

SEEDLING DISEASE - ROOT-KNOT NEMATODE DISEASE INTERACTIONS

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Associations, also sometimes called disease interactions or complexes, between fungal pathogens and plant-parasitic nematodes have been known to occur in cotton for over 100 years. These interactions occur when both organisms infect the cotton plant, and effects on the host can range from mild to very severe. Damage to the plant (or crop) from these interactions can be either additive (disease severity is equal to the combined effects of each pathogen alone) or synergistic (severity due to the interaction is greater than would be expected from the combined additive effects of each organism).

Two groups of cotton pathogens have most often been associated in interactions with nematodes: the vascular wilts, particularly *Fusarium oxysporum* f. sp. *vasinfectum* and several seedling disease pathogens. The nematode that has been most often associated in disease interactions in cotton is the root-knot nematode, *Meloidogyne incognita*. With seedling diseases, interactions with the root-knot nematode have been reported for the following pathogens:

- *Rhizoctonia solani* (damping off, soreshin)
- *Thielaviopsis basicola* (black root rot)
- *Pythium ultimum* (damping off)

These organisms are widely distributed in most cotton growing regions and are commonly found together with nematodes in cotton fields. Interactions can occur from direct effects of the pathogens on each other or the host, or the organisms can influence each other or the host indirectly.

For example:

- Nematode infection of roots of developing seedlings creates wounds that may allow seedling pathogens to enter the roots more easily or to infect tissue that is normally not infected.
- Much higher seedling mortality may occur.
- Infection by the nematode may prolong the period of peak susceptibility for fungal pathogens.
- Infection by the nematode may extend the temperature range at which seedling pathogens can cause disease.
- Infection by one pathogen may influence the reproductive capability of the other pathogen (*P. ultimum* spore production is increased 10-fold on root-knot infected plants; nematode reproduction is decreased substantially on *T. basicola* infected plants).
- Interactions may be more severe in soil types that favor the nematode.

Practical results of the interaction between root-knot and seedling disease include high seedling mortality and stand loss and poor growth and development of surviving plants. Common production problems associated with these interactions are the need for replanting areas within fields or entire fields, poor weed control due to skips, loss of earliness, and yield loss.

Controlling damage from interactions is generally accomplished through management of either one or both of the organisms involved. In some cases, nematode management is the most practical means of minimizing the severity of interactions, while in other cases, controlling the fungal pathogen through fungicides or appropriate cultural practices may be most effective. In all situations, once the presence of these pathogens has been documented in a field, crop and disease management aimed at minimizing the effects of the individual pathogens as well as avoiding increased severity due to potential interactions is advised. The following are some general suggestions for managing fields to avoid disease interactions:

- Determine the root-knot nematode status of the field by:
 - Soil sampling for nematode assay in the fall.
 - Root inspection after harvest in the fall.
- Consider the past seedling disease severity in the field.
- Use a good broad spectrum seed treatment fungicide.
- Consider also using an in-furrow fungicide.
- Control nematodes with a nematicide treatment if thresholds are reached.