

The Effect of Herbivore Interactions on Plant and Seed Development

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Background

- Though the damage of plants from herbivores varies, studies have found that the greatest loss in seed production is derived from insect predation.
- Seed production loss is observed in *Baptisia alba*, with one possible predator causing the majority of it, *Trichapion rostrum*, a weevil species.



Figure 1. Lateral view of *Trichapion rostrum*.

Objective

This study will focus on the variation of seed damage in four sites and their relationship to weevil presence, while also looking at the susceptibility of plants by factoring their notch count per pod.

Methods

- 80 plants from four sites were collected in Wisconsin during August 2020.
- Each plant had 2-5 pods containing a variable number of seeds.
- Seeds were counted per pod and grouped within their plant.
- Seeds were grouped as damaged or undamaged. Pod dimensions, notches, number of weevils, and number of other herbivore species were also recorded.
- In this study, notches are defined as the indent in the pod where the seed emerges from.
- Collected data was visualized with R.

Results



Figure 2. Undamaged pod from ICE Site.

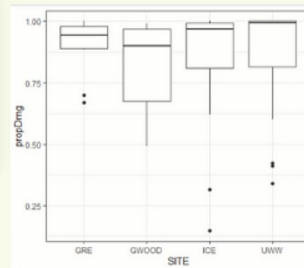


Figure 3: Hypothesis 1. The proportion of seed (propDMG) damage in four grassland sites (SITE) in Wisconsin. ($p = .81$).



Figure 4. Damaged pod from GRE site.

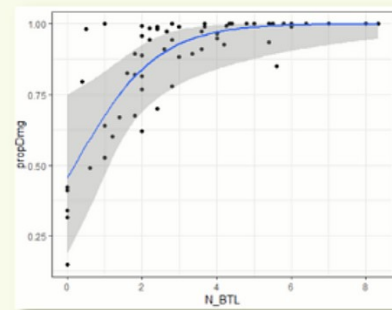


Figure 5: Hypothesis 2. The proportion of damage (propDMG) with the number of weevils (N_BTL) among all sites. ($R^2 = .4415$, $F = .32$, $p < 0.0001$).

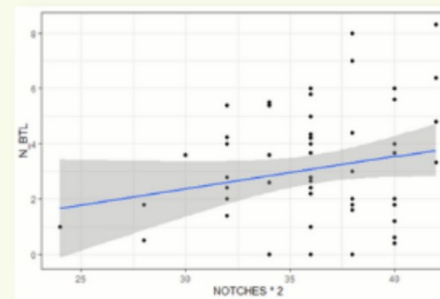


Figure 6: Hypothesis 3. The number of weevils (N_BTL) correlating to seed notches (NOTCHES*2) among all sites. ($R^2 = 0.17$, $F = 2.839$, $p = 0.097$).

Discussion

- The correlation between the proportion of damage and weevil presence per pod showed the strongest correlation and supported evidence that weevils are a common predator of *Baptisia alba*.
- Very little variation in damage was found among sites, suggesting sites may have been environmentally similar.
- A weak correlation between notches and weevil presence may suggest how some seeds are less susceptible to damage, but more research needs to be performed with a larger sample of sites and plants.



Figure 7. Weevil on top of damaged seed.

Future

- It would be of great interest to study the reproductive rate of non-damaged seeds on a long-term scale since seed predation may affect seed production.
- Pod size should also be studied to see if there is a correlation with weevil presence.

References

1. Amsberry, L.K., Maron, J.L. (2006). Effects of herbivore identity on plant fecundity. *Plant Ecol* 187, 39–48. <https://doi.org/10.1007/s11258-006-9131-6>
 2. Andrieu, E., Debussche, M., Munoz, F., & Thompson, J. (2011). How does herbivory affect individuals and populations of the perennial herb *Paeonia officinalis*? *Flora*, 206(6), 544–549. <https://doi.org/10.1016/j.flora.2010.10.001>
 3. Hembrough, A., & Borowicz, V. (2017). Pre-dispersal seed predation by the weevils *Trichapion rostrum* and *Tychius sordidus* limits reproductive output of *Baptisia alba* (Fabaceae). *Botany*, 95(8), 809–817. <https://doi.org/10.1139/cjib-2016-0329>
 4. Linabury, M., Turley, N., & Brudvig, L. (2019). Insects remove more seeds than mammals in first-year prairie restorations. *Restoration Ecology*, 27(6), 1300–1306. <https://doi.org/10.1111/rec.13004>
 5. Sakai, S., & Harada, Y. (2007). Optimum size and number of seeds when seeds suffer pre-dispersal predation. *Evolutionary Ecology Research*, 9(4), 599–617.
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