GENETIC VARIATION IN POPULATIONS OF *DROSOPHILA MELANOGASTER* IN THE CHICAGO AREA

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In the summer of 1947 hundreds of *D. melanogaster* were trapped at several localities in the metropolitan area of Chicago with the purpose of determining the amount of visible mutations and second chromosome lethals in each population. With this information one would be able to analyze the genetic structure, the size of the breeding population, and determine whether a continuous breeding population was present in this particular area.

The flies were caught by baiting half-pint bottles with bananas, and placing the bottles in clumps of bushes, usually in parks or empty lots. Collections were made at three locations: one on the south side, one on the southwest side, and the other one on the north side. Each station was at least ten miles from the other two. Visible mutants were obtained by inbreeding seven F_1 pair-matings. The advantages of this method were ably stated by Spencer (1947). The lethals on the second chromosome were determined by using L/Cy as markers and inbreeding in such a manner as used by Ives (1945) in that the appearance of all Curly winged flies in the third generation would be indicative that a recessive lethal was present on one of the 2nd chromosomes of the original male parent.

The inbreeding for the 2nd chromosome lethals and the F_2 pair matings for visible recessives were done as soon as possible after the arrival of the flies in the laboratory. If they were not mated then they were transferred to a large culture bottle, and 200-400 flies were transferred monthly.

The visible mutation which was the most predominate in the Chicago area in the summer of 1947 was trident (*tri.*), a trident or streak of dark pigmentation on the thorax and scutellum. This mutant gene was found in all but one of the collections made in 1947 (see Table 2). In one collection 81.1 percent of the pair-mating which was inbred produced flies containing *tri.* The population might have gone through a bottle neck in that it was reduced to a few individuals in number. The few remaining flies contained a large number of *tri* genes. A collection at the same location two months later yielded 47.3 percent *tri.* Another mutant gene which was abundant in Drosophila populations was angle wing (a second chromosome mutant in which wings are held out at a 45° angle from the long axis of the body); this mutant gene was present in all but two of the collections.

The highly variable genetic nature of Drosophila populations in a metropolitan area is illustrated by collections No. 5 and No. 6, both from the same locality and 13 days apart.

TABLE I.—PERCENTAGE OF SECOND CHROMOSOMES TESTED THAT CONTAINED LETHALS

Stock number	Place collected	Date	Percentage of 2nd chromosomes that contain lethals	Total tested
1	4000 S. 1000 E.	8/15/47	31.1	93
2	4000 S. 1000 E.	8/22/47	4.16	106
3	4000 S. 1000 E.	8/22/47	15.2	118
5	8500 S. 2400 W.	8/29/47	34.2	120
6	8500 S. 2400 W.	9/11/47	57.1	99
10	5900 N. 1500 W.	9/18/47	5.1	83
11	4000 S. 1000 E.	10/26/47	27.4	102

TABLING II.—VISIBLE MUTATIONS OBTAINED BY INBREEDING F_1 PAIR-MATING
(In percent)

Mutation	No. 1	No. 2	No. 3	No. 5	No. 6	No. 10	No. 11
tri	41.2	81.1	....	29.3	10.6	8.6	47.3
b	12.5	....	....	....	77.7	....	5.3
w	8.6	....	....	....	....	....	....
ss	12.1	....	5.2	....	21.3	....	....
st	4.5	....	....	....	....	....	....
angle wing	8.1	7.5	5.5	....	23.2	49.2	....
net	....	....	....	....	11.4	....	....
extra vein	....	....	....	....	....	....	5.2
cmp	....	....	....	....	....	8.3	10.5
w^e	....	....	2.2	....	....	....	....
ma	....	....	....	....	22.1	....	....
se	....	....	....	....	11.2	....	....

In No. 5 only one mutant *tri* was rerecovered, but in No. 6 seven mutations were found. In No. 5, 34.2 percent of the 2nd chromosomes tested contained lethals and No. 6 contained 57.1 percent 2nd chromosome lethals.

The percentage of 2nd chromosomes that contained lethals varied from the time of one collection to another. One collection, No. 10 (north, side) contained 5.1 percent of lethals, and No. 6 (south side) possessed 57.1 percent second chromosome lethals (see table 1).

How can one account for the tremendous variation in the above collection in regard to visible mutants and recessive second chromosome lethals? One conclusion reached is that *Drosophila melanogaster* breeds in isolated small populations in large metropolitan areas. The small isolated groups can vary greatly from one another in that, at the time of reduction of population in the fall, different visible mutations and lethals are retained by the small groups of surviving flies. In the spring, the small groups expand rapidly in numbers and move into unoccupied areas. There must be a rapid movement or mixing of flies during the summer to account for

the daily variation in population structure at one point. Ives (1945) reported that his work with 2nd chromosome lethals in *D. melanogaster* populations in a rural area near Amherst, Mass., indicated that the flies breed in continuous populations. However, Ives (1948) found that there was a seasonal shift in lethals from summer of 1946 to summer of 1947. There is a strong possibility that *D. melanogaster* breeds in small discontinuous populations in the cities and in continuous populations in rural areas.

The presence of the *tri* in all but one population indicates that the small populations at times (probably late in the summer) expand to such proportions that there is an overflow of flies from one population to another. The populations do not remain genetically isolated from one another. The flies heterozygous for *tri* may have a selective advantage over the non-*tri* flies, and hence become fixed in the population. Reed and Reed (1948) found that a lethal inversion flourishes in the heterozygous state in the laboratory. Again this can account for the relatively high number of lethal mutations on the second chromosomes.

The study of Chicago *D. melanogaster* populations is continuing. The populations of several summers are being compared. The genetic variation of a population from one year to another year at the same location is being obtained. The weather and its influence is being correlated to the genetic fluctuation.

LITERATURE CITED

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