

What Are Endophytes?

by Dr. David Sleper
University of Missouri
Columbia, MO

New information on endophytes has attracted attention in recent months. Both short term and long term value and positive and negative value are being discussed. Dr. David Sleper of the University of Missouri lists the following points as important in answering the question, "What are endophytes?"

—An endophyte is a plant within a plant. In the future, much will be learned about these relationships. In effect, they are fungus-grass connections.

—The fungus, *Epichloe typhina* (ET) can function as a endophyte.

—Choke disease results from a mass of mycelia going through the sexual stage.

—In ryegrasses and tall fescues the fungus does not go through the sexual stage in its life cycle.

—*Sphacela typhina* was identified as an endophyte in 1881. Now, *Acremonium coenophialum* has endophytic properties.

—Endophytes are known to create adverse effects in some animals.

—"Ryegrass Staggers" and "Summer Syndrome" are believed caused by endophytes.

—When sheep graze on endophyte infested forage, they get rough coats and muscle tremors.

—Poor animal performance is often correlated with: elevated rectal temperature, failure to shed winter coat, uncomfortable feeling necessitating attempts to cool off by standing in water or rolling in mud, poor conception rates, low milk production, loss of weight, even death.

—Endophytes also have advantages they can depart to some plants:

- insect resistance;
- disease resistance;
- enhanced heat tolerance;
- enhanced drought tolerance;
- improved persistence;
- increased density;
- faster recovery from injury;
- more attractive appearance;
- greater vigor;
- reduced crabgrass invasion.

—Increased resistance to cutworms, armyworms, and Argentine stem weevils has been confirmed. There is good evidence that other insects may be affected.

—Certain rusts have been noted to be less infectious in the presence of endophytes.

—Insect control may lead to other benefits on the basis of a more vigorous grass stand. Where there are mixed stands of grasses with and without endophytes, those with endophytes survive. This may be related to allelopathy in some instances.

—Dr. Reed Funk of Rutgers University has noted sod webworm resistance in Pennant perennial ryegrass.

—Endophytes are seed born pathogens. Hyphae are found between the aleurone and endosperm layers. Under the seed coat is the aleurone layer then starch endosperm. The endophyte is usually found near the endosperm.

—Seed storage affects the viability of the endophyte. At 30-40 degrees F. it can be maintained for three to four years. When frozen, it can be held even longer. At ambient temperatures, the endophyte will last about one year. In the St. Louis, Missouri area, seed stored in the garage for one year (high summer temperature and humidity) will only have about 20% of the endophyte left.

—Endophytes are transmitted to plants through the seed, not through the soil. As the seed germinates, the fungus grows. It can be found within the plant at about the four or five leaf stage.

—Endophytes do not penetrate living cells. They live in intercellular spaces — in sclerenchyma tissue. Thus, spread of the endophyte does not take place until this strengthening tissue develops. Thus, endophytes are not present in all plant parts and are never found in living cells. They do not develop as readily into root systems of tall fescue as into perennial ryegrass roots. They are found in the sheath more than in leaf blades. The mechanical packing of cells at the collar, where leaf blade joins the sheath, prevents endophyte movement into the blade. Some endophyte toxin may move independently of the fungus.

—All cool season grasses are suitable hosts for the endophyte. Some have more than others. Also, endophytes are present in trees and shrubs. The concept of endophyte enhanced insect resistance is being intensively researched.

—Endophytes are not likely to spread as they are confined to seed and mature plants through seedling development. Other possible mechanisms for spread are being investigated.

—Fungicides have little effect on endophytes. Some seed treatments may be effective, but little control is likely in a mature plant. State seed regulations now include endophyte testing under some conditions. A squash test can be used to indicate the presence of endophyte in the tissue but it will not tell if it is alive. Grow out tests and tissue culture studies are necessary for determination of live endophyte. These tests are time consuming and thus, costly.

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