only 0.24 units from the bar locus on the chromosome map. Unfortunately one of the three males was overretherized. Breeding tests of the other two show a degree of dominance over full which is different from that of bar and they therefore cannot be the result of crossing over. They apparently represent a new mutation.

The most reasonable conclusion to be drawn from these tests is that the locus of ultra-bar is the same as that of bar or that it is

so close to bar as to act as a unit with it for all demonstrable cases. The present case is then an instance of a second mutation in the same germinal material and in the same direction as a previous mutation.

The ultra-bar mutant adds to the series of germinal changes which have been made out in the case of eye-facet number. As previously reported germinal changes have been obtained which involve accessory factors in other than the sex chromosome, some of these producing an effect of large degree and others of small degree. Reverse mutations of the bar stock to full have also been observed. The case described in the present paper is a further step in the same direction as bar. In addition to the further decrease in facet number ultra-bar has a much greater degree of dominance than bar. Furthermore it occurred in the direction of selection, appearing in the low and not in the high selection line.