Endophyte-Enhanced Grasses

Turfgrass infected with nonpathogenic fungal endophytes may meet demands for reduced pesticide use and for lower inputs for maintenance of turf and production of sod. Discovery of the symbiotic relationship between these fungi and turfgrasses occurred when cattle grazing on infected grass developed symptoms such as delirium and "livestock staggers." At the same time, infection with endophytic fungi, which occurs naturally on over 15 million acres of grassland throughout the U.S., results in turfgrasses with higher overall vigor and insect resistance compared with non-endophytic varieties.

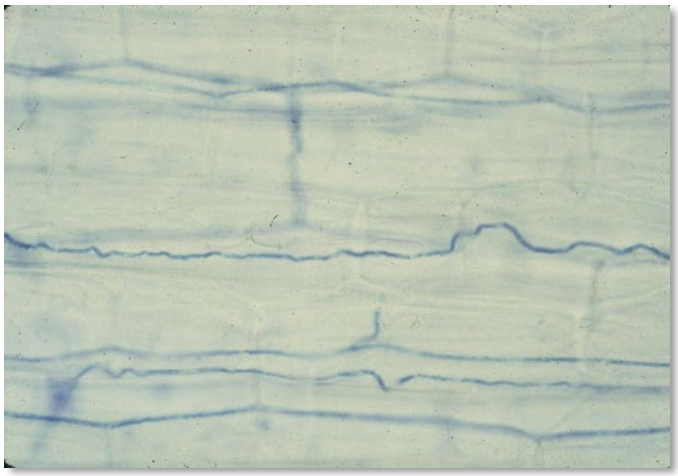

Figure 1 Microscopic view of an endophyte

Life Cycle/History

The term "endophytic" refers to a situation where one organism lives inside another. In this case, the fungus and grass form a relationship that is mutually beneficial and enhances the reproductive success of each. The fungal endophytes *Neotyphodium spp.* (in perennial ryegrass and tall fescue) and *Epichloe festucae* (in fineleaf fescues) manifest no visible signs on their fescue and perennial ryegrass hosts. These endophytes are transferred from plant to plant via seed. The mycelium of the fungus then grows into the sheath, stem, and leaf tissues of the developing grass seedling and maturing plant. Finally, the fungal endophyte enters the flowering stem and seed. The endophyte is passed to the next generation of turfgrass plants through the seed.

Plant Growth, Persistence, and Stress Tolerance

Endophyte-infected grasses tend to be comparatively vigorous, especially under conditions of minimal fertilization and irrigation. Infected plants produce greater numbers of tillers and roots, making them more drought-tolerant, more competitive with weed species, able to recover more rapidly from injury and generally more persistent in the field. The higher performance is particularly notable under stressful conditions such as high temperature, as well as nutrient and water deficiency.

Resistance to Insects and Other Pests

Figure 2. Endophyte-enhanced perennial ryegrass (Right) shows chinch bug resistance vs no endophyte perennial ryegrass (Left).

Endophytic grasses have shown high resistance to foliar-feeding insects such as billbugs, chinch bugs, sod webworms, fall armyworms and argentine stem weevils. Biologically active alkaloids are found only in infected grasses. The insecticidal effects produced by these compounds deter insect infestations, resulting in a population decline. Alkaloid levels in the roots are low, however, and endophytes are thus not effective against root feeders such as white grubs.

Endophyte-Infected Cultivars

To maintain the viability of the endophyte, seeds must be stored at cool temperatures (approx. 40 degrees F) and under dry conditions. Even under excellent storage conditions, the percentage of viable endophytes in a seed lot will decline over time. In contrast, however, endophytes last indefinitely in plants; the endophytic content of a lawn typically increases over time as endophytic tillers outcompete non- endophytic ones.

Source: University of Rhode Island Landscape Horticulture Fact Sheet