Effects of the specialist aphid, Aphis echinaceae, on overall herbivory of Echinacea angustifolia

Introduction

- Fragmentation of tallgrass prairie leaves remaining populations of *Echinacea angustifolia* and other native plants vulnerable to ecological and genetic threats.
- Ant-aphid-host plant relationships are one of many interspecific dynamics that can influence the performance of individual plants and whole populations with major evolutionary implications in isolated remnants.
- The top-down effects of *Aphis echinaceae* on their hosts are relatively unknown. By deterring other herbivores and reducing foliar damage, the specialist aphid could potentially offer benefits to E. angustifolia.
- Understanding specialist aphids as a potential advantage to dwindling plant species can help improve conservation and restoration practices.

Hypothesis

Aphid colonization on *E. angustifolia* reduces overall herbivory by other chewing herbivores.

Methods

- In 2011, 100 study plants in an experimental plot were randomly selected for one of two treatment groups: aphid addition and aphid exclusion. This year 70 of the original 100 study plants were found (33 addition and 37 exclusion).
- Addition plant had aphids regularly added.
- Exclusion plants had all aphids regularly removed.
- Foliar herbivory was assessed at the end of the summer based on the proportion of chewed leaves per individual plant.



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Results

Greater Peak Aphid Abundance is Associated with **Reduced Herbivory**

Maximum aphid abundance reached	Mean proportion of damaged leaves
0	0.50
1-10	0.45
>10	0.32



maximum aphid abundance reached



Tests using two of the 3 indicators of aphid presence—peak abundance and seasonal load, but not treatment group evidenced a slight negative association between aphid load and herbivory rates.

- Plants that reached higher peak abundance categories displayed lower rates of herbivory (ANOVA p=0.20, df=2).
- Plotting seasonal aphid load scores of the plants against the proportion of damaged leaves yielded a correlation value of -0.23.

Among the 70 plants found, there was no significant difference in the survival rate of the plants between the treatment groups (p=0.51).





Conclusion

- Aphids, along with their farming ants, can reduce foliar herbivory rates on *E. angustifolia*, potentially supplying a benefit to host plants without harming overall performance.
- Trends were weaker than in past years but corroborate the findings of the 2011 and 2012 studies.
- Even while the aphids in this manipulative experiment may have deterred herbivores on study plants, this benefit may not necessarily play out under natural distribution conditions.
- Future studies might examine what links A. echinaceae to higher herbivory rates under natural distribution patterns.

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