Anguina tritici

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Classification:

Tylenchida
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Historical Perspective

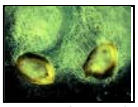
Rev. Turbeville Needham first observed *Anguina tritici*. He reported his observations to the Royal Society of London in a letter that was read before the society on December 22, 1743. It generated considerable interest regarding the significance of Needham's observations in the ongoing debate regarding spontaneous generation of life.

Needham's letter:

"Upon opening lately the small black Grains of smutty Wheat, which they here distinguish from blighted Corn, the latter affording nothing but a black Dust, into which the whole Substance of the Ear is converted; I perceived a soft white fibrous Substance, a small Portion of which I placed upon my Object-plate: It seemed to consist wholly of longitudinal Fibres bundled together; and you will be surprized, perhaps, that I should say, without any the least Sign of Life or Motion. I dropped a Globule of Water upon it, in order to try if the Parts, when separated, might be viewed more conveniently; when, to my great Surprize, these imaginary Fibres, as it were, instantly separated from each other, took Life, moved irregularly, not with a progressive, but twisting Motion; and continued to do so for the Space of Nine or Ten Hours, when I threw them away."

(Reproduced in Christie (1959) from Needham (1744)).

What Needham saw.....



Anguina tritici J2 from a broken seed gall

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Morphology and Anatomy:

The adult nematodes are 2-2.5 mm long with a very short stylet (about 10 µm long). Mature female body swollen and ventrally curved when heat-relaxed. Females are monovarial with the ovary reflexed two or more times.

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Distribution:

India, Ethiopia, Syria, Rumania, Yugoslavia.

Nematode occurs throughout the world and is easily disseminated in seed.

Anguina tritici may be considered a "museum relic" nematode in the western world. Up to 9% of wheat samples in England between 1918-1936 contained galls. From 1949-1957, 0-0.02% contained galls; none found since 1957.

Seed galls (left), healthy seed (right)

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Economic Importance:

C-rated pests in California.

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Feeding:

Infective stage, J2 does not parasitize roots, but moves on the root and stem surface in a film of water to the stem growing tip.

Juveniles probably feed ectoparasitically between compacted leaves until flower primordia form. The ectoparasitic feeding can result in leaf curling in the host.

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Hosts:

Wheat and rye.

The following plants are listed as hosts in various literature sources:

Avena sativa	*Triticum spelta*
Hordeun vulgare	*Triticum ventricosum*
Secale cereale	*Triticum vulgare*
Triticum aestivum	
Triticum monococcum	

For an extensive list of host plant species and their susceptibility, copy the name

Anguina tritici

select Nemabase and paste the name in the **Genus and species box**

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Life Cycle:

Juveniles (J2) penetrate flower primordia and develop through the third and fourth stages to adulthood. The final molt to adulthood occurs only after the seed gall has formed.

Galls can develop from undifferentiated flower buds, stamen tissues, and various other tissues.

Galls contain up to 80 adults in a 1:1 sex ratio.

Reproduction is amphimictic; mating occurs and females produce up to 2000 eggs per individual over several weeks. Thousands of J2s are present in seed galls.

Galls fall to the ground, absorb water, and release juveniles in springtime, or galls may be harvested and stored with seed. Juveniles within drying galls can enter a cryptobiotic state; viable juveniles have been recovered for up to periods as long as 38 years.

Galls appear darker, shorter, and thicker than seed kernels. When galls become wet and absorb water, juveniles are activated.

For nematodes forming seed galls, one generation is produced per year; more than one generation per year can be produced for nematodes that form leaf galls and more stages may be found in the gall.

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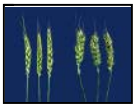
Damage:

Ectoparasitic feeding of *A. tritici* may cause leaf rolling, curling, and spiralling. Plants mature more slowly, and produce smaller seed heads. Yield depressions of 50% are common. 

Crop losses occur frequently in areas with primitive agricultural practices, because seed flotation, mechanical separation, and crop rotation are not practiced.

The interaction of this nematode and *Clavibacter tritici* in wheat in India results in an oozing bacterial infection of the grain known as Tundu disease. The disease is also known as spike blight or yellow ear rot.

The bacterium appears unable to cause the disease without the nematode. The bacterium is vectored on the surface of the nematode into the inflorescence. It colonizes the galled tissue stimulated by the nematode, and out-competes the nematode for this resource (Bird). 

Clavibacter toxicus attached to the cuticle of *A. tritici*

(electron micrograph, M. McClure)

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Management:

Crop rotation for 1 to 2 years to a non-host eliminates *A. tritici* from the soil. The nematode does not survive by feeding on fungi.

Seed can be cleaned by placing it in a 20% brine solution; galls float to the surface where they can be separated. The seed is then rinsed and dried (heat treated).

Mechanical separation also effective in removing galls from seed.

There are no resistant varieties of wheat. However, there are resistant varieties of barley (Paruthi and Bhatti, 1981).

Host Plant Resistance, Non-hosts and Crop Rotation alternatives:

For a list of plant species or cultivars (if any) reported to be immune or to have some level of resistance to this nematode species, copy the name

Anguina tritici

select **Nemabase Resistance Search** and paste the name in the **Genus and species box**

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References:

Christie, J.R. 1959. Plant Nematodes: Their Bionomics and Control. University of Florida. 256p.

Needham, T. 1744. A letter concerning chalky tubulous concretions, called malm: with some microscopical observations on the farina of the red lily, and of worms discovered in smutty corn. Philosophical Transactions of the Royal Society of London 42:634-641.

Paruthi, I. J., and D. S. Bhatti. 1981. Studies on *Anguina tritici* in barley. Nematologica 27:463-466.

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