



How Histone Inhibition Affects Diapause in *Megachile rotundata*

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Introduction

- Alfalfa Leaf Cutting Bees (ALCB) are a highly managed bee species
- These bees create nests from alfalfa leaf clippings
- Offspring may enter diapause: A hibernation mechanism needed to survive winter conditions
- Some bees won't enter diapause and continue development, these are known as non-diapausers
- Non-diapausers are problematic for managers, as there is less yield of bees the following summer
- Studies in other insects show that diapause may be linked to gene expression
- We inhibited the formation of histones which may allow for easier transcription and therefore gene expression

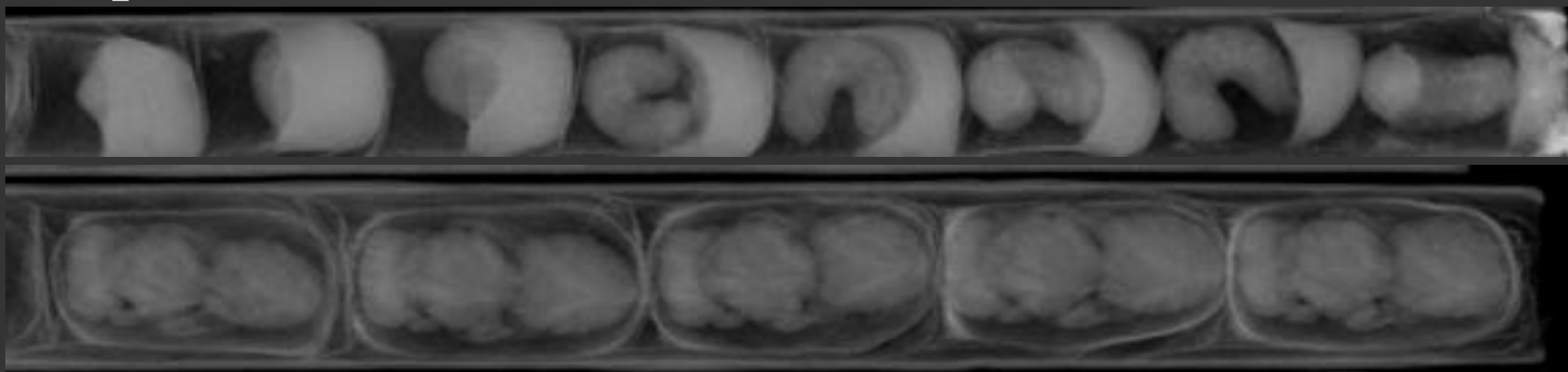


Figure 1. Two Nests
Top Nest: Diapausing Bees
Bottom Nest: Non-Diapausing Bees

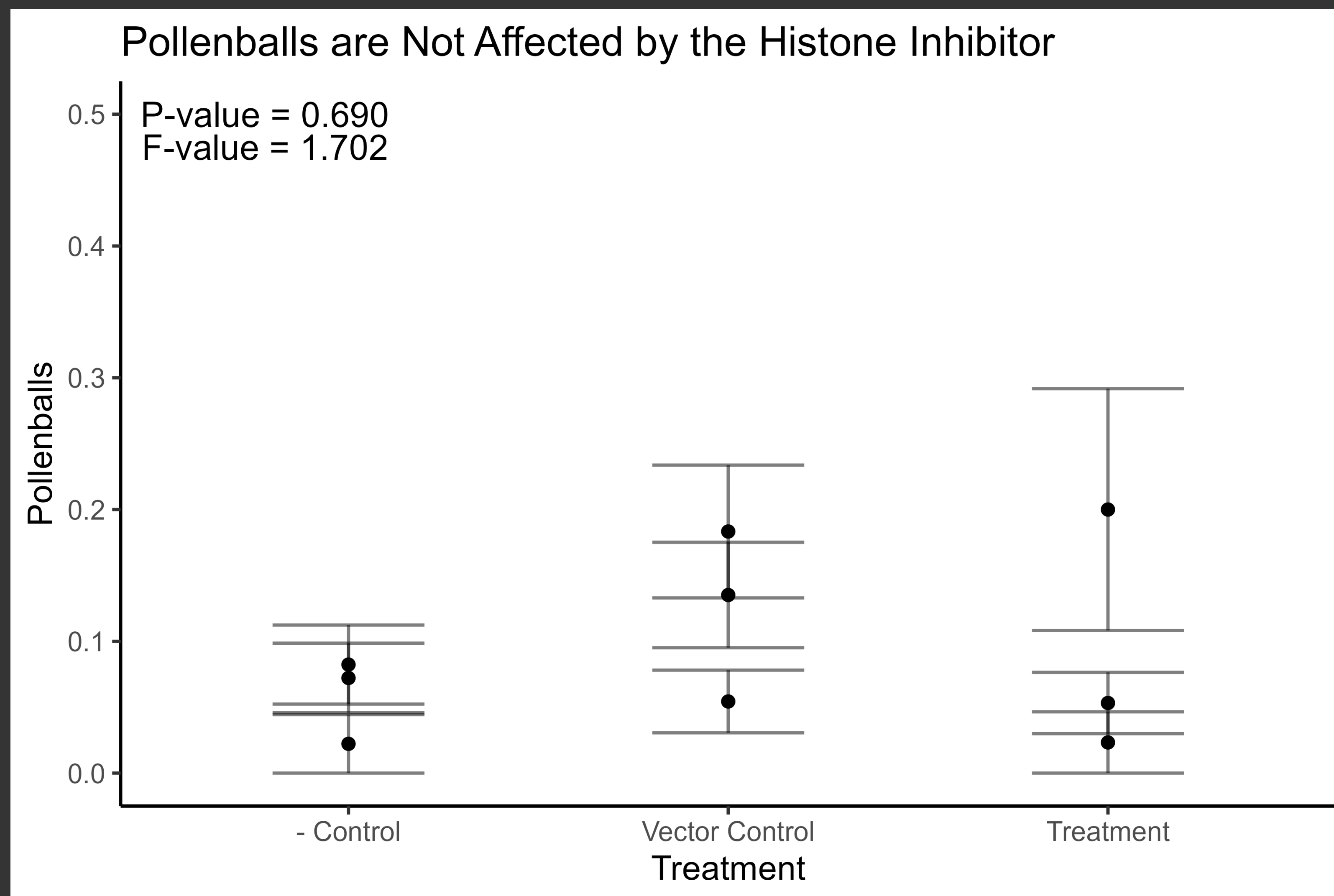
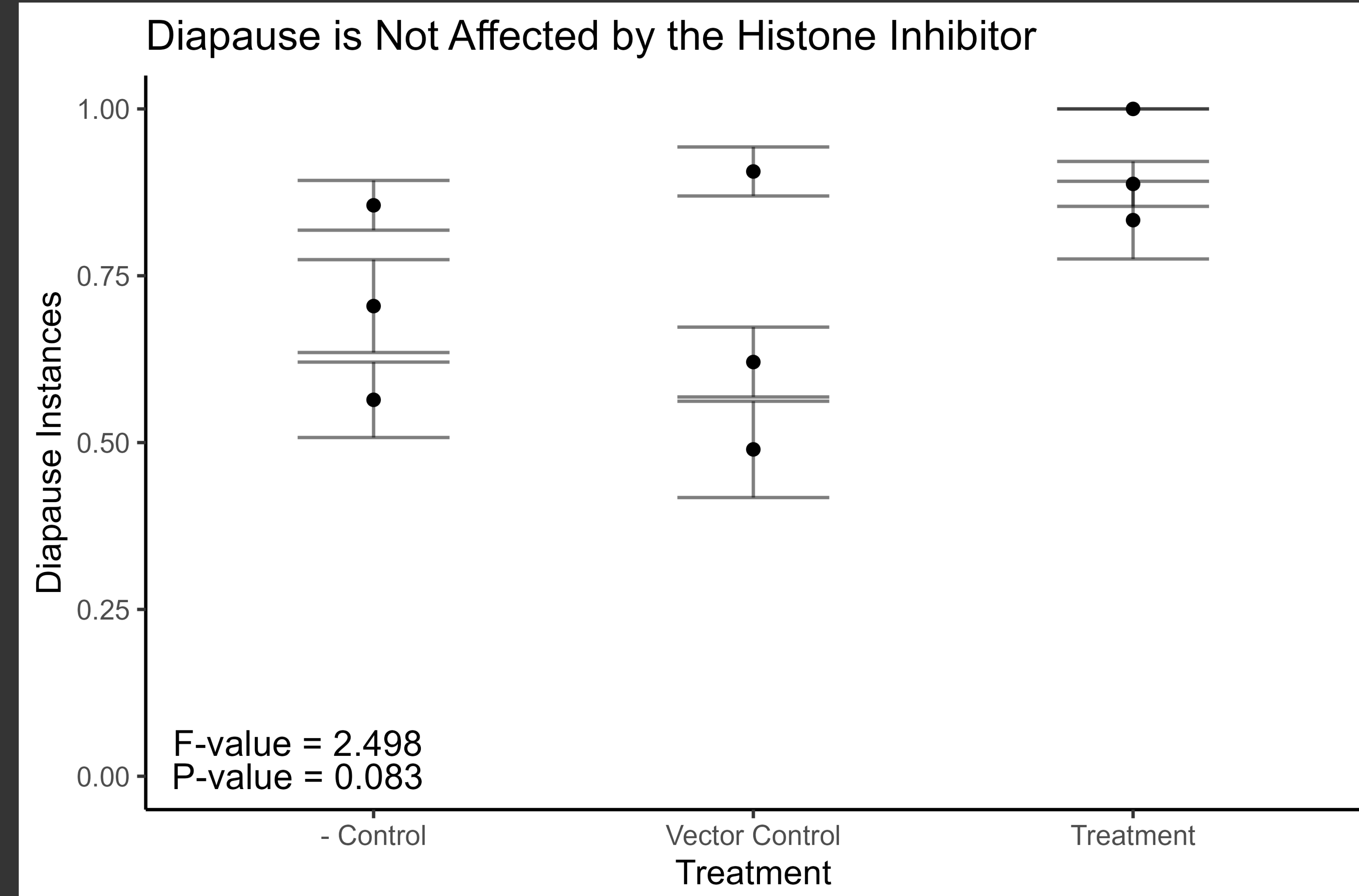


Figure 2. Adult Female Alfalfa Leaf Cutter Bee

Objectives

- Observe if inhibiting the formation of histones induces diapause in *Megachile rotundata*
- We hypothesized feeding ALCB Trichostatin A would produce more diapausing offspring because inhibiting the formation of histones may allow for easier transcription and therefore gene expression

Results



Methods

- Control
1 gram sugar
1 ml water

Vector Control
14 µl DMSO
7 ml water

Histone Inhibitor
14 µl Trichostatin A
7 ml water

Sucrose Solution

10 µM

10 µM

3 Replicates

3 Replicates

3 Replicates

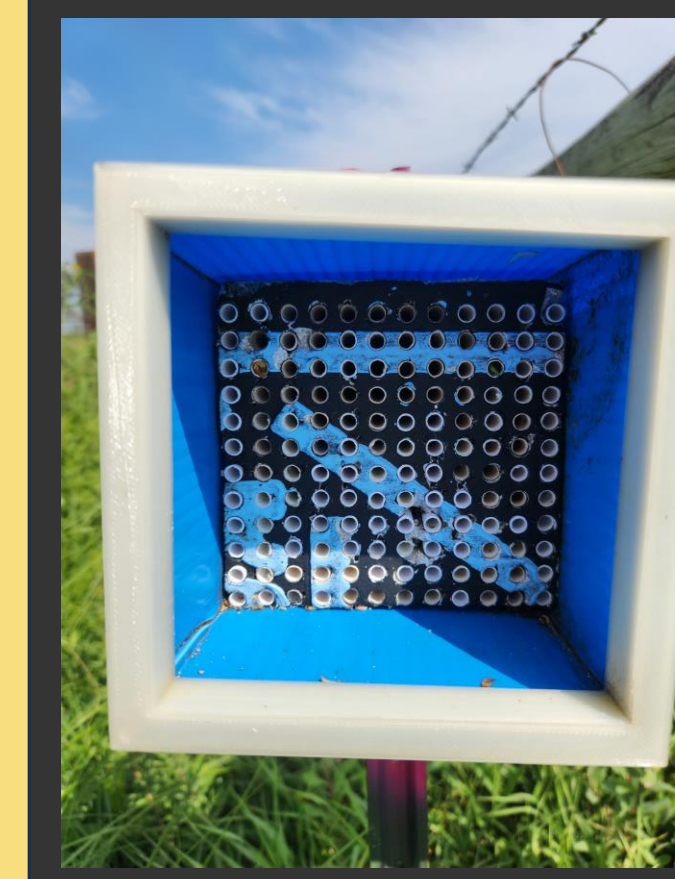


Figure 3. One of the nine bee boxes used in the experiment

- Control: Sucrose Solution
- Vector Control: DMSO
- Histone Inhibitor: Trichostatin A
- 45 Females and 25 Males per box
- Collected after 3 weeks of being in the field



Figure 4. Al Tennant releasing bees at one of the bee boxes

Conclusions

- The histone inhibitor had no significant effect on the number of diapausing offspring
- The histone inhibitor had no significant effect on pollenballs
- Diapause was irregularly high this year which could have played an effect in this study

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References

- Denlinger, D. L. (2002). Regulation of diapause. *Annual Review of Entomology*, 47(1), 93–122. <https://doi.org/10.1146/annurev.ento.47.091201.145137>
- Lindahl Allen, M., Koch, C. M., Clelland, G. K., Dunham, I., & Antoniou, M. (2009). DNA methylation-histone modification relationships across the desmin locus in human primary cells. *BMC Molecular Biology*, 10(1). <https://doi.org/10.1186/1471-2199-10-51>
- Pitts-Singer, T. L., & Cane, J. H. (2011). The alfalfa leafcutting bee, *Megachile rotundata*: The world's most intensively managed solitary bee. *Annual Review of Entomology*, 56(1), 221–237. <https://doi.org/10.1146/annurev-ento-120709-144836>