***Sod webworm resistant plots** of perennial ryegrass stand out at Rutgers test site.*

# Insect Resistant Turf

## Presence of endophytic fungi in ryegrass show increased insect resistance.

**Seed companies may be able to help managers of golf course and landscape turf in the near future by enhancing the insect resistance of ryegrass.**

**Recent discoveries by Dr. C. Reed Funk of Rutgers University and others have established resistance to bill bugs and sod webworms by ryegrass when endophytic fungi are present in plant tissue. The fungi were first found in ryegrass in New Zealand in the 1940's. New Zealand scientists have since noticed ryegrass containing the fungi resisted attack by the Argentine stem weevil.**

**Dr. William Meyer, well-known turf breeder for Turf Seed, Inc., Hubbard, Oregon, believes the viability of the fungi may be affected by storing seed more than one year after production. He says this may require seed producers to start new generations of breeder and foundation seed more often than currently practiced to maintain the insect resistance in the seed. The fungi is spread only by seed transmission. As Meyer states, "The discovery of the endophytic fungus in ryegrass and its association with insect resistance is certainly the topic of the day."**

**Dr. Funk and Dr. Richard Hurley, vice president of Lofts Seed Co., Bound Brook, N.J., presented a paper to the Forage and Turfgrass Endophyte Workshop held in Oregon in May. Excerpts from their paper follow.**

Recent discoveries associating the presence of endophytic fungi, living within the tissues of a host plant, with plant resistance to a number of serious insect pests will require important modifications in current methods of seed production, storage, labeling, and breeding.

The benefits of endophyte-enhanced pest resistance (EEPR) must be weighed against occasional adverse affects of endophyte containing plants on the health and performance of animals consuming such plants as a major part of their diet. We may want endophyte containing verieties in turf and other non-food plants.

Scientists working in New Zealand were the first to demonstrate an endophytic fungus was associated with resistance to the Argentine stem weevil, an important pest of pastures, turfs, small grains, and maize. They also showed non-endophyte containing plants were gradually eliminated from pastures as endophyte infected plants survived and dominated. The relationship between the fungi and perennial ryegrass is symbiotic.

Recent studies have demonstrated resistance to sod webworms attacking perennial ryegrass in New Jersey was associated with the presence of endophytic fungi. Twelve perennial ryegrasses were rated as having high resistance to sod webworms in the trials.

Resistance of perennial ryegrass to the bluegrass billbug has also been reported. It is likely such a unique resistance mechanism might well enhance resistance to many other insects and possibly fungal pathogens (diseases).

In nature, endophyte infected plants are very common in perennial ryegrass and tall fescue. Ryegrasses containing the *Lolium* endophyte have been selected from old turfs in widely separated areas of the United States. The endophyte is found in varying frequencies in commercially available perennial ryegrass cultivars.

Some popular turf type perennial ryegrass varieties had high frequencies of endophyte when they were originally released. In many instances, however, some or all of the seed lots of these varieties have lost most of the endophyte.

Endophytic fungi can be transmitted by both vegetative propagation of the host plant or through seed. It has been observed that endophyte viability can be lost by normal seed storage practices within a period of less than two years. Viability can be maintained by cold, dry storage conditions. This requires special attention to seed production, storage, and seed labeling practices. The seed industry needs to evaluate the costs versus benefits of new practices.

Plants containing certain endophytes might produce substances which could have adverse effects on the health and performance of animals consuming these plants under certain conditions. It may be necessary to limit the use of plants containing certain endophytes to non-food uses and to properly identify and label such materials.

It is possible endophytic fungi might be involved in host plant response to many additional insect, disease and neamtode pests. This makes it important to identify, stabilize, maintain, and properly label endophyte containing varieties.

Techniques for artifically inoculating plants with endophytic fungi have not been perfected to date. Such techniques would be helpful to the plant breeder but are not critical to the success of programs designed to develop and maintain endophyte containing varieties.

**WTT**

**Endophyte Levels in Perennial Ryegrasses.**

| Variety | High | Moderately High | Moderate | Low |
|---|---|---|---|---|
| All*Star | | x | | |
| Birdie II | | x | | |
| Citation | | | | x |
| Citation II | x | | | |
| Cowboy | | x | | |
| Dasher | | | x | |
| Delray | | | x | |
| Derby | | | x | |
| Diplomat | | | | x |
| Elka | | | | x |
| Gator | | | | x |
| Linn | | | x | |
| Manhattan | | | | x |
| Omega | | | | x |
| Palmer | | | x | |
| Pennfine | | | x | |
| Pennant | x | | | |
| Prelude | | x | | |
| Premier | | x | | |
| Regal | x | | | |
| Repel | x | | | |
| Ranger | | | | x |
| Yorktown II | | | | x |