NEMATODE AND FUNGAL DISEASE INTERACTIONS ON COTTON

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Plant parasitic nematodes are often associated with soils borne fungal pathogens in disease complexes on many crops. In cotton, Fusarium wilt caused by *Fusarium oxysporum* f. sp. *vasinfectum* increases in severity when associated with the root-knot nematode (*Meloidogyne incognita).* This Fusarium wilt-root-knot nematode disease complex is possibly the most economically important disease complex of cotton worldwide.

Symptoms of Fusarium wilt may occur at any stage of crop development, however, foliar symptoms typically develop with the beginning of flowering. Foliar symptoms of Fusarium wilt on cotton seedlings appear on the cotyledons with vein darkening, marginal chlorosis progressing to necrosis and finally defoliation. In plants with true leaves, foliar symptoms include marginal chlorosis of the leaves of the lower nodes (Figure 1). The chlorotic areas are initially interveinal and then expand but are usually limited by secondary veins. Chlorotic areas become necrotic and the leaves separate from the plant easily. Plants appear wilted and in some cases only one side of the plant will show symptoms. Symptomatic plants are stunted compared to surrounding healthy plants (Figure 2). Vascular discoloration or browning is visible in a stem cross-section (Figure 3). The vascular browning is usually limited to the steel or vascular cylinder. If Fusarium wilt develops in the vegetative stage of cotton plant growth the infected plants are more likely to die than if the disease develops when the cotton plant has progressed to the reproductive stages of plant growth.

The fungus, *Fusarium oxysporum* Schlecht. f. sp. *vasinfectum* Atk. Sny. & Hans. grows rapidly on potato dextrose agar. The colony is white, fluccose with a violet pigment in the medium on the reverse side. Macroconidia are borne on branched monophiliads or in sporodochium (Figure 4). They are fusiform to flacate in shape with three to five septa and 27-48 x 2.5 -4.5 μm in size. Microconidia are borne on short unbranched monophiliads. They are one-celled, hyaline and 5-20 x 2.2-3.5 μm in size. Chlamydospores are produced both intercalary and terminally on vegetative hyphae and range in size from 7-13 μm in diameter.

The root-knot nematode, *Meloidogyne incognita* (Kofoid & White) Chitwood is a sedentary endoparasite nematode (Figure 5). Second stage juveniles hatch for the egg and are the infective stage which penetrates the cotton root system. Once they penetrate to the steel, the nematode induces the formation of specialized feeding cells from which the nematode feeds for the remained of its life. The females enlarge to a pear-shape and deposit from 200-1,000 eggs during her life. The life cycle can be complete from egg to egg in as little as 20 days under ideal conditions.

Other nematodes have been reported to increase Fusarium wilt incidence in cotton. Generally, sedentary endoparasitic nematodes are thought to increase Fusarium wilt incidence. The reniform nematode, *Rotylenchulus reniformis*, (Figure 6) and the sting nematode, *Belonolaimus gracilis*, increased wilt incidence in wilt susceptible cotton varieties in greenhouse studies.

Disease interaction between nematodes has also been associated with the seedling disease complex of cotton. The seedling disease fungal pathogens *Rhizoctonia solani, Thielaviopsis basicola,* and *Pythium ultimum* cause pre and post emergency damping off of the cotton seedlings, necrotic lesions on the hypocotyl and reduced root vigor of surviving seedlings. The root-knot nematode has been shown to increase seedling disease severity caused by *Rhizoctonia solani, Thielaviopsis basicola,* and *Pythium ultimum* on cotton. The presence of the root-knot nematode may also expand the length of susceptibility of the cotton plant. Seedling disease caused by *R. solani* and *P. ultimum* was increased by the presence of root-knot and appears to be related to the population density of the root-knot nematode at planting. Black root-rot, caused by *T. basicola,* was found to be more sever and cotton plants developed more slowly in fields infested with the root-knot nematode. It has also been reported that the root-knot, reniform and lance nematodes increase cotton seedling disease caused by the fungi, *Alternaria* spp., *Glomerella gossypii*, and *Fusarium oxysporum*.

Selected References

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Figure 1. Fusarium wilt root knot nematode complex P. Colyer

Figure 2. Fusarium wilt root knot nematode complex P. Colyer

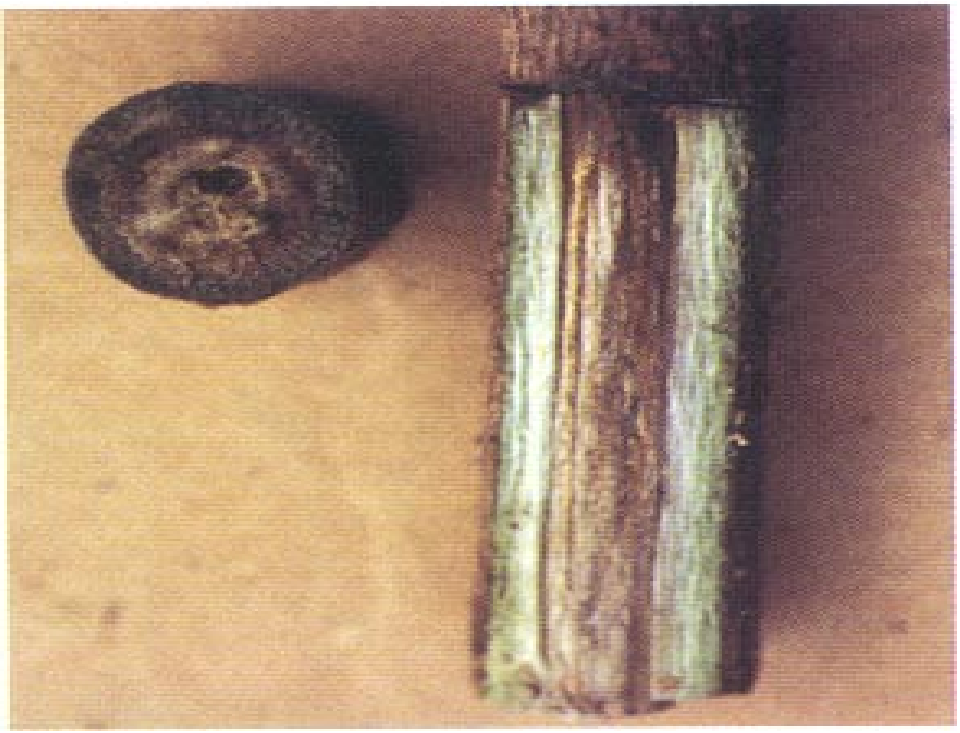

Figure 3. Fusarium wilt stem cross sections T. Kirkpatrick

Figure 4. Fusarium oxysporum A. Plamateer

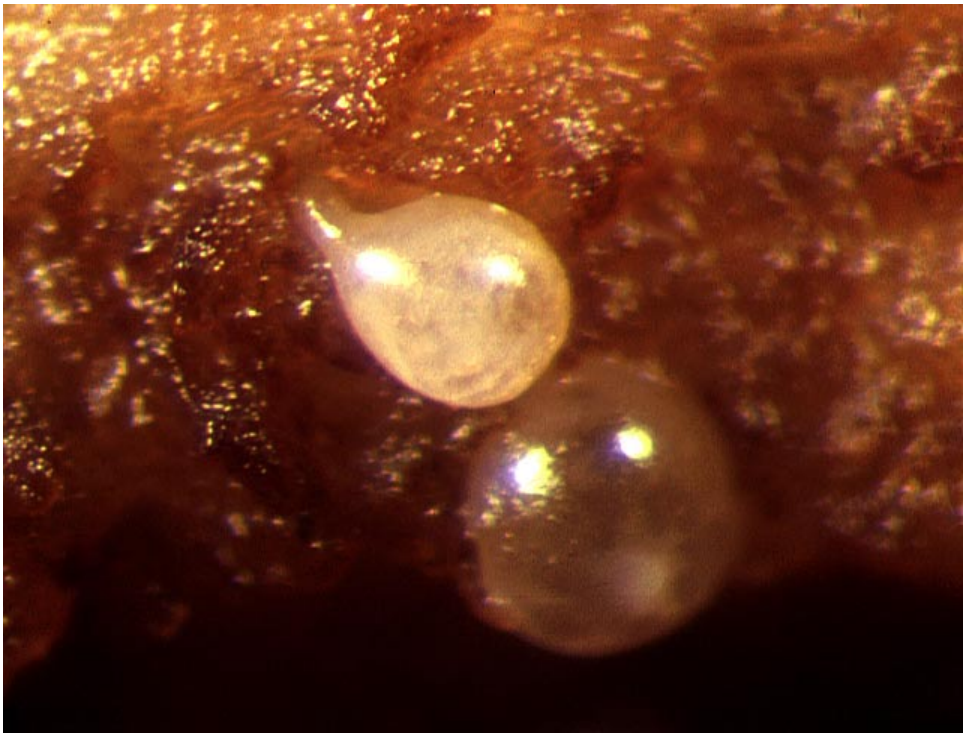

Figure 5. Root-knot nematode female Nema Pix

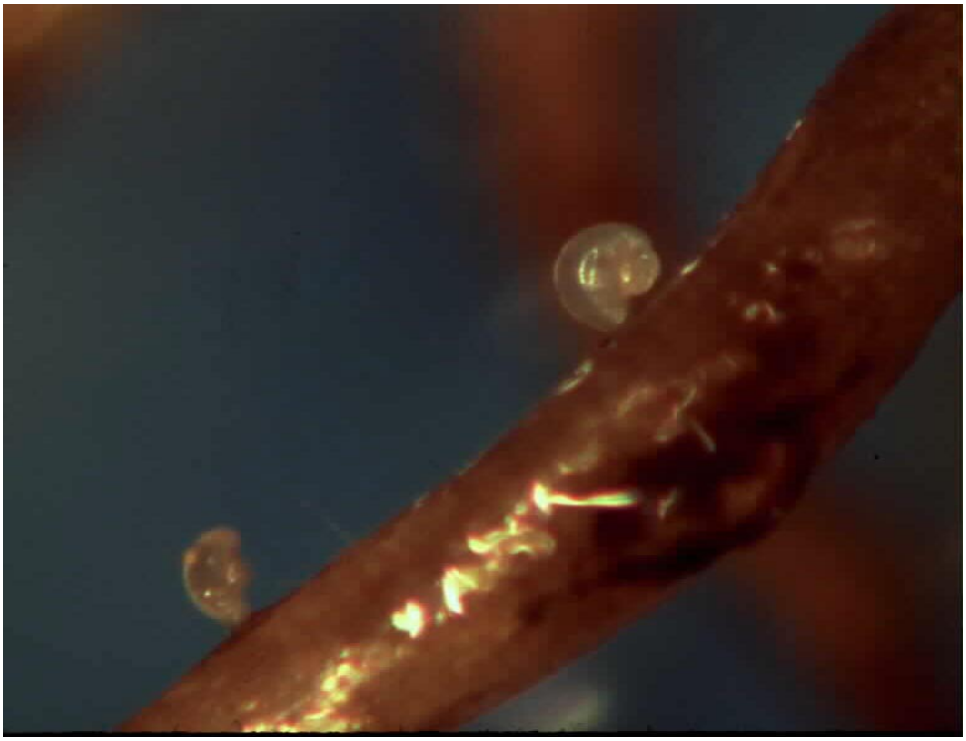

Figure 6. Reniform nematode female on a washed cotton root.