# The Correlation Between Cuticle Coloration and Negative Geotaxis in *Drosophila melanogaster*

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## Introduction

- Previous research has shown a genetic correlation between cuticle color and aggressive behavior in *Drosophila melanogaster* potentially through the dopamine synthesis pathway. Dopamine is used to produce melanin pigmentation and can affect multiple behaviors (1).
- Negative geotaxis is the movement of individuals against gravity. Geotaxis measures movement ability with slower rates associated with a loss of motor development (2).
- As such, individuals that are more aggressive should be more active and have higher rates of geotaxis movement (1).

**Hypothesis**:
- Since we found a positive correlation between cuticle color and aggressive behavior, our group predicts a similar positive correlation between cuticle color and faster negative geotaxis times.

## Methods

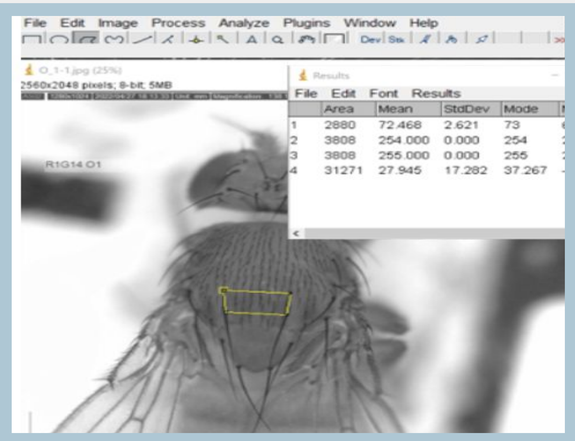
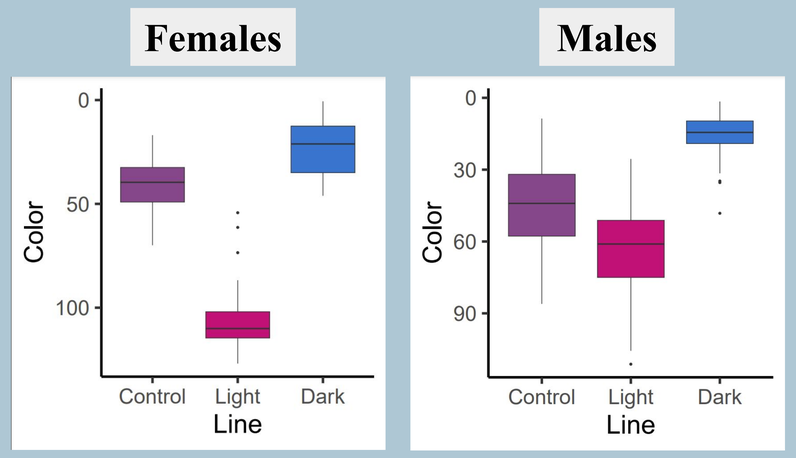


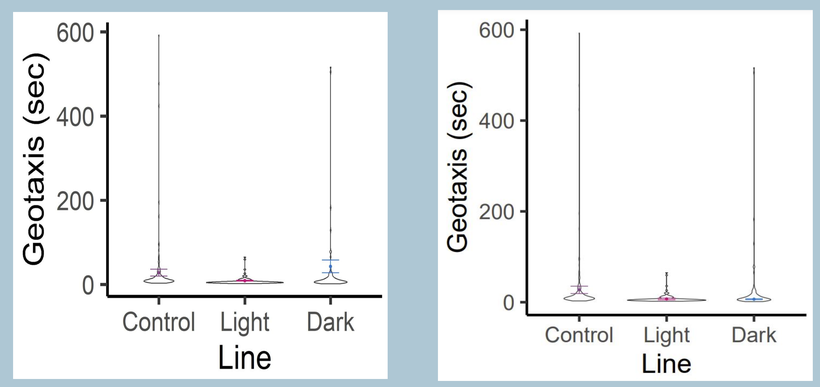

**Figure 1: ImageJ software is being used to calculate mean grey scale values. For this *D. melanogaster,* the mean grey scale value is 27.945.**

- We selected for darker and lighter cuticle color for 12 generations. As well as maintained a control population.
- To measure geotaxis, flies are placed in a vertically sealed tube and timed for how quickly they climb to a predetermined mark at 3 inches from the bottom of the tube.
- To measure the color of the flies, we used ImageJ to determine the mean grey-scale value of the dorsal thorax (Figure 1).

## Results




| | Control vs. Light | Control vs. Dark | Light vs. Dark |
|---|---|---|---|
| Females (p-value for Line = 0.517) | Not significant | Not significant | Not significant |
| Males | p-value = 0.0013 | p-value = 0.0011 | p-value = 0.9779 |




| | Control vs. Light | Control vs. Dark | Light vs. Dark |
|---|---|---|---|
| Females | p-value = 0.5568 | p-value < 0.0001 | p-value < 0.0001 |
| Males | p-value < 0.0001 | p-value < 0.0001 | p-value < 0.0001 |

## Conclusion & Future Directions

- We found a sex difference in geotaxis behavior. Females did not significantly change their behavior based on color. Males selected for both light and dark were significant faster than control flies.
- This data does not support our prediction that darker flies would be faster than both light selected and control flies.
- Cuticle color may not constrain the independent evolution of negative geotaxis behavior.
- More individuals need to be tested to determine the relationship between color and geotaxis.
- We plan to repeat this experiment in a second population of *D. melanogaster* and in two populations of *D. simulans*.

## References

1. Takahashi, A. (2013). Pigmentation and behavior: Potential association through pleiotropic genes in *drosophila*. *Genes & Genetic Systems*, *88*(3), 165–17

2. Cao, W., Song, L., Cheng, J., Yi, N., Cai, L., Huang, F., & Ho, M. (2017). An Automated Rapid Iterative Negative Geotaxis Assay for Analyzing Adult Climbing Behavior in a Drosophila Model of Neurodegeneration. *Journal of Visualized Experiments*, *127*.

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