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Effect of High Fat/High Sugar Diets on *fruitless* Gene Expression and Copulatory Behavior in *Drosophila melanogaster*

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Introduction

- *Drosophila melanogaster*, the common fruit fly, is a model organism in biological studies.
- The *fruitless* gene in *Drosophila* is a neuronal gene that codes for a transcription factor whose functional role is to control the mating ability of male fruit flies.
- A diet high in fat and sugar has been shown to increase sexual function significantly in *Drosophila*.
- **Hypothesis:** If a diet high in fat and sugar causes decreased sexual functioning, that decrease is due to a reduction in expression of the *fruitless* gene.

Methods

- **Primer synthesis:** Primers for *fruitless* were designed using IDT Oligoanalyzer software.
- **Culturing:** *Drosophila* were cultured in tubes with hydrated potato flake media and yeast. Experimental groups were reared with 500 mg of coconut oil and 500 mg of sucrose, just 500 mg of sucrose, or 100 mg of sucrose added to the media.
- **RNA extraction:** RNA was extracted using Trizol and purified using Qiagen's RNeasy Mini Kit.
- **Reverse transcription:** cDNA was synthesized using the Thermo Scientific RevertAid RT kit.
- **qPCR** was performed using PowerUP SYBR Master Mix to determine expression of the *fruitless* gene. *Gapdh* gene expression was used as a positive control.
- **Courtship Behavior** was assessed in male-female pairs by tallying the number of behaviors observed in a 10 minute period.

Results

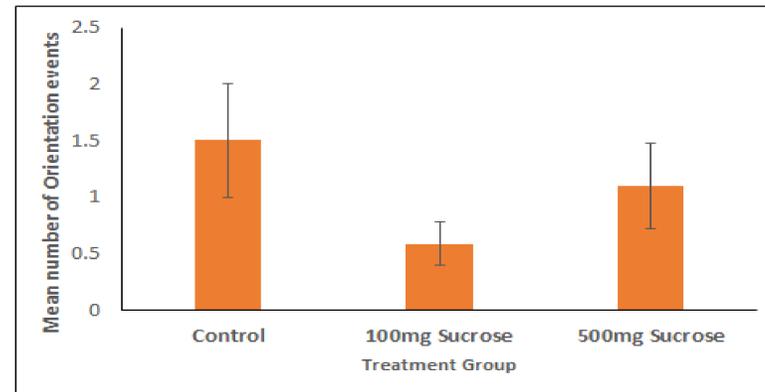


Figure 1: Mean number of orientation events per treatment group of flies. There was no significant differences between groups. $p=0.121368$ for control v. 100 mg and $p=0.53390$ for control v. 500mg. (control $n=8$, 100mg $n=10$, and 500mg $n=12$)

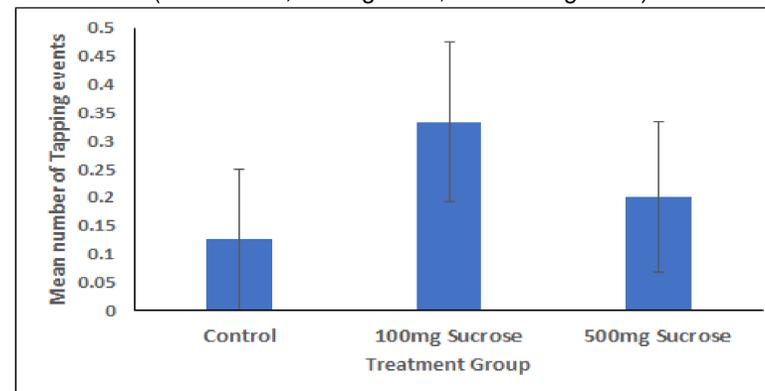


Figure 2: Mean number of Tapping events per treatment group of flies. There was no significant differences between groups. $p=0.285546$ for control v. 100mg and $p=0.686981$ for control v. 500mg. (control $n=8$, 100mg $n=10$, and 500mg $n=12$)

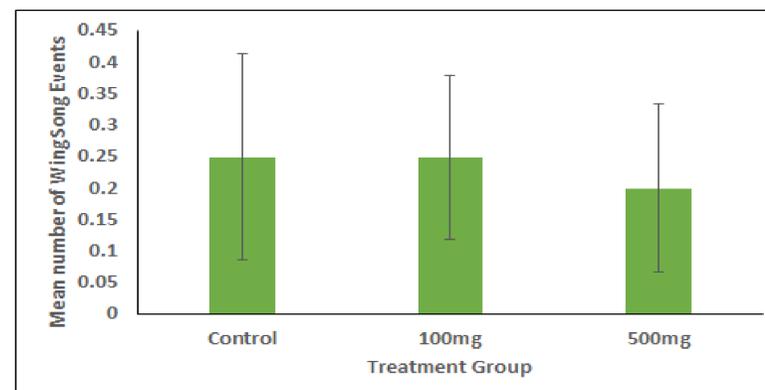


Figure 3: Mean number of Wing Song events per treatment group of flies. There was no significant differences between groups. $p=1$ for control v. 100mg and $p=0.816201$ for control v. 500mg. (control $n=8$, 100mg $n=10$, and 500mg $n=12$)

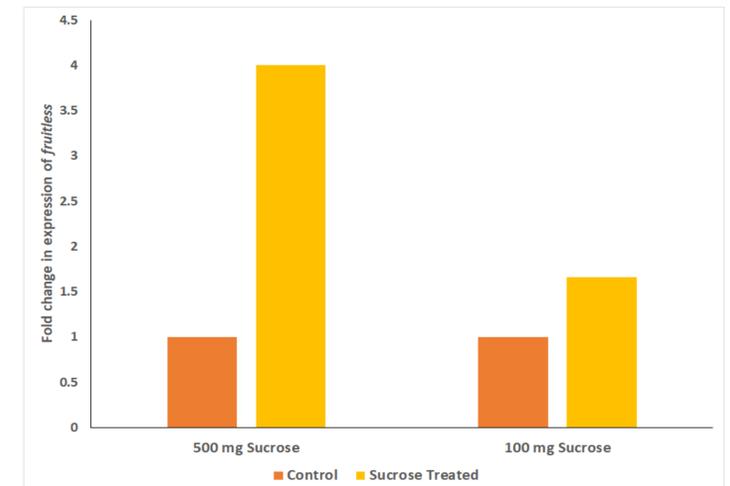


Figure 4: Fold change in expression of *fruitless* in groups treated with sucrose vs. control group. ($n=2$ per experimental group)

Conclusion

- The Courtship assay was inconclusive due to a small sample size and low occurrence of courtship-like behaviors between male-female pairs.
- Our first round of experiments did not yield any living *Drosophila*.
- qPCR from our second round of experiments demonstrated that flies reared in sucrose cultures had increased expression of *fruitless*, but statistical significance was not achieved.
- The results disagreed with our hypothesis on gene expression and supported the null hypothesis that there was no change in copulatory behavior.

References

Lebreton, Sébastien et al. "Feeding regulates sex pheromone attraction and courtship in *Drosophila* females" Scientific reports vol. 5 13132. 10 Aug. 2015.

Acknowledgements

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