Comparing the Effects of Parasitism by *Castilleja levisecta* and Competition on Host Species

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**Introduction**

*Castilleja levisecta* is a short-lived perennial native to Washington State. As a hemiparasite, it parasitizes host plants by forming haustoria connections to the host's roots to absorb water and nutrients directly. As a threatened species, much of the previous research on *Castilleja* has focused on finding the ideal host, but little research examined the effect that parasitism has on its host. My research addressed four principal questions:

1. **Does parasitism by *Castilleja levisecta* affect host traits?**
2. **Which effect is stronger, parasitism or competition?**
3. **Does haustoria count predict any of the host traits?**
4. **Does haustoria count predict any of the *Castilleja levisecta* traits?**

**Methods**

*Achillea millefolium* and *Eriophyllum lanatum* were chosen as host species for *Castilleja levisecta* and for the competition treatments. I established 5 treatments, each representing a form of competition or parasitism. Each treatment was replicated 15 times (6 plants per replicate). After two months, a set of plant traits was measured for each host plant: above and below ground mass, total mass, height, and number of stems. Traits were then averaged for each species in each replicate. I used 1-way ANOVA (and Tukey tests) to compare intraspecific, interspecific, and parasitism effects for each host (Q1-2) and linear models to examine relationships with haustoria count (Q3-4).

**Results**

- **Mean above ground mass for treatments with host *Achillea*** (points are jittered to avoid overlap). *Achillea* performed significantly better with interspecific competition than with parasitism for this and all other traits.

- **Mean above ground mass for treatments with host *Eriophyllum*** (points are jittered to avoid overlap). *Eriophyllum* performed significantly worse with interspecific competition than with parasitism or parasitism for this and all other traits.

**Relationships**

- **Relationships between mean above ground mass and haustoria count for both *Achillea* and *Eriophyllum***. None of the linear models for any trait in either species was significant.

- **Relationships between mean above ground mass of *Castilleja* and haustoria count with host *Eriophyllum***. Linear models for mean above ground mass, below ground mass, height, and total mass were significant for *Castilleja* with host *Eriophyllum*, but none of the models were significant for *Castilleja* with host *Achillea*.

**Conclusions**

Parasitism does not seem to have an effect on host traits, and interspecific competition seems to have a greater effect on host species compared to parasitism and intraspecific competition. Host species are affected differently by interspecific competition, with *Achillea* performing better and *Eriophyllum* performing worse. Haustoria count was not able to predict traits for any of the host species, but haustoria count was able to predict *Castilleja* traits when grown with *Eriophyllum* for four of the five traits.

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