

THE RELATIONSHIP OF BODY SIZE AND EGG SIZE IN DROSOPHILA

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Introduction.—This paper presents a study of the relationship of body size and egg size, and body size and rate of egg laying of a homozygous red, forked, bar stock of *Drosophila*.

Materials and Methods.—All flies were raised at a temperature of 27° C. The large flies were obtained by giving the developing larvae optimum conditions of space and food, while the larvae of the small flies had insufficient moisture, food and space.

The size of the flies was determined by measuring the length of the thorax. In a previous paper (Eigenbrodt, 1930) it was found that such measurements are reliable indices of the size of flies. Single pairs of these flies were placed in eight dram homeopathic vials. Glass rods which had previously been dipped in banana agar and afterwards inoculated with a solution of compressed yeast were inserted into these vials and these were changed daily. Daily egg counts for each female were made, and size determinations were made of those eggs which were in a horizontal position.

Experimental Data.—Table 1 gives the mean egg lengths of all of the flies used in these experiments. A total of 2619 eggs were measured.

mean differences, and so might be considered significant. Warren, 1923, while working on the problem of the inheritance of egg size in *Drosophila*, made some preliminary observations on the relationship of body size and egg size and he concluded that there is no correlation between the size of the female and the size of the egg she lays. Although one cannot positively say that the large flies lay larger eggs than the small flies, one can draw the conclusion that the small flies lay eggs which vary more in size than the eggs of the large flies, for the standard deviation (a measure of variability) of the eggs of the large flies is only 11.6 while that of the small flies is 14.9.

Table II, which shows the body size and egg size relationship of ten large and ten small flies taken at random from those flies which had the largest number of egg measurements, also indicates that the egg size of the small flies is more variable than that of the large flies. The egg lengths of the small flies varies from 492.4 to 508.5 microns, a difference of 16.1 microns, while the egg lengths of the large flies varies from 504.8 to 508.0, a difference of only 3.2 microns.

TABLE I—COMBINED DATA SHOWING RELATIONSHIP BODY SIZE AND EGG SIZE IN DROSOPHILA (IN MICRONS)

Size of flies	Number of flies	Number of eggs	Mean egg length	Standard Deviation
1035	23	1390	506.5±0.2	11.6
659	20	1229	503.8±0.3	14.9

The data show that there is an average difference of 376 microns in the thoracic lengths of large and small flies, but there is only an average difference of 2.7 ± 0.4 microns in the egg lengths of large and small flies, the large flies having the slightly larger eggs. Although these mean differences in egg lengths are small, yet they are nearly seven times larger than the probable error of the

The relationship of body size and egg laying rate was also determined and results are shown in table III. The large flies laid an average of 24.5 eggs per day for each fly while the small flies laid an average of only 15.48 eggs per day, but unexpectedly, the small flies averaged 15.66 egg laying days, while the large flies averaged only 11.08 egg laying days.

TABLE II—BODY SIZE AND EGG SIZE RELATIONSHIPS OF INDIVIDUAL DROSOPHILA FLIES

Large Flies				Small Flies			
Size of flies	Number of eggs	Egg length	Standard deviation	Size of flies	Number of eggs	Egg length	Standard deviation
1010	134	504.8±0.8	13.2	687	102	492.4±1.2	18.1
1010	69	505.7±1.0	11.8	768	97	497.8±1.2	17.2
990	102	506.1±0.7	10.2	707	104	500.9±1.2	18.3
1030	91	506.7±0.8	11.5	687	121	503.0±0.7	11.7
1010	76	507.1±1.0	12.9	747	61	503.5±1.0	11.9
1151	39	507.1±1.1	10.3	606	67	504.9±0.8	9.2
990	94	507.2±0.8	11.4	687	70	505.6±0.8	10.1
1131	68	507.5±0.9	10.6	687	76	505.8±1.4	18.0
1010	112	507.7±0.8	12.7	586	64	507.4±0.7	8.5
970	64	508.0±0.7	8.5	727	140	508.5±0.8	14.5

TABLE III—RELATIONSHIP OF BODY SIZE AND EGG LAYING RATE IN DROSOPHILA

Average size of flies	Number of flies	Average number of eggs per fly	Average number of egg laying days	Average number of eggs per day
1010	24	271.5	11.08	24.50
719	15	242.5	15.66	15.48

Thus the small flies outlive the large flies. Alpatov, 1932, found similar results with the wild stock of *Drosophila* and he states that "a negative correlation was found between the duration of life and the average egg production (per day for the whole producing period)".

CONCLUSIONS

1. Large flies lay eggs which are slightly larger than the eggs of small flies. However, these differences may not be great enough to be significant.
2. The small flies lay eggs which show

greater variability in size than the eggs of large flies.

3. The small flies lay fewer eggs than the large flies but they live longer than the large flies.

REFERENCES

- Alpatov, W. W. 1932. Egg production in *Drosophila melanogaster* and some factors which influence it. Jour. Exp. Zool., 63: 85-112.
- Eigenbrodt, Harold J. 1930. The Somatic effects of temperature on a homozygous race of *Drosophila*. Physiological Zoology 3: 392-412.
- Warren, Don C. 1923. Inheritance of egg size in *Drosophila*, Genetics 9: 41-70.