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Interitance Pattern of Vestigial Mutation in Drosophila melanogaster

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Inheritance Pattern of Vestigial Mutation in *Drosophila melanogaster*

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BIO 141-001

1. Purpose

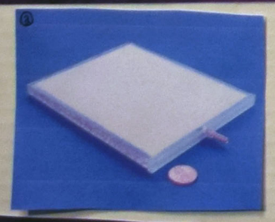
The purpose of this project is to study and observe the inheritance pattern of the vestigial mutation in *Drosophila melanogaster*.

2. Background

Drosophila melanogaster, or fruit flies, make an ideal specimen to study because of their Mendelian traits. Fruit flies have dominant and recessive traits, which are based on the combination of alleles received from their parents. These traits are more clear cut and a simpler inheritance pattern to study. There are other specimens that possess Mendelian traits, but fruit flies can be studied with easily accessible tools and over a short period of time. Using carbon dioxide, the flies can be put to sleep for however long is necessary without killing or affecting them. Also, they develop into full grown flies after just two weeks, which makes mating future generations less time consuming than what other specimen, such as a plant, might require.

Identifying Female vs. Male

Female	Male
No sex combs on forelegs	Sex combs on forelegs
Lighter tip on abdomen	Darker tip on abdomen



3. Materials

- CO_2 emitting apparatus / fly pad
- Vials, sponge caps, and labels
- Fly food and water
- Dissecting scope
- Watercolor paint brush

4. Procedure

Virgin vg-/vg- x Male WT

Made a cross of virgin females of vestigial mutation with a male homozygous wild type fly. After about two weeks, the first generation began to pupate with enough larvae in the food to release the adults. This was done to avoid mixing the adult flies with their offspring. Once the first generation hatched, we then counted and documented the first generation's sex and wing type of those that had hatched. Once sufficient data was collected, about five males and females from the first generation were transferred into a fresh vial. This process of mating, releasing the adults, and then documenting the sex and wing type of the offspring was repeated for the second generation of flies. The same process was repeated for the reciprocal cross.

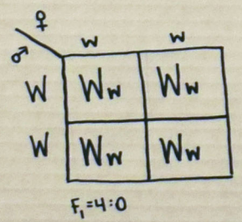
Virgin WT x Male vg-/vg-

Ideally, this procedure would be copied exactly as the first cross, but a few mishaps happened along the way. This cross was started far later than the first because mold had accumulated and the food started receding from the edges. Flies were dying so it needed restarted twice. To combat this, we added yeast to the new vials for the mold and didn't let our tubes rest sideways overnight, but stored them upright instead. The next difference was when we accidentally knocked out the flies using gas instead of CO_2 when counting the first generation. Other than these issues, the experiment was carried out the same as the other cross.

5. Results

Virgin vg-/vg- x Male WT
1st Generation:
23 Male WT
16 Female WT
0 vg-/vg-
2nd Generation:
31 Male WT
26 Female WT
8 Male vg-/vg-
9 Male vg-/vg-

Virgin WT x Male vg-/vg-
1st Generation:
19 Male WT
24 Female WT
0 vg-/vg-
2nd Generation:
12 Male WT
14 Female WT
0 vg-/vg-



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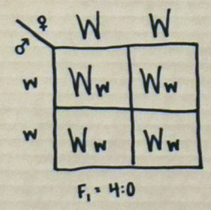

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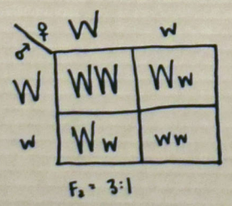

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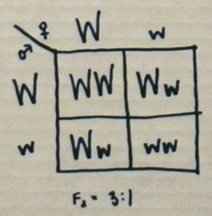

F_2 = 3:1

6. Analysis

Chi Square Statistical Analysis

	Phenotypes	
	WT	vg-/vg-
OBS	57	17
EXP	55.5	18.5
OBS-EXP	1.5	-1.5
$(OBS-EXP)^2$	2.25	2.25
$\frac{(OBS-EXP)^2}{EXP}$	0.0405	0.122

$C_2 = 0.0405 + 0.122 = 0.162$
Df = 3.84

$0.162 < 3.84$

7. Conclusion

The Chi Square statistic determines the amount of error that is allowed for obtaining valid results. The equation works so that essentially the more data and phenotypes that are used, the greater source of error that's allowed. The resulting C2 value from the successful cross was 0.162. Since this value was below the critical value (3.84), it's data is said to be precise enough to be valid data. This means that the inheritance pattern of the vestigial mutation in flies fits the Punnett Square's 3:1 ratio of WT to vestigial. The precedent set by the Chi Square analysis vouches for the validity of our research, which is that wild type is the dominant trait in fruit flies. We cannot make a claim as to whether this is a sex linked trait since the reciprocal cross' data is unusable.

8. Future Research

Although our crosses weren't both successfully completed, our project could lead to future research opportunities. Since the only procedural change between the two crosses was gassing the first generation of flies from the reciprocal cross, then we hypothesize that this environment had an effect on the vestigial mutation, but not the wild type. Future research might test the effects of the environment that the adults are subjected to and how that might affect the lifespan of their offspring even before conception.