A seed infecting fungus (*Tilletia ehrhartae*) could provide a partial biological control mechanism for invasive Veldt grass (*Ehrharta calycina*).

**Introduction**

Invasive plant species disrupt and alter ecosystem diversity, species composition, and ecological function. Management of invasive species can lead to significant economic cost (Torchin and Mitchell 2004). Veldt grass (*Ehrharta calycina*), is causing a decline in plant diversity and a change in ecosystem processes in Coastal California. It is ranked as “high concern” by the Calif. Invasive Plant Council because of its rate of spread and overall impacts.

The enemy release hypothesis (ERH) posits that plant species, on introduction to a novel region, experience a decrease in interactions with natural enemies that would normally regulate their distribution and abundance (Keane & Crawley 2002). Veldt grass (*Ehrharta calycina*), is a species-specific seed pathogen of *Ehrharta calycina* (Pasco et al. 2005). The fungal smut (Fig. 1b), is known from the native range of Veldt grass (South Africa) and Australia (ibid.).

Infection by this smut is systemic (Castlebury et al. 2005): the entire seed is replaced by fungal spores. Under the ERH, the smut represents a potential biological control agent of Veldt grass. Studies have been conducted on plants released from pathogens (Mitchell and Power 2003), and it is known that pathogens can have a negative impact on host population densities and growth rates (Torchin and Mitchell 2004). But, it is also known that fungal infections can cause an increased growth vigor (Wennstrom 1999). An increase in vigor would make this plant more, not less, invasive.

**Methods**

We collected Veldt grass samples from sand dune habitat at two locations, the Guadalupe-Nipomo Dunes National Wildlife Refuge (N=24) and Los Osos (N=24), CA (Fig. 3). Quadrats were used to subsamples within each location. Quadrats (N= 6 / location) measuring 20m² were placed so that they spanned variation in slope and aspect. The smutted individual (Fig. 4) closest to each quadrant corner, with a diameter (at 10 cm above ground) <10 cm, was selected. For each smutted individual (4 per quadrat), the nearest uninfected neighbor was also collected. We recorded the following data from 48 infected and 48 uninfected individuals: plant diameter, height of each stem, and total number of smutted and non-smutted stems. In infected individuals, stem height of infected versus uninfected stems was evaluated to determine whether infection stimulated or inhibited growth. We also used growth at the site of escape (in the root mass) to evaluate inhibition/stimulation by comparing infected and uninfected portions of the root mass. Specifically we determined if the escaped (uninfected) portions were "superior" (Fig. 5), or if they showed "ball and socket" growth (Fig. 6), growth forms. Either form would indicate more vigorous growth in escaped (uninfected) portions of the root than in infected portions.

**Results**

Infected individuals showed clustering of smutted stems, and separate root masses leading to non-smutted stems. We interpreted this as an escape from systemic infection. The average length for smutted stems and the average length for non-smutted stems is shown in Figure 7. The paired t-test (averages were compared within individuals and not across individuals, t-value = 20.95, p-value <= 0.0001) supports a decrease in vigor in smutted stems.

**Conclusions**

- Individuals exhibited escape from infection.
- A significant difference in stem height between smutted (infected) and non-smutted (uninfected) stems, suggesting a decrease in vigor with infection.
- No correlation between infection and stimulated or inhibited vigor in growth.
- Because the plant is able to escape infection, the fungal infection becomes less relevant over time.
- Additional control methods including seed predators, herbicides, and removal might aid in regulating this invasive species.

**References**


