

Mating Preference Experiment (1/2002)

One of the most important components of the reproductive fitness (or adaptive value) of an individual is the degree of mating success. The greater the ability to mate, the greater the likelihood to leave offspring. Different genotypes may have different degrees of mating success. Thus mating success may refer to competition between genotypes within a single interbreeding population.

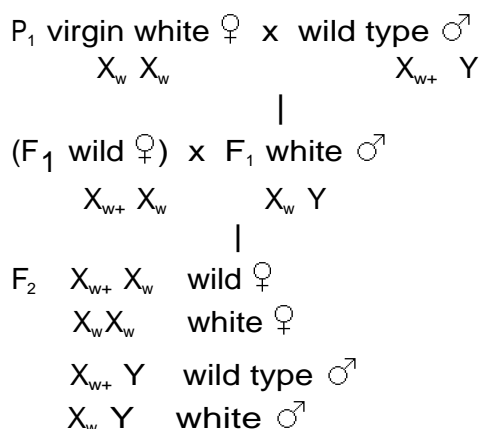
Mating success is measured by observing the success or failure of crossmating between genotypes. The observation may be direct, as by actually observing mating behavior and copulation. On the other hand the observations may be indirect, such as by dissecting the sperm tracts of the females or by raising the offspring to determine fertilization. We will use the last method.

In Drosophila, as in many animals, it is the female that exercises discrimination among suitors. The male will indiscriminately mate with almost any female. Therefore, we usually test for "female choice" of mates. Such experiments are done in two sets, testing the choice of each of the two sets of females separately.

Set #1	Set #2
Males A	Males A
>Females A	>Females B
Males B	Males B

If the crosses are properly made, the genotype of the particular male(s) chosen by the female will be apparent from the offspring produced.

Procedure for Mating Competition Between Genotypes. - This procedure is a female choice test between white males and wild type males. The choice of white females is tested in one set and that of wild type females in the other set. In order to be a valid comparison, the flies should be of the same age and genetic background. Ideally, the only variable should be the white v.s. wild phenotype (and genotype) itself. In order to obtain flies which are comparable to each other in age and genetic background, the following crosses are made.



The F<sub>2</sub> flies will be used in the two sets of preferential mating experiments shown below. Note that the E<sub>2</sub> females must be virgin.

Set #1: Two vials, each containing 20 F<sub>2</sub> white males, and 20 F<sub>2</sub> wild type males, and 20 virgin F<sub>2</sub> X<sub>w</sub>X<sub>w</sub> white ♀.

Set #2: Two vials, each containing 20 F<sub>2</sub> white males, and 20 F<sub>2</sub> wild type males, and 20 virgin F<sub>2</sub> X<sub>w+</sub>X<sub>w</sub> wild ♀.

After introducing the flies into the cultures, allow them to remain for 8 hours. Discard all of the males. Place each female into a separate labeled vial. Wait 5-7 days and discard the females. Obtain the next generation, but do not score flies after a maximum of 7 days of emergence. Score each vial separately for the number of X<sub>w</sub>X<sub>w</sub> white ♀ and X<sub>w+</sub>X<sub>w</sub> wild ♀. In set #1, the presence of 100% X<sub>w</sub>X<sub>w</sub> white ♀ indicates that their father was a white eye male; while the presence of 100% X<sub>w+</sub>X<sub>w</sub> wild ♀ indicates that a wild type male was their father. The presence of both X<sub>w+</sub>X<sub>w</sub> wild ♀ and X<sub>w</sub>X<sub>w</sub> white ♀ indicates that their mother multiple-mated with males of both types. Record the numbers, but do not include these vials in your statistical analysis. In set #2, the presence of 100% wild type females indicates that their father was wild type, while the presence of 50% X<sub>w+</sub>X<sub>w</sub> wild ♀ and 50% X<sub>w</sub>X<sub>w</sub> white ♀ indicates that their father was white eyed. Ratios of red eyed and white eyed females which are significantly different than 1:1 may indicate multiple mating, and these vials should not be used in your statistical analysis (but record the data).

**Statistical Analysis** - Compare your observed results to those expected with completely random mating (no mating preference). Test each set independently using a simple Chi-square test with 1 degree of freedom. Exclude those females which failed to reproduce and those females which multiple-mated.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Set #1

F <sub>2</sub> males chosen:	O	E	O-E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E
wild type ♂	14	7.5	6.5	42.25	5.633
white ♂	1	7.5	- 6.5	42.25	5.633
Σ	15	15	0		11.267 = χ <sup>2</sup>

df = 1

P>0.01\*\*

Write a report in which you provide the standard Introduction, Materials and Methods (ignore the routine details of Drosophila culture), Results, Discussion, and Conclusions. I expect that you will all have the same observed data, since you are working as a team. However, I expect that each of you will write your own paper without “borrowing” analyses, etc. from the others.