

White Grubs Have Unseen Effects on Competition Between Turfgrasses and Dandelions

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Objectives:

The influence of insect herbivory in driving the composition of plant communities is well documented. By feeding only on certain plant species, insects can provide a competitive advantage to less favored species growing in the same environment. Fungal endophytes are known to provide defense against surface feeding insects. Their ability to provide defense against root-feeding insects has not been well studied. In a series of greenhouse studies conducted by Richmond, Grewal and Cardina at Ohio State University, the influence of endophyte infection and root-feeding by larvae of the Japanese beetle on the competition between turfgrasses and dandelions was investigated.

Rationale:

Larvae of the Japanese beetle, feed on the roots of turfgrass plants and they can be a serious pest of turfgrass. Fungal endophytes can have profound effects on the growth and competitive abilities of infected turfgrasses because of the strong defense they provide against surface feeding insects. However, their influence on root-feeding invertebrates seems to be highly variable, and dependent upon endophyte strain, turfgrass cultivar, and invertebrate species.

Procedures:

In order to determine the influence of Japanese beetle larval feeding and endophyte infection on competition between dandelions and turfgrass, 50:50 mixtures of dandelion with either endophyte infected or uninfected perennial ryegrass or tall fescue were established in the greenhouse. Plants were allowed to establish and grow for 3 months after planting and were cut regularly to a height of 6.0 cm. Three field collected, fully grown Japanese beetle larvae were added to half of the pots. After two more months, the number of tillers (grass) or leaves (dandelion) were recorded and above-ground biomass was collected by cutting plants at the soil surface. Roots belonging to individual plants were carefully separated, washed free of soil and organic matter, and also placed into paper bags. All plant material was dried at 80°C for 48 h prior to measuring biomass. Dry weights for all plant materials were analyzed.

Results:

Root-feeding by Japanese beetle larvae and endophyte infection both had a significant influence on perennial ryegrass growing in mixtures with dandelion whereas only root-feeding had a significant influence on tall fescue growing in mixtures with dandelion. In mixtures of perennial ryegrass or tall fescue and dandelion, Japanese beetle larvae reduced the number of perennial ryegrass and tall fescue tillers and above- and below-ground biomass, allowing dandelion to produce more leaves and greater above- and below-ground biomass in each case (Fig. 1 A through F and Fig. 2 A through C). Endophyte infection had no influence on Japanese beetle larvae and did not protect either grass from larval damage. Somewhat unexpectedly, endophyte infection was actually detrimental to perennial ryegrass in terms of competition with dandelion. Endophyte infected perennial ryegrass produced fewer tillers and had lower above- and below-ground biomass than uninfected plants, but dandelion did not benefit from this result. Endophyte

infection in competing tall fescue plants decreased the number of dandelion leaves and above-ground biomass, but had no significant influence on dandelion below-ground biomass. These results indicate that endophyte infection does not necessarily protect turfgrasses from white grubs and that the influence of endophyte infection on competition between turfgrasses and weeds may vary. More importantly however, these data indicate that white grub feeding may benefit weeds by shifting the competitive balance in their favor.

Conclusion:

Our data indicate that feeding by Japanese beetle larvae can shift the competitive balance in favor of dandelions regardless of the endophyte infection status of competing turfgrasses.

- Feeding by white grubs can shift competitive interactions between turfgrass and weeds in favor of certain weeds.
- Endophyte infection apparently does not protect turfgrasses from white grubs.
- The influence of endophyte infection on competition between turfgrasses and weeds may vary, with some grasses benefiting from infection while others are detrimentally affected.

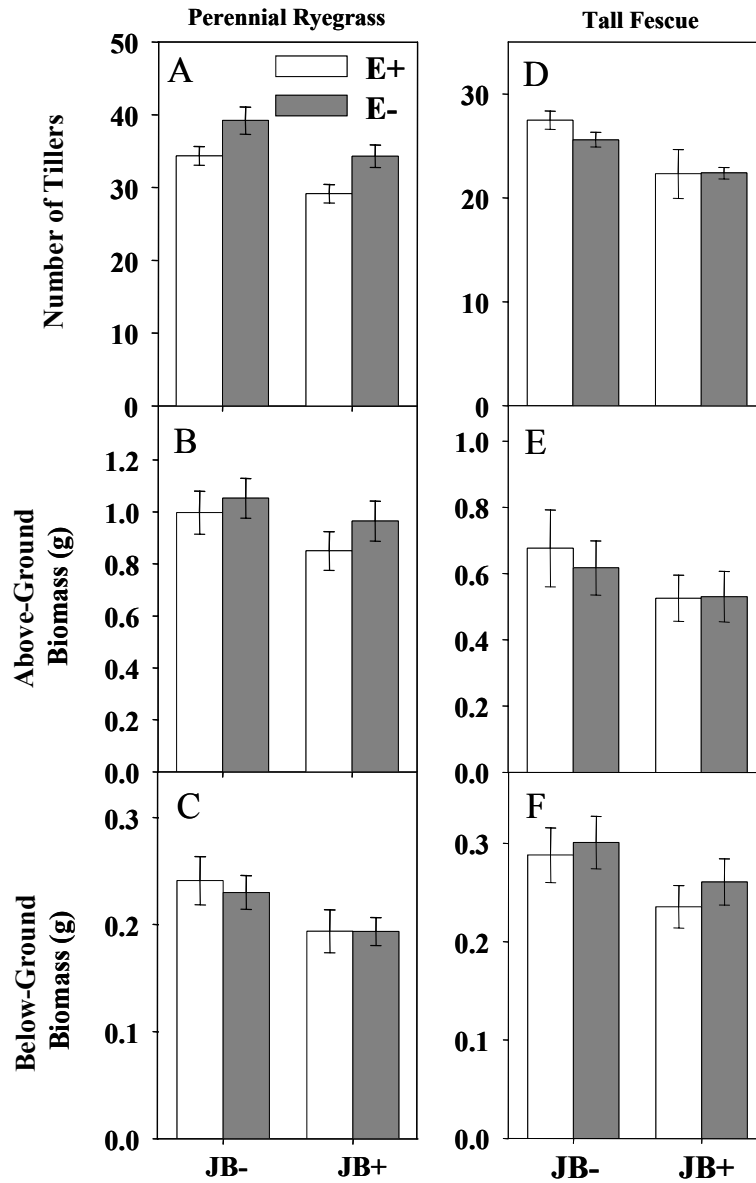


Figure 1. Influence of below-ground herbivory by larvae of the Japanese beetle (JB-, JB+), and endophyte infection (E-, E+) on number of tillers, and above- and below-ground biomass of perennial ryegrass (A-C) and Tall fescue (D-F) in mixtures with dandelion in the greenhouse.

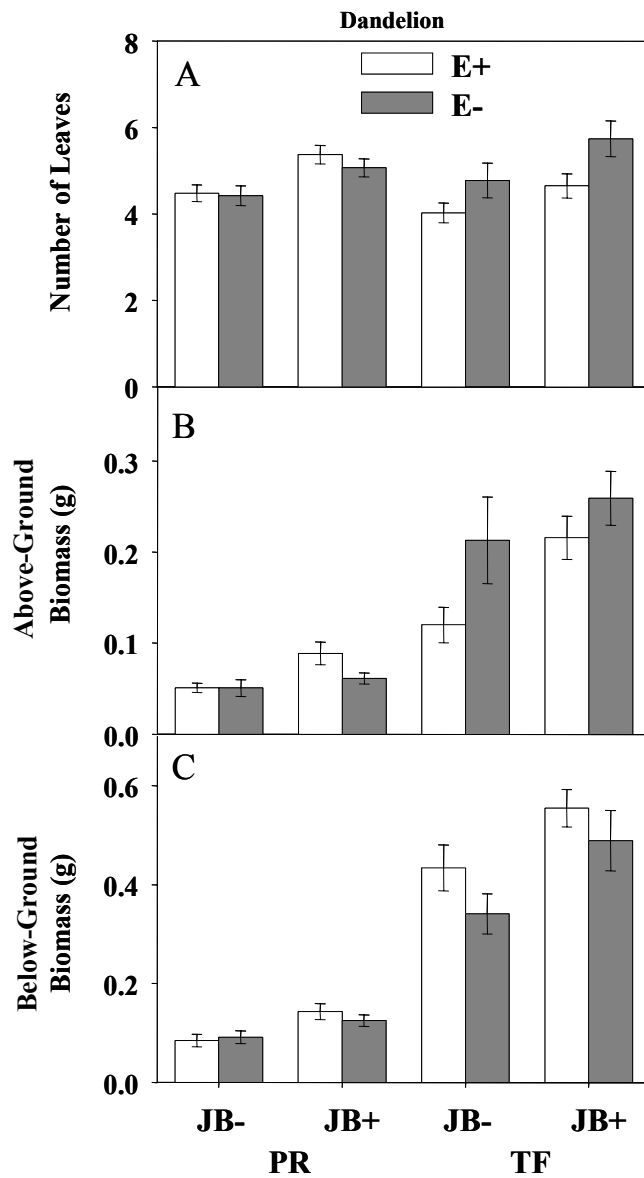


Figure 2. Influence of below-ground herbivory by larvae of the Japanese beetle (JB-, JB+), and endophyte infection (E-, E+) in competing grass plants on number of leaves (A), and above- (B) and below-ground biomass (C) of dandelion plants growing in mixtures with perennial ryegrass (PR) or tall fescue (TF) in the greenhouse.