
ENDOPHYTE-ENHANCED GRASSES

Turfgrass infected with non-pathogenic (non-disease causing) fungal endophytes may help meet demands for reduced pesticide use and for lower inputs in 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. As such, endophyte-enhanced turfgrasses may be used as a low input, biological control option for sustainable turf care programs.

LIFE CYCLE/HISTORY

The term “endophytic” refers to a situation where one organism lives inside another. In this case, a fungus and grass form a relationship that is mutually beneficial and enhances the success of each. The fungal endophytes *Neotyphodium coenophialum* and *N. lolii* show no visible signs on their fescue and perennial ryegrass hosts in a mown turf. 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. Through the seed the endophyte is passed to the next generation of turfgrass plants.

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, and nutrient and water deficiency. The result is a grass that is highly suitable for medium to low input situations.

RESISTANCE TO INSECTS AND OTHER PESTS

Endophytic grasses have shown high resistance to foliar-feeding insects such as billbugs, chinch bugs, sod webworms, and fall armyworms. Biologically active alkaloids are found only in infected grasses. The insecticidal effects produced by these compounds deter insects from feeding or cause “antibiosis” effects which alter the life cycle of the insect. The result is an ultimate decline in the population. Alkaloid levels in the roots are low and therefore, endophytes are not effective against root feeders such as white grubs.

ENDOPHYTE-INFECTED CULTIVARS

There is an increasing number of endophyte-infected, improved cultivars of tall fescue, perennial ryegrass, and fine fescues. Combinations of these varieties are often marketed as low maintenance mixtures. Despite attempts to incorporate endophytic fungi into Kentucky bluegrass and bentgrasses, these high quality grasses are still endophyte free.

In order to maintain the viability of the endophyte, seeds must be stored at cool temperatures (approx. 40°F) and under dry conditions. Even under excellent storage conditions, the percent of viable endophyte in a seed lot will decline over time.

Buyers should be aware that the amount of endophyte within a specific cultivar can vary in amount from season to season depending on the conditions prevailing during the growing and harvest of the turfgrass seed.

ENDOPHYTE-INFECTED GRASSES FOR USE IN IPM PROGRAMS

Use of endophytic grasses provides a self-sustaining biological control option for turf. Outbreaks of insect and other pests may be prevented or minimized as a result of the insecticidal effects resulting from the interaction as well as to the vigorous nature of turf growth. The enhanced tolerance to stresses, as compared with non-endophytic varieties, makes endophyte-infected grasses particularly suitable for low budget, low input, low maintenance situations. Endophytic grasses may form an integral part of an IPM strategy for turf in that they can withstand a range of mowing, fertilization, and irrigation practices. These grasses are also compatible with the use of most insecticides and herbicides, and are only temporarily affected by fungicides.

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